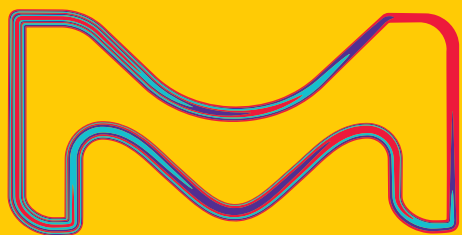


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Kelsey McBride  
Head of International/Distributor Sales, Tissue Diagnostics

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**primary  
antibodies**

# Specialty Quick Reference



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# Specialty Quick Reference



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GLUT1	138
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Napsin A	203
Podoplanin	235
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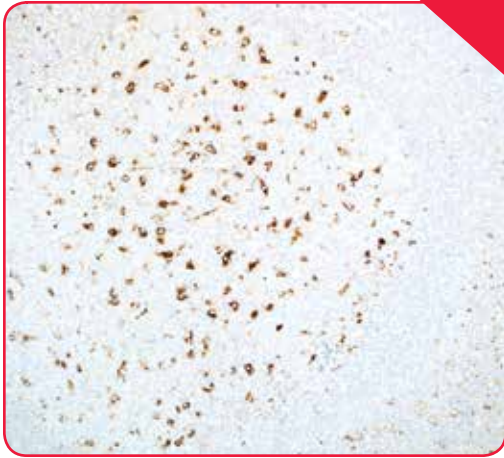


## Soft Tissue Pathology

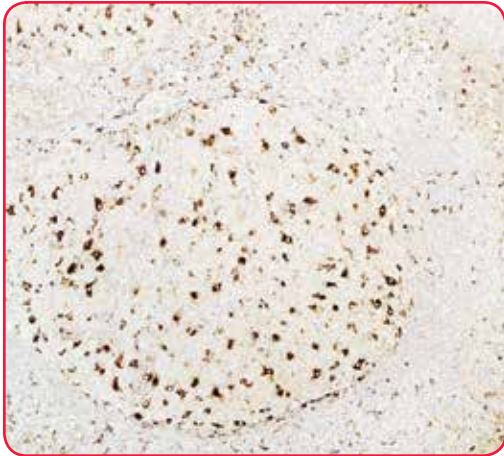
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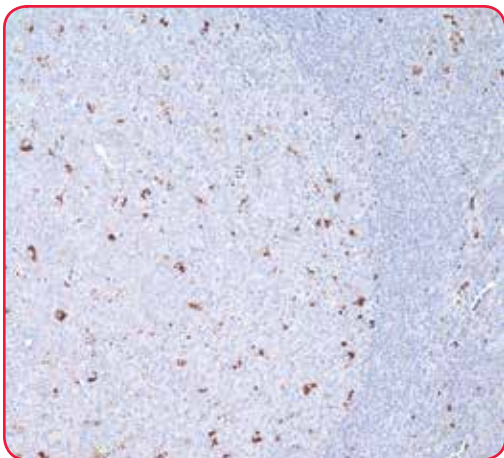
# A-1-Antichymotrypsin



Tonsil, germinal center



Tonsil, germinal center



Tonsil, germinal center

Alpha-1-antichymotrypsin is an acute phase protein that inhibits serine proteases such as chymotrypsin and cathepsin G.<sup>1</sup> Alpha-1-antichymotrypsin primary antibody can be used to identify the presence of alpha-1-antichymotrypsin in histiocytes and their derived neoplasms.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

A1ACT

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Liver: Malignant vs. Benign	297

## Reference

1. Baker C, et al. SERPINA3 (aka alpha-1-antichymotrypsin). *Front Biosci.* 2007; 12:2821-35.
2. du Boulay CE. Demonstration of alpha-1-antitrypsin and alpha-1-antichymotrypsin in fibrous histiocytomas using the immunoperoxidase technique. *Am J Surg Pathol.* 1982; 6:559-64.

## Ordering Information

**A-1-Antichymotrypsin**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	222A-14
0.5 mL concentrate	222A-15
1 mL concentrate	222A-16
1 mL predilute	222A-17
7 mL predilute	222A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# A-1-Antitrypsin

Alpha-1-Antitrypsin is a protease inhibitor from the serpin superfamily, which inhibits a number of protease enzymes from inflammatory cells. The immunohistochemical anti-A-1-antitrypsin reagent has been useful in studying inherited AAT deficiency, hepatic tumors, lesions of a histiocytic nature, and cryptogenic cirrhosis or other forms of liver disease with portal fibrosis of uncertain etiology.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

A1AT

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Liver: Malignant vs. Benign	297

## Reference

1. Callea F, et al. Detection of Pi Z phenotype individuals by alpha-1-antitrypsin (AAT) immunohistochemistry in paraffin-embedded liver tissue specimens. *J Hepatol.* 1986; 2:389-401.
2. Palmer PE, et al. Immunohistochemistry of liver in alpha1-antitrypsin deficiency. A comparative study. *Am J Clin Pathol.* 1974; 62:350-4.
3. Palmer PE, et al. Expression of protein markers in malignant hepatoma: evidence for genetic and epigenetic mechanisms. *Cancer.* 1980; 45:1424-31.
4. Kindblom LG, et al. Immunohistochemical investigations of tumors of supposed fibroblastic-histiocytic origin. *Hum Pathol.* 1982; 13:834-40.
5. Raintoft I, et al. Does the Z gene variant of alpha-1-antitrypsin predispose to hepatic carcinoma? *Hum Pathol.* 1979; 10:419-24.
6. Ramsay AD, et al. Variable antigen expression in hepatoblastomas. *Appl Immunohistochem Mol Morphol.* 2008; 16:140-7.

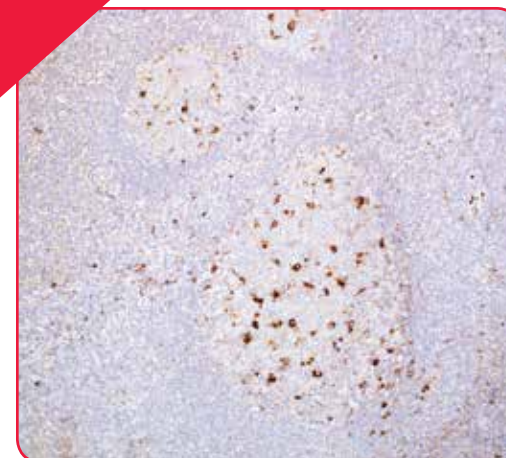
## Ordering Information

### A-1-Antitrypsin

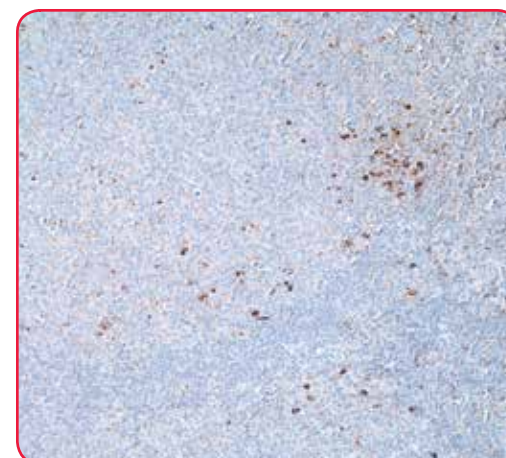
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	223A-14
0.5 mL concentrate	223A-15
1 mL concentrate	223A-16
1 mL predilute	223A-17
7 mL predilute	223A-18

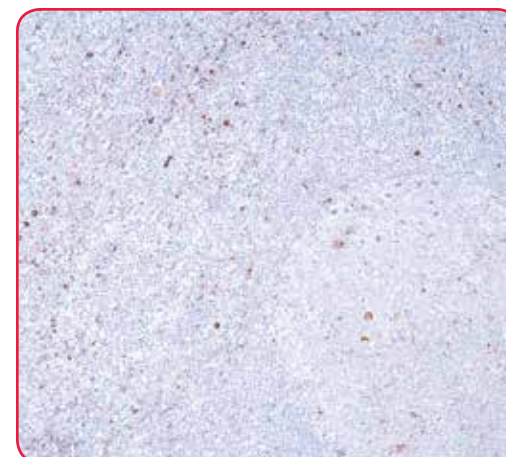
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Tonsil

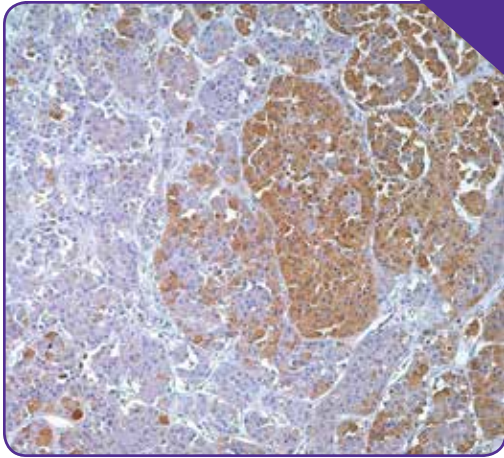


Tonsil

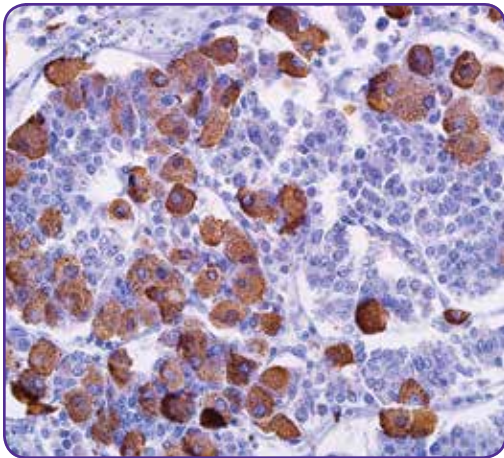


Tonsil

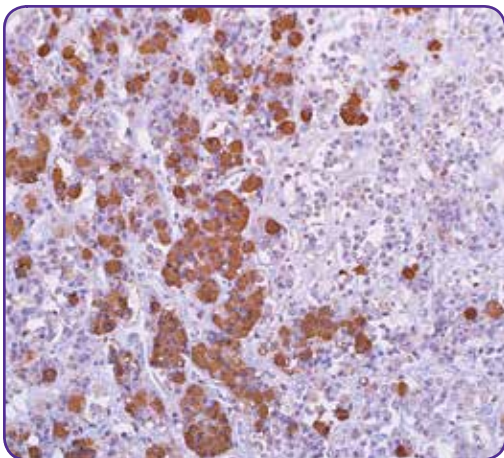
# ACTH



Pituitary lesion



Pituitary lesion



Pituitary lesion

ACTH or adrenocorticotrophic hormone is synthesized from pre-pro-opiomelanocortin (pre-POMC). ACTH is produced and secreted from corticotrophs in the anterior lobe (or adenohypophysis) of the pituitary gland. The anti-ACTH immunohistochemical reagent could be useful in the study of neoplastic and non-neoplastic pituitary diseases.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pituitary

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

Neuropathology

## Reference

1. Pizarro CB, et al. Measurement of Ki-67 antigen in 159 pituitary adenomas using the MIB-1 monoclonal antibody. *Braz J Med Biol Res.* 2004; 37:235-43.
2. Kageyama K, et al. A multihormonal pituitary adenoma with growth hormone and adrenocorticotrophic hormone production, causing acromegaly and Cushing disease. *Am J Med Sci.* 2002; 324:326-30.
3. Fan X, et al. Immunohistochemical localization of carboxypeptidases D, E, and Z in pituitary adenomas and normal human pituitary. *J Histochem Cytochem.* 2002; 50:1509-16.
4. Japon MA, et al. Glial-derived neurotrophic factor and RET gene expression in normal human anterior pituitary cell types and in pituitary tumors. *J Clin Endocrinol Metab.* 2002; 87:1879-84.

## Ordering Information

### ACTH

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	206A-74
0.5 mL concentrate	206A-75
1 mL concentrate	206A-76
1 mL predilute	206A-77
7 mL predilute	206A-78

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# Actin, Muscle Specific

Muscle specific actin is a part of the actin family of proteins which are highly conserved, major components of the cytoskeleton. Anti-muscle specific actin immunohistochemical reactivity is seen in skeletal, cardiac, and smooth muscle cells and can be seen in neoplasms with muscle differentiation such as leiomyomas and rhabdomyosarcomas. In contrast, anti-muscle specific actin reactivity is typically not seen in endothelial cells, connective tissues, carcinomas, melanomas, lymphomas and most nonmyogenic sarcomas.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** skeletal muscle

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Soft Tissue Pathology

## Associated Grids

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## Reference

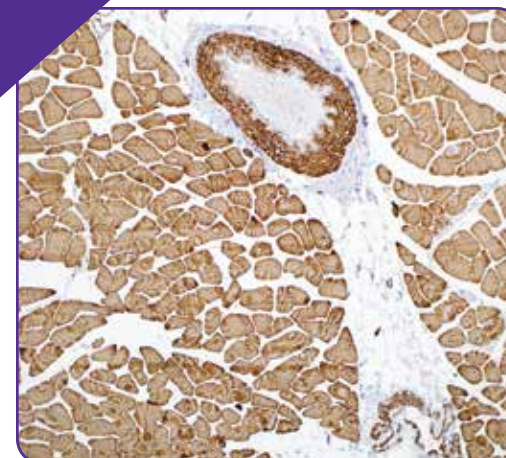
1. Gown AM, et al. Human atherosclerosis. II. Immunocytochemical analysis of the cellular composition of human atherosclerotic lesions. *Am J Pathol.* 1986; 125:191.
2. Schmidt RA, et al. Diagnosis of rhabdomyosarcomas with HHF35, a monoclonal antibody directed against muscle actins. *Am J Pathol.* 1988; 131:19-28.
3. Azumi N, et al. Immunophenotypic diagnosis of leiomyosarcomas and rhabdomyosarcomas with monoclonal antibodies to muscle-specific actin and desmin in formalin-fixed tissue. *Mod Pathol.* 1988; 1:469-74.
4. Rangdaeng S, et al. Comparative immunohistochemical staining for desmin and muscle-specific actin. A study of 576 cases. *Am J Clin Pathol.* 1991; 96:32-45.
5. Tsukada T, et al. HHF35, a muscle actin-specific monoclonal antibody. II. Reactivity in normal, reactive, and neoplastic human tissues. *Am J Pathol.* 1987; 127:389-402.

## Ordering Information

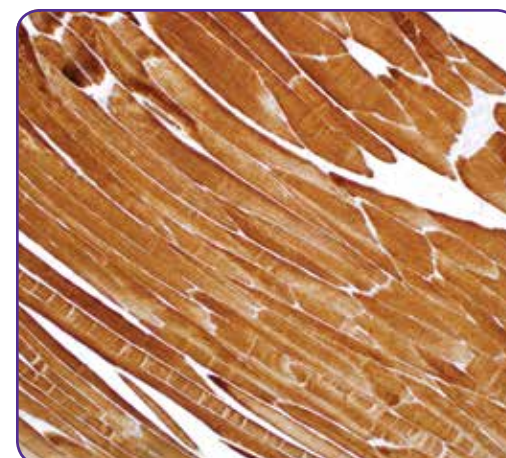
**Actin, Muscle Specific (HHF35)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	201M-94
0.5 mL concentrate	201M-95
1 mL concentrate	201M-96
1 mL predilute	201M-97
7 mL predilute	201M-98
25 mL predilute	201M-90

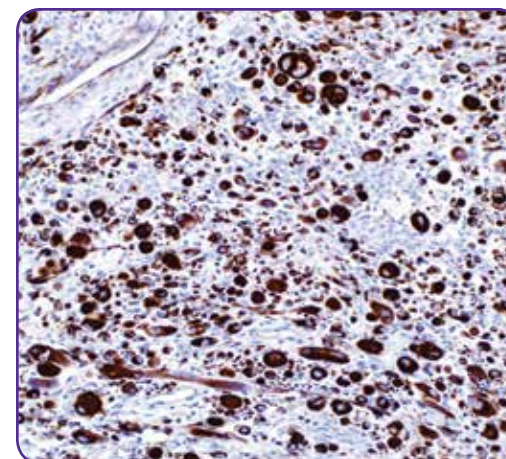
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Skeletal muscle

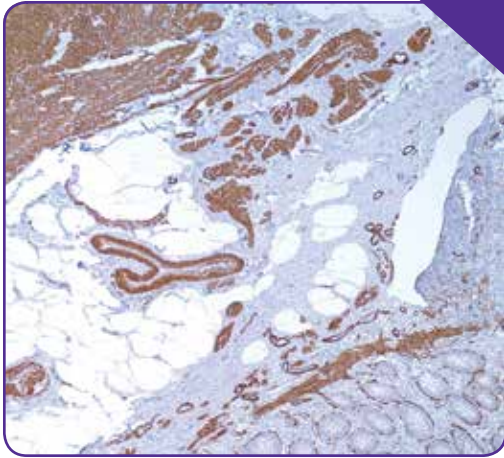


Skeletal muscle

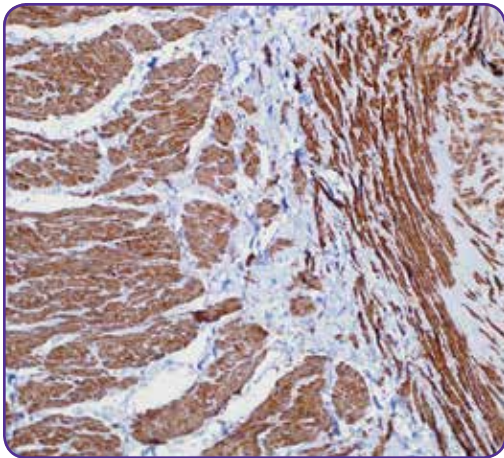


Rhabdomyosarcoma

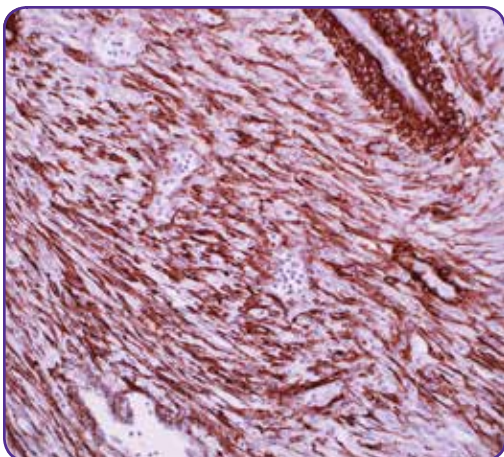
# Actin, Smooth Muscle



Colon



Colon



Soft tissue

Smooth muscle actin is a part of the actin family of proteins which are highly conserved and form microfilaments. These filaments are one of the major components of the cytoskeleton. Anti-smooth muscle actin immunohistochemical reactivity is seen in smooth muscle cells, myofibroblasts and myoepithelial cells.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** appendix, uterus, vessel wall

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG/k

## Associated Specialties

Anatomic Pathology

Soft Tissue Pathology

## Associated Grids

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## Reference

1. Cooke PH. A filamentous cytoskeleton in vertebrate smooth muscle fibers. *J Cell Biol.* 1976; 68:539-56.
2. Skalli O, et al. A monoclonal antibody against alpha-smooth muscle actin: a new probe for smooth muscle differentiation. *J Cell Biol.* 1986; 103:2787-96.
3. Perez-Montiel MD, et al. Differential expression of smooth muscle myosin, smooth muscle actin, h-caldesmon, and calponin in the diagnosis of myofibroblastic and smooth muscle lesions of skin and soft tissue. *Am J Dermatopathol.* 2006; 28:105-11.

## Ordering Information

### Actin, Smooth Muscle (1A4)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	202M-94
0.5 mL concentrate	202M-95
1 mL concentrate	202M-96
1 mL predilute	202M-97
7 mL predilute	202M-98
25 mL predilute	202M-90

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Adenovirus

Adenovirus infection is associated with a broad spectrum of clinical disease in both children and adults. It has gained more attention as an important complication in patients who have undergone bone marrow or solid organ transplantation. The incidence of adenovirus infection in bone marrow transplant patients has been reported at 5-20%.<sup>1,2</sup> Adenovirus infection on morphology should be differentially diagnosed from other virus infections, especially CMV infection. Anti-adenovirus can assist in this differential diagnosis by showing a round or crescent-shaped nuclear inclusion, generally within the surface epithelium and is exclusively intra-nuclear in location.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** adenovirus infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Soft Tissue Pathology

## Reference

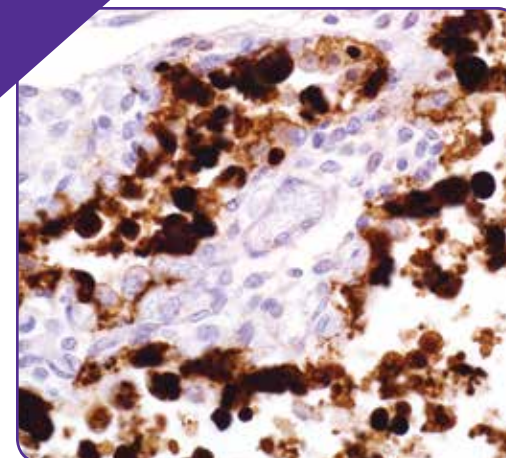
1. Ison MG. Adenovirus Infections in Transplant Recipients. Clin Infect Dis. 2006; 43:331-9.
2. Shayan K, et al. Adenovirus enterocolitis in pediatric patients following bone marrow transplantation: report of 2 cases and review of the literature. Arch Pathol Lab Med. 2003; 127:1615-8.

## Ordering Information

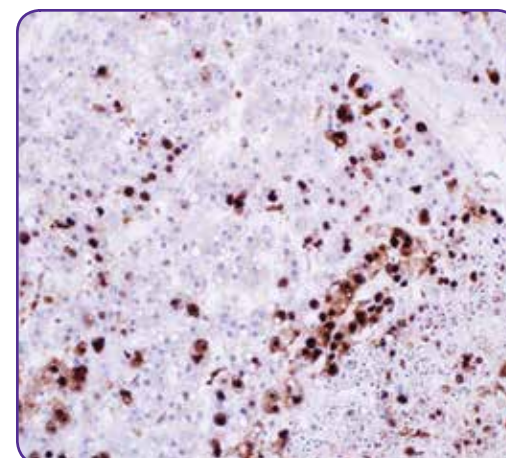
**Adenovirus (20/11 & 2/6)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	212M-14
0.5 mL concentrate	212M-15
1 mL concentrate	212M-16
1 mL predilute	212M-17
7 mL predilute	212M-18

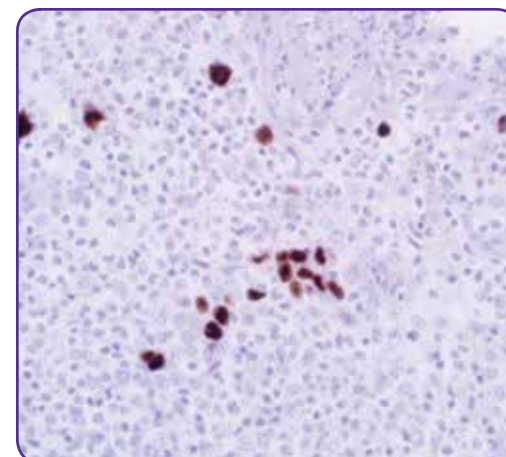
*Please contact your distributor for details on product availability and regulatory status in your country.*



Infected liver

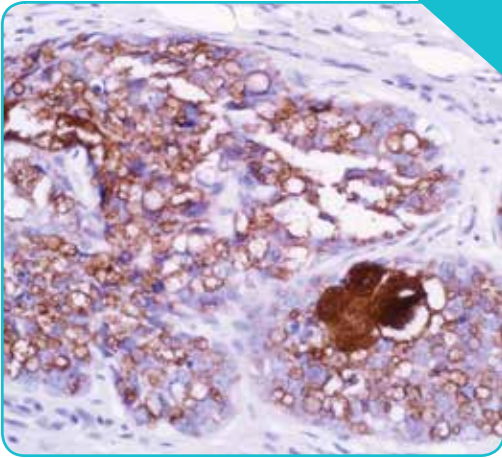


Infected liver

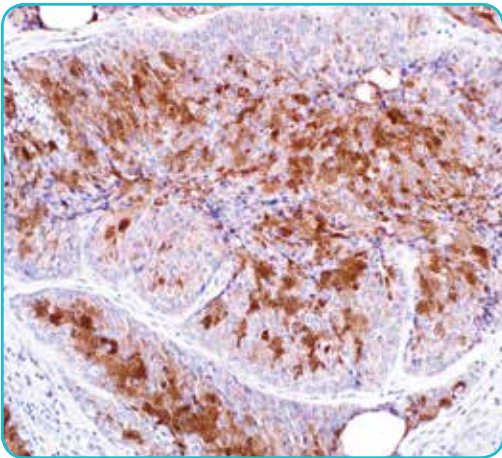


Infected liver

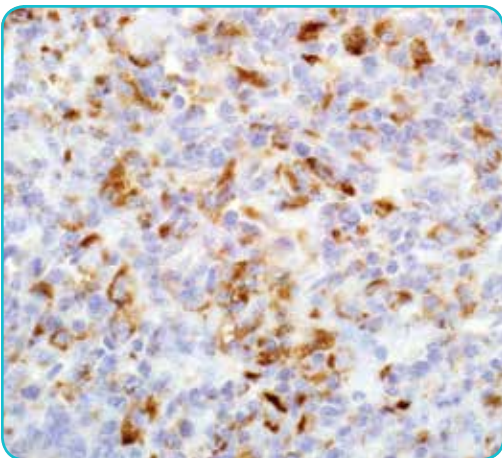
# Adipophilin



Cutaneous sebaceous carcinoma



Cutaneous sebaceous carcinoma



Burkitt lymphoma

Anti-adipophilin targets PLIN2 (perilipin 2) protein belonging to the perilipin family associated with lipid globule surface membranes and intracellular lipid storage droplets in various normal cells. It is helpful in the identification of intracytoplasmic lipids, as seen in sebaceous lesions. Anti-adipophilin is useful in labeling the sebocytes, hence being valuable for the identification of sebaceous carcinoma.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** sebaceous neoplasms

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Cutaneous Epithelial Neoplasms	304

## Reference

1. Lai TF, et al. Eyelid sebaceous carcinoma masquerading as in situ squamous cell carcinoma. *Dermatol Surg.* 2004; 30:222-5.
2. Ostler DA, et al. Adipophilin expression in sebaceous tumors and other cutaneous lesions with clear cell histology: an immunohistochemical study of 117 cases. *Mod Pathol.* 2010; 23:567-73.

## Ordering Information

### Adipophilin

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	393A-14
0.5 mL concentrate	393A-15
1 mL concentrate	393A-16
1 mL predilute	393A-17
7 mL predilute	393A-18

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# ALDH1A1

ALDH1A1 belongs to the ALDH enzymes, a family of evolutionarily conserved enzymes comprised of 19 isoforms that are localized in the cytoplasm, mitochondria or nucleus.<sup>1</sup> ALDH1A1 is predominantly expressed in the epithelium of testis, brain, eye, liver, kidney, as well as neural and hematopoietic stem cells.<sup>2</sup> Recently, it has been reported that high ALDH1A1 mRNA expression was seen in solitary fibrous tumor (SFT) and hemangiopericytoma (HPC), compared to meningiomas and synovial sarcomas.<sup>3</sup> Anti-ALDH1A1 IHC has been recommended for routine use in association with anti-CD34 for the differentiation among SFT, HPC, meningioma, and synovial sarcoma.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** solitary fibrous tumor

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Identification of Meningiomas from Histologic Mimics	296
Skin: Spindle Cell Tissues and Tumors	306, 307
Brain: CNS Tumors	318
Meningeal Solitary Fibrous Tumor (SFT)	318
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324

## Reference

1. Marcato P, et al. Aldehyde dehydrogenase: its role as a cancer stem cell marker comes down to the specific isoform. *Cell Cycle*. 2011; 10:1378-1384.
2. Chute JP, et al. Inhibition of aldehyde dehydrogenase and retinoid signaling induces the expansion of human hematopoietic stem cells. *Proc Natl Acad Sci. USA*. 2006; 103:11707-11712.
3. Bouvier C, et al. ALDH1 is an immunohistochemical diagnostic marker for solitary fibrous tumours and haemangiopericytomas of the meninges emerging from gene profiling study. *Acta Neuropathol Commun*. 2013; 1:1-10.

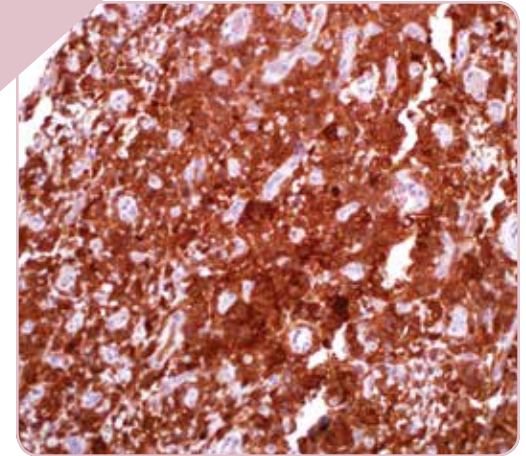
## Ordering Information

### ALDH1A1 (44)

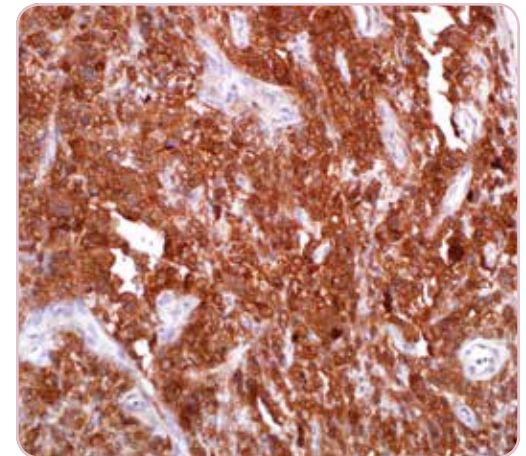
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	400M-14
0.5 mL concentrate	400M-15
1 mL concentrate	400M-16
1 mL predilute	400M-17
7 mL predilute	400M-18

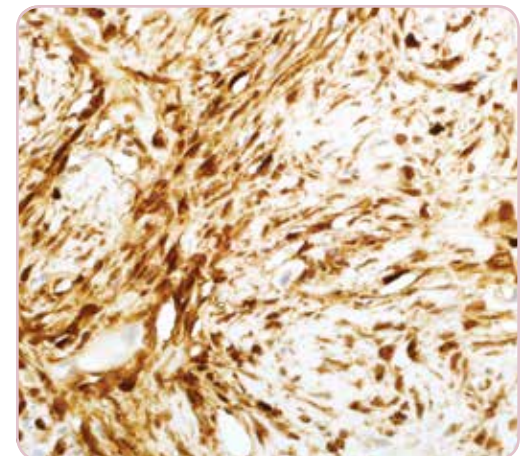
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Solitary fibrous tumor



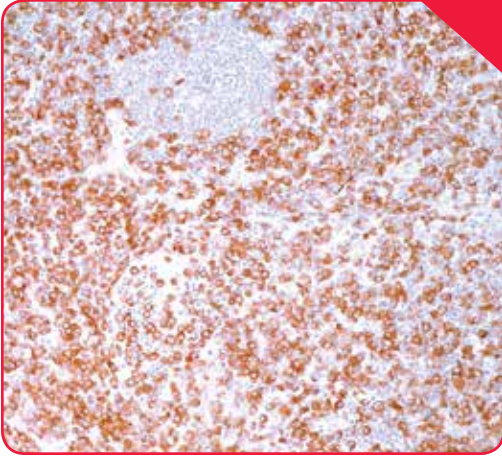
Solitary fibrous tumor



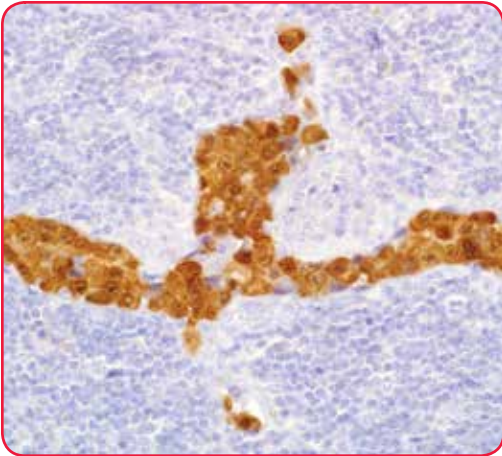
Solitary fibrous tumor



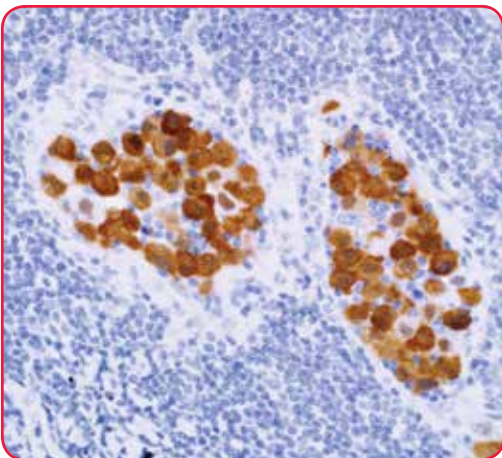
# ALK Protein



Lymph node, anaplastic large cell lymphoma



Anaplastic large cell lymphoma with a sinusoidal distribution



Lymph node, anaplastic large cell lymphoma

Anaplastic lymphoma kinase (ALK) is a novel receptor protein-tyrosine kinase.<sup>1</sup> ALK can create a fusion protein with a nuclear protein gene called nucleophosmin (NPM) via the amino terminus of NPM and the catalytic domain of ALK.<sup>2</sup> The product of this fusion protein is oncogenic.<sup>1</sup> Studies have found this chromosomal translocation in most anaplastic large-cell non-Hodgkin lymphomas, making ALK a good marker for anaplastic large cell lymphomas.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** anaplastic large cell lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>3</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Spindle Cell Tumors	300
Hodgkin vs. Non-Hodgkin Lymphomas	314
Soft Tissue Tumors	322, 323

## Reference

1. Iwahara T, et al. Molecular characterization of ALK, a receptor tyrosine kinase expressed specifically in the nervous system. *Oncogene*. 1997; 14:439-49.
2. Morris SW. Fusion of a kinase gene, ALK, to a nucleolar protein gene, NPM, in non-Hodgkin lymphoma. *Science*. 1994; 263:1281-4.

## Ordering Information

### ALK Protein (ALK-1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	204M-14
0.5 mL concentrate	204M-15
1 mL concentrate	204M-16
1 mL predilute	204M-17
7 mL predilute	204M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Alpha-Fetoprotein

Alpha-fetoprotein (AFP) is a fetal tumor-associated polypeptide of the albuminoid gene family that binds and transports molecules in addition to many other proposed functions.<sup>1</sup> This secretory protein is synthesized primarily in the fetal liver whereas expression is repressed in adult liver.<sup>2</sup> Anti-AFP has been immunohistochemically demonstrated in hepatocellular carcinoma (HCC) and shows no immunoreactivity in normal liver.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** fetal liver

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP209: IgG

## Synonyms and Abbreviations

AFP

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Liver: Malignant vs. Benign	297
Various Germ Cell Tumor Components	301
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309

## Reference

1. Mizejewski GJ. Alpha-fetoprotein structure and function: relevance to isoforms, epitopes, and conformational variants. *Exp Biol Med.* 2001; 226:377-408.
2. Lazarevich NL. Molecular mechanisms of alpha-fetoprotein gene expression. *Biochemistry (Mosc).* 2000; 65:117-33.
3. Yusof YA, et al. Immunohistochemical expression of pi class glutathione S-transferase and alpha-fetoprotein in hepatocellular carcinoma and chronic liver disease. *Anal Quant Cytol Histol.* 2003; 25:332-8.

## Ordering Information

### Alpha-Fetoprotein (EP209)

Rabbit Monoclonal Primary Antibody



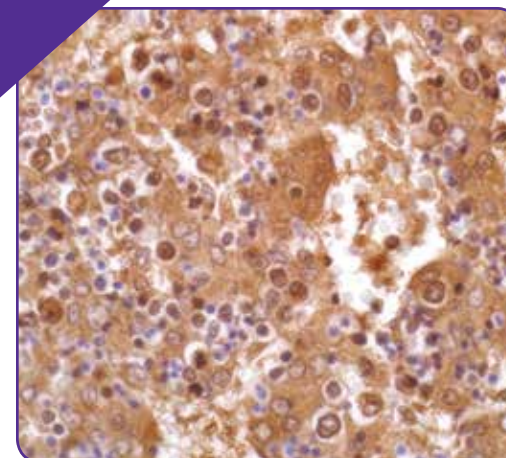
Volume	Part No.
0.1 mL concentrate	203R-14
0.5 mL concentrate	203R-15
1 mL concentrate	203R-16
1 mL predilute	203R-17
7 mL predilute	203R-18

### Alpha-Fetoprotein

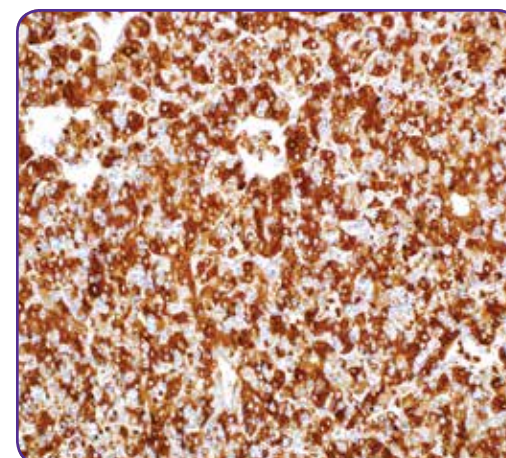
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	203A-14
0.5 mL concentrate	203A-15
1 mL concentrate	203A-16
1 mL predilute	203A-17
7 mL predilute	203A-18

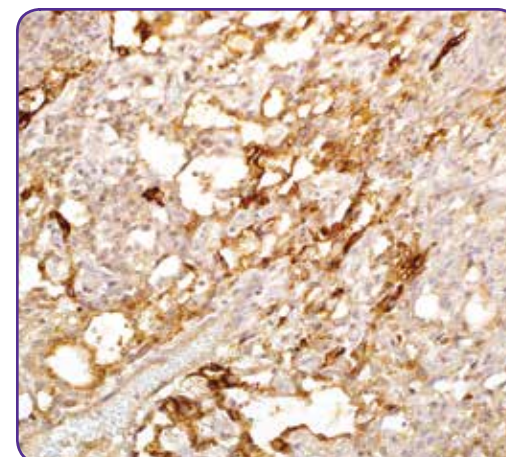
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Fetal liver

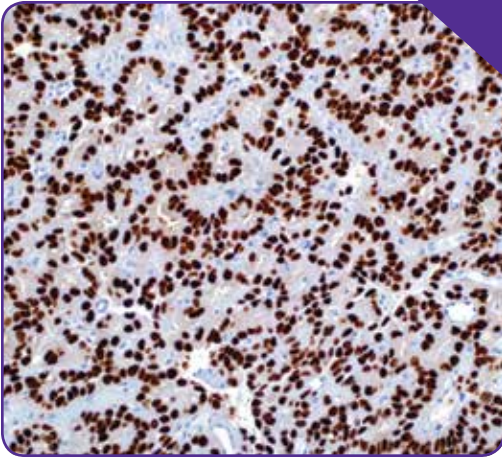


Fetal liver

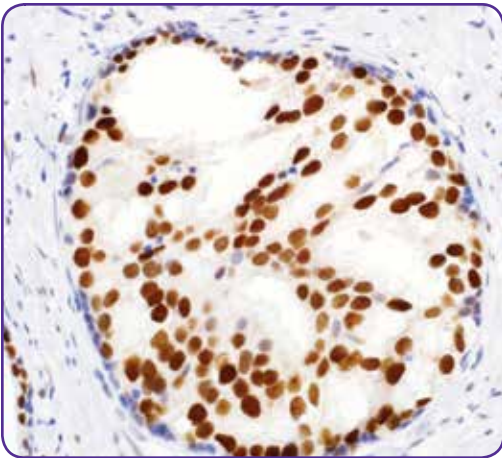


Ovarian yolk sac tumor

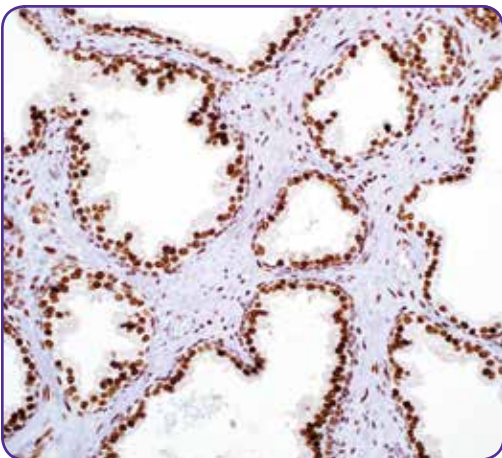
# Androgen Receptor



Prostatic adenocarcinoma



Prostate adenocarcinoma



Prostate, hyperplasia

As a member of the steroid hormone superfamily, androgen receptor functions within distinct intracellular compartments to mediate cellular growth and transcriptional activation of androgen-regulated signaling pathways. This is accomplished through interactions between steroid ligand and androgen receptor molecules in the cytoplasm that promote dimerization and conformational change. The ligand-receptor homodimers are subsequently translocated to the nucleus for binding to genetic response elements and enhancer regions.<sup>1</sup> Androgen receptor expression is broadly distributed across a variety of normal tissue types as well as in carcinomas of the breast<sup>2</sup> and urothelium,<sup>3</sup> and specifically plays a critical role in prostate development, homeostasis, and carcinogenesis.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** prostate carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP120: IgG
- SP107: IgG

## Synonyms and Abbreviations

AR

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Colon vs. Prostate Adenocarcinoma	294
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Cutaneous Neoplasms	304
Prostate: Malignant vs. Benign	310

## Reference

1. Roy AK, et al. Androgen receptor: structural domains and functional dynamics after ligand-receptor interaction. *Ann N Y Acad Sci.* 2001; 949:44-57.
2. Collins LC, et al. Androgen receptor expression in breast cancer in relation to molecular phenotype: results from the Nurses' Health Study. *Mod Pathol.* 2011; 24:924-31.
3. Rahmani AH, et al. Implication of androgen receptor in urinary bladder cancer: a critical mini review. *Int J Mol Epidemiol Genet.* 2013; 4:150-55.
4. Leach DA, et al. Stromal Androgen Receptor in Prostate Cancer Development and Progression. *Cancers (Basel).* 2017; 9:pil: E10.

## Ordering Information

### Androgen Receptor (EP120)

Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	200R-24
0.5 mL concentrate	200R-25
1 mL concentrate	200R-26
1 mL predilute	200R-27
7 mL predilute	200R-28

### Androgen Receptor (SP107)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	200R-14
0.5 mL concentrate	200R-15
1 mL concentrate	200R-16
1 mL predilute	200R-17
7 mL predilute	200R-18

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# Annexin A1

Annexin A1, also known as lipocortin I, is a protein that is encoded by the ANXA1 gene in humans. Annexin A1 is a useful marker for identifying hairy cell leukemia cells.<sup>1</sup> Additionally, aberrant expression of Annexin A1 has been reported in certain types of breast and gastric carcinomas.<sup>2-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** hairy cell leukemia

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

ANXA1

Lipocortin I

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312
Mature B-cell Neoplasms	315
Small and Medium/Large B-Cell Neoplasms	317

## Reference

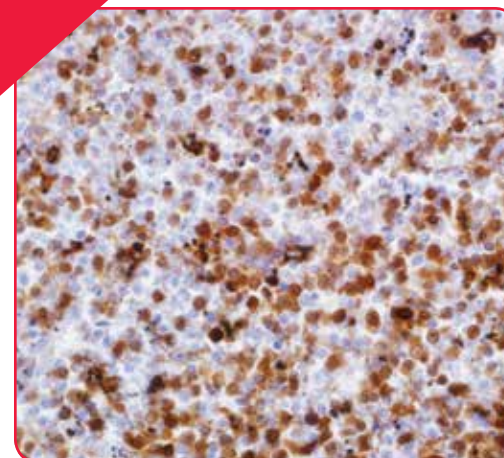
1. Falini B, et al. Simple diagnostic assay for hairy cell leukaemia by immunocytochemical detection of annexin A1 (ANXA1). *Lancet*. 2004; 363:1869-70.
2. Sobral-Leite M, et al. Annexin A1 expression in a pooled breast cancer series: association with tumor subtypes and prognosis. *BMC Med*. 2015; 13:156.
3. Cheng TY, et al. Annexin A1 is associated with gastric cancer survival and promotes gastric cancer cell invasiveness through the formyl peptide receptor/extracellular signal-regulated kinase/integrin beta-1-binding protein 1 pathway. *Cancer*. 2012; 118:5757-67.
4. Sato Y, et al. Up-regulated Annexin A1 expression in gastrointestinal cancer is associated with cancer invasion and lymph node metastasis. *Exp Ther Med*. 2011; 2:239-43.
5. Wang KL, et al. Expression of annexin A1 in esophageal and esophagogastric junction adenocarcinomas: association with poor outcome. *Clin Cancer Res*. 2006; 12:4598-604.

## Ordering Information

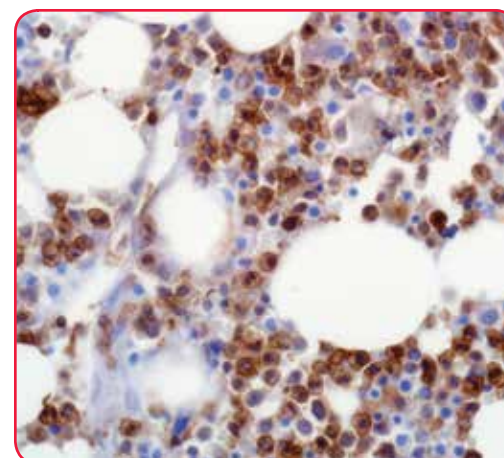
### Annexin A1 (MRQ-3) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	221M-14
0.5 mL concentrate	221M-15
1 mL concentrate	221M-16
1 mL predilute	221M-17
7 mL predilute	221M-18

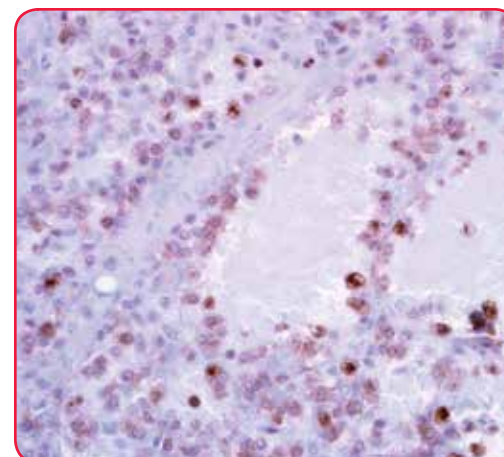
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Hairy cell leukemia

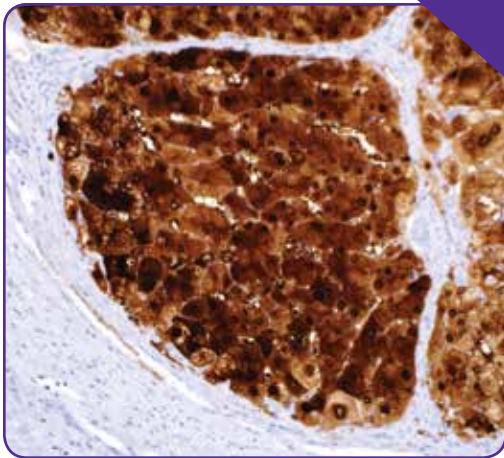


Bone marrow

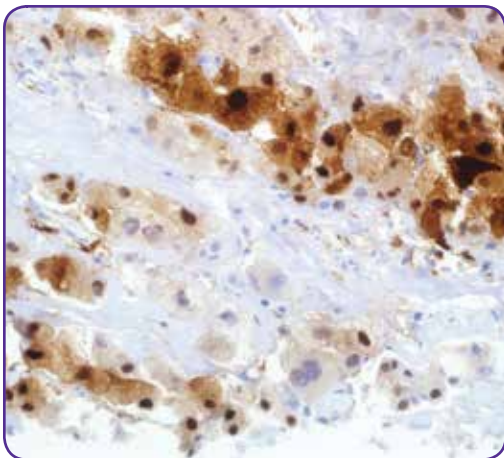


Spleen

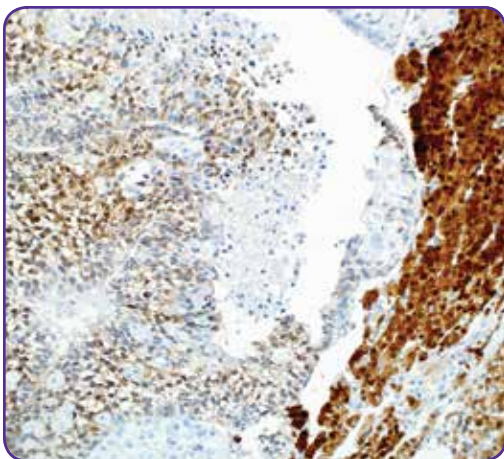
# Arginase-1



Liver, cirrhosis



Liver, hepatocellular carcinoma



Liver, hepatocellular carcinoma

Arginase-1 is a key urea cycle metalloenzyme that has demonstrated expression in normal human liver with a high degree of specificity.<sup>1-2</sup> Hepatocellular carcinoma (HCC) is the most common primary malignant tumor of the liver accounting for an estimated 70-85% of total liver cancers worldwide.<sup>3-4</sup> Diagnostic pitfalls exist in the morphologic distinction of HCC from other hepatocellular and non-hepatocellular lesions. In difficult or equivocal cases, the application of immunohistochemical (IHC) panels has been shown to aid in the distinction of benign and malignant liver lesions.<sup>5-10</sup> In sections of normal liver, anti-arginase-1 produced strong, diffuse cytoplasmic reactivity in all hepatocytes throughout the lobule. In some cases, patchy nuclear reactivity is also evident in hepatocytes along with the cytoplasmic reactivity.<sup>1,2</sup> Reactivity is not observed in bile duct epithelial cells, sinusoidal endothelial cells, Kupffer cells, or vascular endothelial cells. In sections of HCC, anti-arginase-1 produces cytoplasmic or cytoplasmic plus nuclear reactivity.<sup>11,12</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** hepatocellular carcinoma, normal liver

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP261: IgG
- SP156: IgG

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Differential Diagnosis of Metastatic Adenocarcinomas	295
Liver: Malignant vs. Benign	297
Liver: Primary and Metastatic Epithelial Neoplasms	308

## Reference

1. Mulhaupt H, et al. Histochemistry. 1987; 87:465-70.
2. Sekine S, et al. J Pathol. 2009; 219:365-72.
3. Jemal A, et al. Clin. 2011; 61:69-90.
4. Ferrel LD. Philadelphia, PA: Saunders Elsevier Inc., 2009. 1291-325.
5. Wee A. Cytojournal. 2005; 2:7.
6. Wee A. Cytopathology. 2011; 22:287-305.
7. Niemann TH, et al. Cancer. 1999; 87:295-8.
8. Onofre AS, et al. Cancer. 2007; 111:259-68.
9. Nassar A, et al. Diagnostic Cytopathology. 2009; 37:629-35.
10. Zimmerman RL, et al. Cancer. 2001; 93:288-91.
11. Radwan NA, et al. Diag Pathol. 2012; 7:149.
12. Nguyen T, et al. Arch Pathol Lab Med. 2015; 139:1028-34.

## Ordering Information

### Arginase-1 (EP261)

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	380R-24
0.5 mL concentrate	380R-25
1 mL concentrate	380R-26
1 mL predilute	380R-27
7 mL predilute	380R-28

### Arginase-1 (SP156)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	380R-14
0.5 mL concentrate	380R-15
1 mL concentrate	380R-16
1 mL predilute	380R-17
7 mL predilute	380R-18
25 mL predilute	380R-10

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# BCA-225

Anti-BCA-225 primary antibody labels breast cancer antigen 225 (BCA-225) in primary and metastatic breast carcinoma. BCA-225 was first identified in T47D breast carcinoma cells, but its expression in other carcinomas such as lung, kidney, ovary and endometrium has also been demonstrated.<sup>1-4</sup> BCA-225 expression has also been found in sebaceous gland tumors.<sup>5,6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

BRST-1

## Associated Specialties

Anatomic Pathology

Breast/Gynecological Pathology

Cytopathology

## Associated Grids

Grid	Page No.
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299

## Reference

1. Mesa-Tejada R, et al. Immunocytochemical distribution of a breast carcinoma associated glycoprotein identified by monoclonal antibodies. *Am J Pathol*; 1988 130:305-14.
2. Loy TS, et al. Distribution of BCA-225 in adenocarcinomas: An immunohistochemical study of 446 cases. *Am J Clin Pathol*. 1991; 96: 326-9.
3. Brown RW, et al. Immunohistochemical identification of tumor markers in metastatic adenocarcinoma. A diagnostic adjunct in the determination of primary site. *Am J Clin Pathol*. 1997; 107:12-9.
4. Ma CK, et al. Comparative immunohistochemical study of primary and metastatic carcinomas of the liver. *Am J Clin Pathol*. 1993; 99: 551-7.
5. Ansai S, et al. An immunohistochemical study of BCA-225 in various skin cancers. *J Dermatol*. 1994; 21:20-4.
6. Sinard JH. Immunohistochemical distinction of ocular sebaceous carcinoma from basal cell and squamous cell carcinoma. *Arch Ophthalmol*. 1999; 117:776-83.

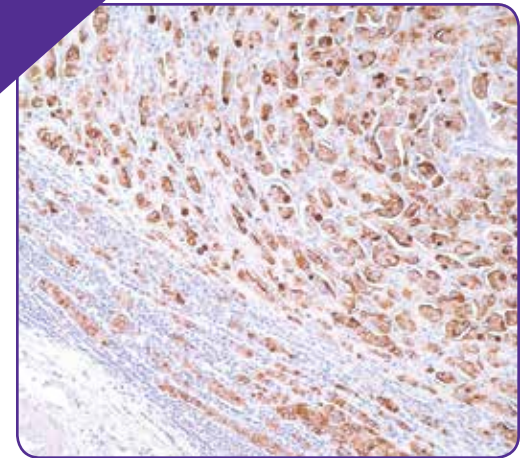
## Ordering Information

### BCA-225 (Cu-18)

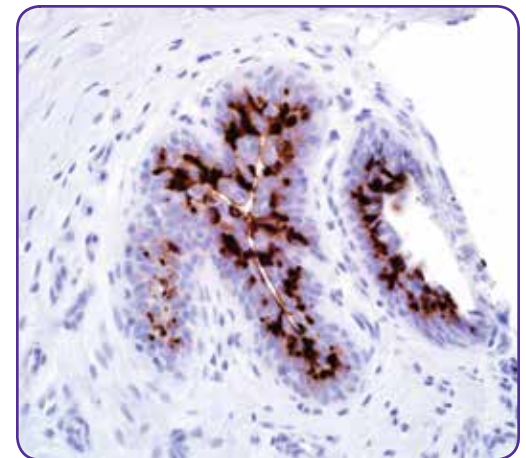
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	225M-14
0.5 mL concentrate	225M-15
1 mL concentrate	225M-16
1 mL predilute	225M-17
7 mL predilute	225M-18

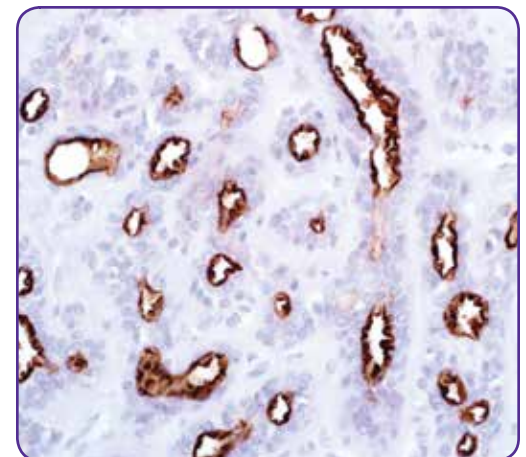
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Lymph node, metastatic breast invasive ductal carcinoma

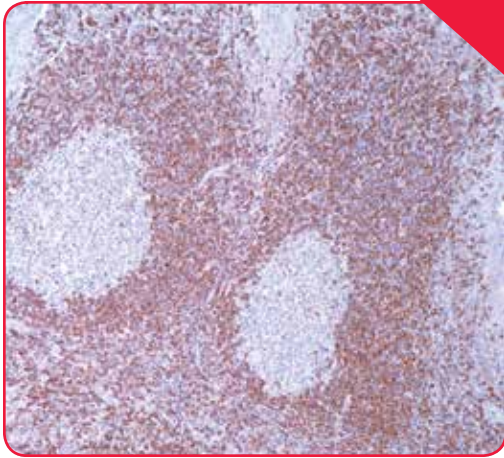


Breast

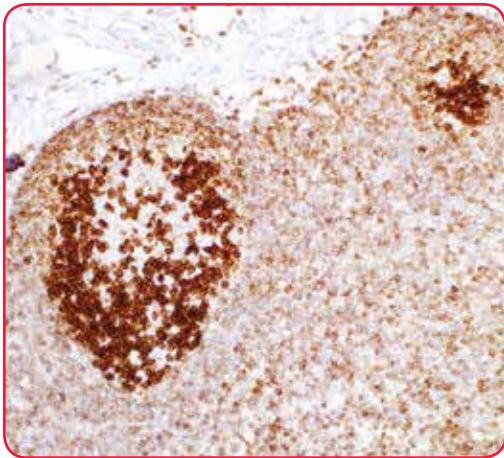


Breast

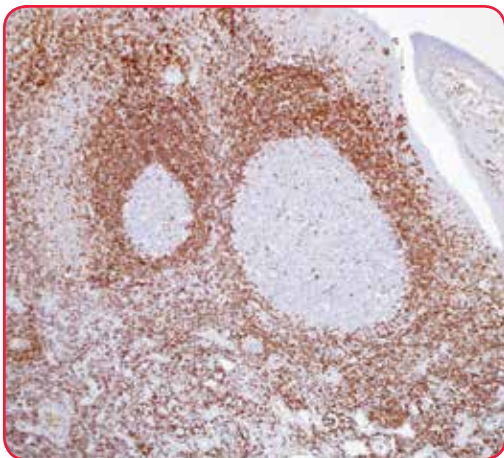
# BCL2



Tonsil



Lymph node, follicular lymphoma *in situ*



Tonsil

BCL2 is a protein associated with apoptosis regulation produced by the *bcl-2* gene, located on chromosome 14q32.<sup>1</sup> BCL2 is comprised of an alpha (239 amino acids) and beta chain. BCL2 (and thus BCL2 alpha chain) is found in mitochondrial and nuclear membranes and in the cytosol rather than the cell surface. In normal lymphoid tissue, BCL2 antibody reacts with small B-lymphocytes in the mantle zone and many cells within the T-cell areas. Anti-BCL2 alpha has shown consistent negative reaction on reactive germinal center B-cells and positive staining of neoplastic follicles in follicular lymphoma.<sup>2</sup> This antibody is valuable when distinguishing between reactive and neoplastic follicular proliferation in lymph node biopsies. This antibody may also be used in distinguishing between those follicular lymphomas that express BCL2 protein and the small number in which the neoplastic cells are BCL2 negative. Anti-BCL2 has been used as an indicator of minimal residual disease in the bone marrow of follicular lymphoma patients when staining is strong and uniform.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 124: IgG<sub>1</sub>/k
- E17: IgG
- SP66: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Spindle Cell Tumors	300
Cervix	302
Cutaneous Neoplasms	304
Skin: Basal vs. Squamous Cell Carcinoma	306
B-cell Lymphomas	311
c-Myc in Diffuse Large B-cell Lymphoma (DLBCL)	312
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314
Lymphomas and Myeloid Sarcoma	315
Mature B-cell Neoplasms	315

## Reference

1. AS-Y Leong, et al. Manual of diagnostic antibodies for immunohistochemistry. 2nd edition. 2003 p. 25-27.
2. Cooper K, et al. *bcl-2* and p53 protein expression in follicular lymphoma. Journal of Pathology. 1997; 182:307-10.
3. Chetty R, et al. Immunohistochemistry in apparently normal bone marrow trephine specimens from patients with nodal follicular lymphoma. J Clin Pathol. 1995; 48:1035-1038.

## Ordering Information

### BCL2 (124)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	226M-94
0.5 mL concentrate	226M-95
1 mL concentrate	226M-96
1 mL predilute	226M-97
7 mL predilute	226M-98
25 mL predilute	226M-90

### BCL2 (E17)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	226R-14
0.5 mL concentrate	226R-15
1 mL concentrate	226R-16
1 mL predilute	226R-17
7 mL predilute	226R-18

### BCL2 (SP66)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	226R-24
0.5 mL concentrate	226R-25
1 mL concentrate	226R-26
1 mL predilute	226R-27
7 mL predilute	226R-28

Please contact your distributor for details on product availability and regulatory status in your country.

# BCL6

BCL6 is a transcriptional regulator gene which codes for a 706-amino-acid nuclear zinc finger protein.<sup>1</sup> In normal tissue these antibodies have strong nuclear staining for a subset of B-lymphocytes, mostly located in germinal centers (GC).<sup>2</sup> BCL6 antibodies stain malignant cells in follicular lymphoma,<sup>3</sup> diffuse large B-cell lymphomas<sup>4</sup> and Burkitt lymphoma.<sup>4</sup> BCL6 expression is present in high levels in nearly all of the neoplastic (LP) cells in nodular lymphocyte-predominant Hodgkin lymphoma, but not detectable in most of the tumor (Hodgkin/Reed-Sternberg) cells in classical Hodgkin lymphoma.<sup>6</sup> BCL6 expression has been also seen in anaplastic large cell lymphomas (ALCL).<sup>7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP278: IgG
- GI191E/A8: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314
Hodgkin vs. Non-Hodgkin Lymphomas	314
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Falini B, et al. Bcl-6 protein expression in normal and neoplastic lymphoid tissues. *Ann Oncol.* 1997; 2:101-4.
2. Aukema SM, et al. Double-hit B-cell lymphomas. *Blood.* 2011; 117:2319-31.
3. Dogan A, et al. CD10 and BCL-6 expression in paraffin sections of normal lymphoid tissue and B-cell lymphomas. *Am J Surg Pathol.* 2000; 24:846-52.
4. Carbone A, et al. B-cell lymphomas with features intermediate between distinct pathologic entities. From pathogenesis to pathology. *Hum Pathol.* 2010; 41:621-31.
5. Bai M, et al. B-cell differentiation immunophenotypes in classical Hodgkin lymphomas. *Leuk Lymphoma.* 2006; 47:495-501.
6. Carbone A, et al. Expression of BCL-6 protein and CD138/syndecan-1 as B-cell markers in Hodgkin disease. *Int J Biol Markers.* 1999; 14:144-8.
7. Saglam A, et al. Immunohistochemical expression of Mum-1, Oct-2 and Bcl-6 in systemic anaplastic large cell lymphomas. *Tumori.* 2011; 97:634-8.

## Ordering Information

### BCL6 (EP278)

Rabbit Monoclonal  
Primary Antibody

Volume	Part No.
0.1 mL concentrate	227R-24
0.5 mL concentrate	227R-25
1 mL concentrate	227R-26
1 mL predilute	227R-27
7 mL predilute	227R-28

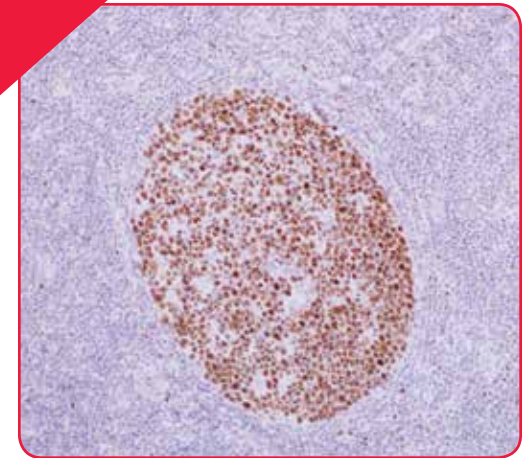
### BCL6 (GI191E/A8)

Mouse Monoclonal Antibody

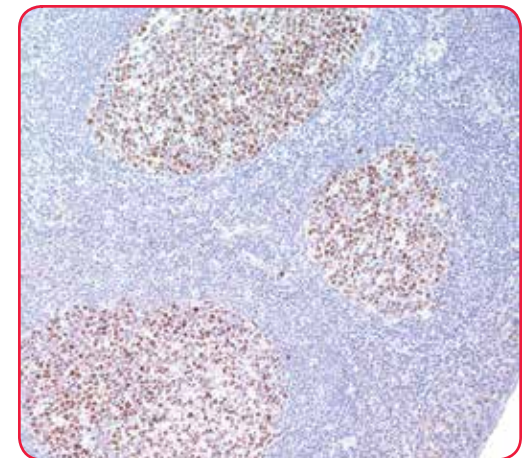
Volume	Part No.
0.1 mL concentrate	227M-94
0.5 mL concentrate	227M-95
1 mL concentrate	227M-96
1 mL predilute	227M-97
7 mL predilute	227M-98
25 mL predilute	227M-90

Please contact your distributor for details on product availability and regulatory status in your country.

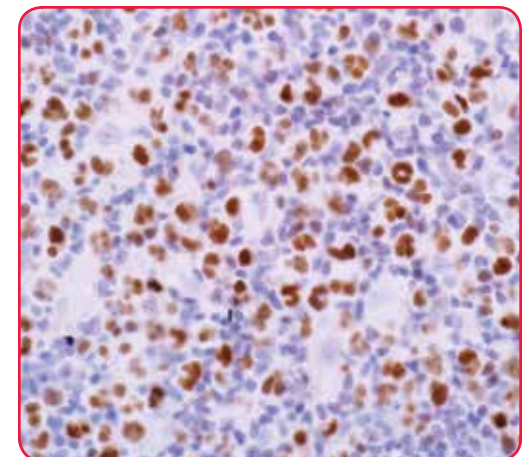
BCL6 is protected by U.S. patents 6,174,997 and 6,783,94 (Cancer Genetics, Inc.)



Tonsil, germinal center



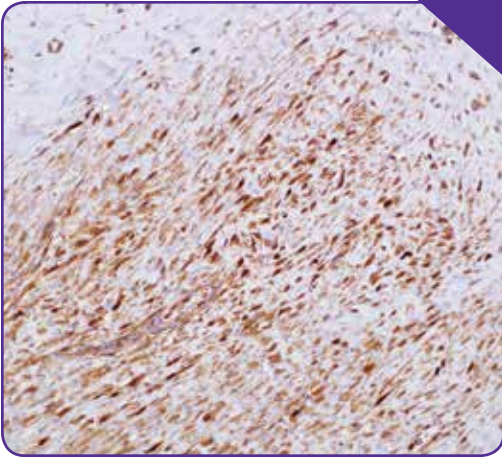
Tonsil, germinal center



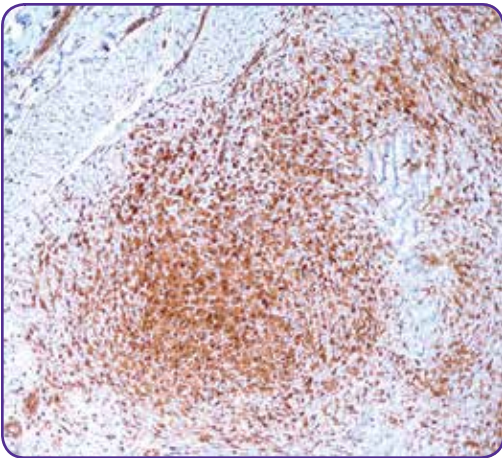
Nodular lymphocyte predominant Hodgkin lymphoma



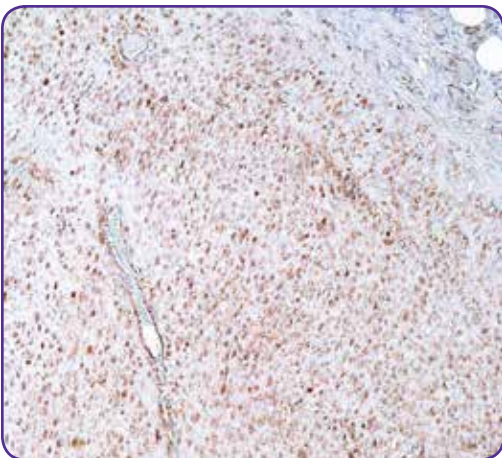
# Beta-Catenin



Breast, fibromatosis



Breast, fibromatosis neoplastic cells



Soft tissue, fibromatosis

Beta-Catenin is a 92-kD protein normally found in the cytoplasm of the cell in the submembranous location. Mutations in the beta-catenin gene result in nuclear accumulation of this protein. Nuclear accumulation of this protein has been demonstrated in fibromatosis (desmoid tumors) of the breast and abdomen and, therefore, is useful in differentiating from other spindle cell neoplasms that may occur in these locations.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous, nuclear

**Control** fibromatosis of breast

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Spindle Cell Tumors	300
Pancreatic Epithelial Tissues and Tumors	308

## Reference

1. Alman BA, et al. Increased beta-catenin protein and somatic APC mutations in sporadic aggressive fibromatoses (desmoid tumors). *Am J Pathol.* 1997; 151:329-34.
2. Li C, et al. Adenomatous polyposis coli gene mutation alters proliferation through its beta-catenin-regulatory function in aggressive fibromatosis (desmoid tumor). *Am J Pathol.* 1998; 153:709-14.
3. Abraham SC, et al. Fibromatosis of the breast and mutations involving the APC/beta-catenin pathway. *Hum Pathol.* 2002; 33:39-46.
4. Montgomery E, et al. Beta-catenin immunohistochemistry separates mesenteric fibromatosis from gastrointestinal stromal tumor and sclerosing mesenteritis. *Am J Surg Pathol.* 2002; 26:1296-301.

## Ordering Information

### Beta-Catenin (14)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	224M-14
0.5 mL concentrate	224M-15
1 mL concentrate	224M-16
1 mL predilute	224M-17
7 mL predilute	224M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# BG8, Lewis<sup>y</sup>

Blood group Lewis carbohydrate determinants are oligosaccharides on glycolipids and glycoproteins. In healthy individuals the Lewis<sup>y</sup> antigen is a type 2 antigen usually only expressed in low levels of a few cell types such as some epithelial cells. Reportedly these antigens are aberrantly expressed in high levels in many carcinomas. Anti-BG8, Lewis<sup>y</sup> reactivity in immunohistochemistry is seen in carcinomas of the breast, lung, and colon.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** lung adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM

## Associated Specialties

Anatomic Pathology

Cytopathology

## Associated Grids

Grid	Page No.
Thymus	301
Skin: Spindle Cell Tissues and Tumors	306, 307
Lung Adenocarcinoma vs. Mesothelioma	319

## Reference

1. Davidson B, et al. Detection of cancer cells in effusions from patients diagnosed with gynaecological malignancies. Evaluation of five epithelial markers. *Virchows Arch.* 1999; 435:43-9.
2. King JE, et al. Sensitivity and specificity of immunohistochemical markers used in the diagnosis of epithelioid mesothelioma: a detailed systematic analysis using published data. *Histopathology.* 2006; 48:223-32.
3. Marchevsky AM, et al. Evidence-based guidelines for the utilization of immunostains in diagnostic pathology: pulmonary adenocarcinoma versus mesothelioma. *Appl Immunohistochem Mol Morphol.* 2007; 15:140-4.
4. Ordonez NG. The immunohistochemical diagnosis of mesothelioma: a comparative study of epithelioid mesothelioma and lung adenocarcinoma. *Am J Surg Pathol.* 2003; 27:1031-51.
5. Ordóñez NG. Value of thyroid transcription factor-1, E-cadherin, BG8, WT1, and CD44S immunostaining in distinguishing epithelial pleural mesothelioma from pulmonary and non-pulmonary adenocarcinoma. *Am J Surg Pathol.* 2000; 24:598-606.

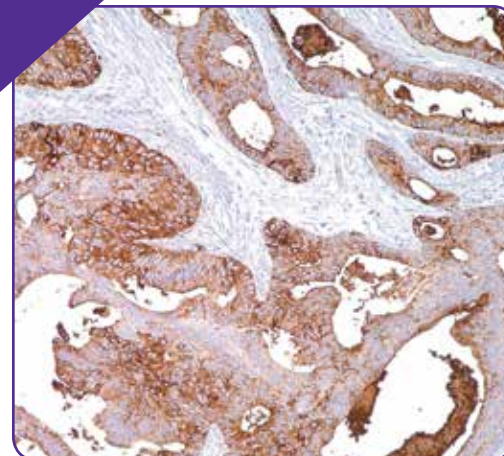
## Ordering Information

### BG8, Lewis<sup>y</sup> (F3)

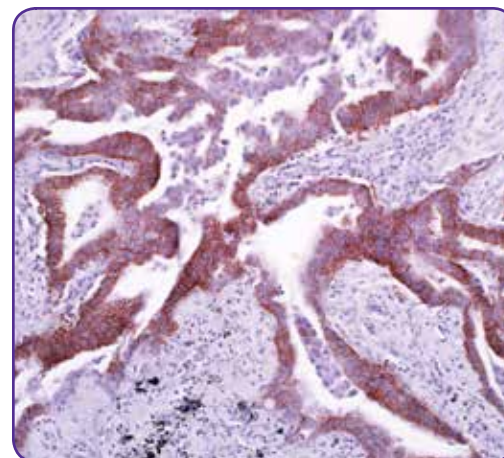
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	228M-14
0.5 mL concentrate	228M-15
1 mL concentrate	228M-16
1 mL predilute	228M-17
7 mL predilute	228M-18

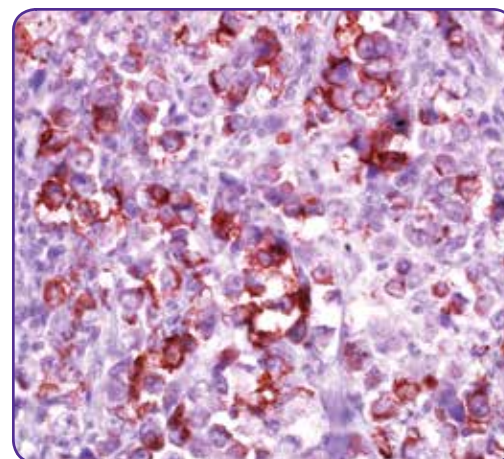
*Please contact your distributor for details on product availability and regulatory status in your country.*



Lung adenocarcinoma

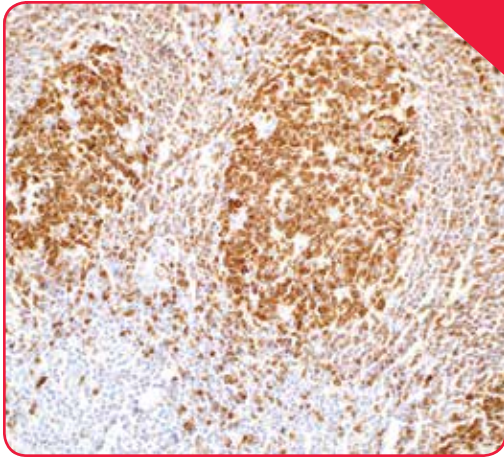


Lung adenocarcinoma

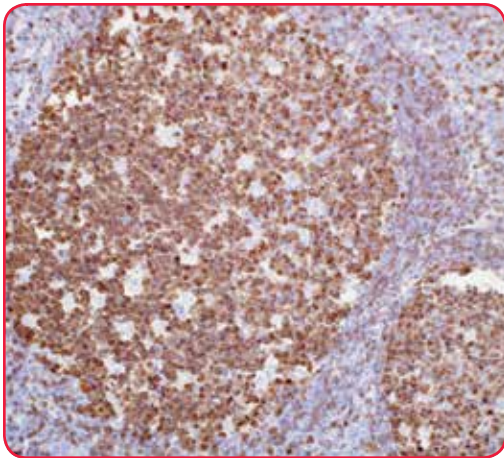


Breast carcinoma

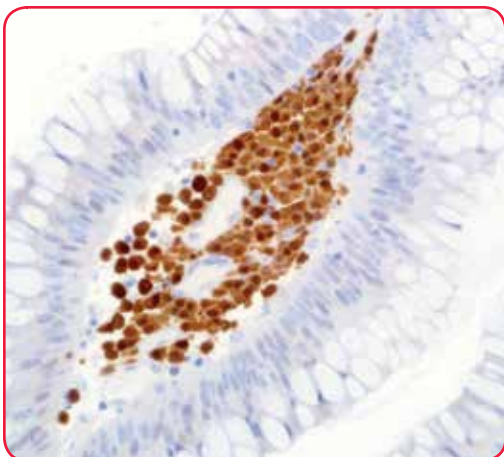
# BOB.1



Tonsil



Tonsil



Colonic mucosa

Oct-binding factor-1 (OBF1), also known as BOB.1, is a B-cell-specific coactivator which has been mapped to chromosome 11q23.<sup>1</sup> Expression of BOB.1/OBF.1 is restricted largely to mature B-cells, with germinal center B-cells normally staining for BOB.1.<sup>2,3</sup> Analyses of BOB.1/OBF.1 expression in a variety of established B-cell lines representing different stages of B-cell development has suggested a constitutive, B-cell-specific expression pattern. LP cells in nodular lymphocyte predominant Hodgkin lymphoma, because they are germinal center-derived, are consistently immunoreactive for BOB.1. Conversely, only some cases of classical Hodgkin lymphoma show BOB.1 immunoreactivity within the Hodgkin and Reed-Sternberg cells.<sup>3-7</sup> Expression of BOB.1/OBF.1 has been reported in follicular center cell lymphoma, diffuse large B-cell lymphoma and some cases of acute myeloid leukemia.<sup>8-12</sup> B-CLL, marginal zone lymphoma, and mantle cell lymphoma may show weak to moderate immunoreactivity.<sup>11-12</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- MRQ-35: IgG<sub>2b</sub>
- SP92: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Hodgkin vs. Non-Hodgkin Lymphomas	314

## Reference

1. Junker S, et al. Assignment of the human gene for Oct-Binding Factor-1 (OBF1), a B-Cell-specific coactivator of Octamer-Binding transcription Factors 1 and 2, to 11q23.1 by somatic cell hybridization and in situ hybridization. *Genomics*. 1996; 33:143-5.
2. Dabbs DJ. *Diagnostic Immunohistochemistry*, Third Edition. Saunders. 2006.
3. Steimle-Grauer SA, et al. Expression patterns of transcription factors in progressively transformed germinal centers and Hodgkin lymphoma. *Virchows Arch*. 2003; 442:284-93.
4. Valsami S, et al. A clinicopathological study of B-cell differentiation markers and transcription factors in classical Hodgkin lymphoma: a potential prognostic role of mum1/IRF4. *Haematologica*. 2007; 92:1343-50.
5. Stein H, et al. Down regulation of Bob.1 /OBF.1 and oct2 in classical Hodgkins disease but no in lymphocyte predominant Hodgkins disease correlates with immunoglobulin transcription. *Blood*. 2001; 97:496-501.

For the complete list of references see the product IFU.

## Ordering Information

### BOB.1 (SP92)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	294R-14
0.5 mL concentrate	294R-15
1 mL concentrate	294R-16
1 mL predilute	294R-17
7 mL predilute	294R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# c-Myc

The oncogenic transcription factor, c-Myc, has a crucial role in growth control, differentiation, cellular metabolism and apoptosis and is associated with variety of tumors.<sup>1</sup> c-Myc antibody stains this protein in tissues from colorectal adenocarcinoma,<sup>2</sup> breast invasive ductal carcinoma,<sup>3</sup> prostate adenocarcinoma,<sup>4</sup> Burkitt lymphoma, and diffuse large B-cell lymphoma.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** Burkitt lymphoma, prostate carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymphomas and Myeloid Sarcoma	315

## Reference

1. Dang CV. c-Myc target genes involved in cell growth, apoptosis, and metabolism. *Mol Cell Biol.* 1999; 19:1-11.
2. Toon CW, et al. Immunohistochemistry for myc predicts survival in colorectal cancer. *PLoS One.* 2014; 9:e87456.
3. Naidu R, et al. Protein expression and molecular analysis of c-myc gene in primary breast carcinomas using immunohistochemistry and differential polymerase chain reaction. *Int J Mol Med.* 2002; 9:189-96.
4. Yang G, et al. Combined c-Myc and caveolin-1 expression in human prostate carcinoma predicts prostate carcinoma progression. *Cancer.* 2005; 103:1186-94.
5. Bellan C, et al. Burkitt lymphoma versus diffuse large B-cell lymphoma: a practical approach. *Hematol Oncol.* 2010; 28:53-6.

## Ordering Information

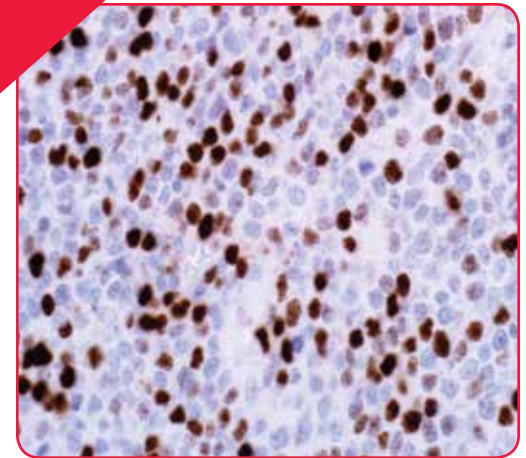
**c-Myc (EP121)**

Rabbit Monoclonal  
Primary Antibody

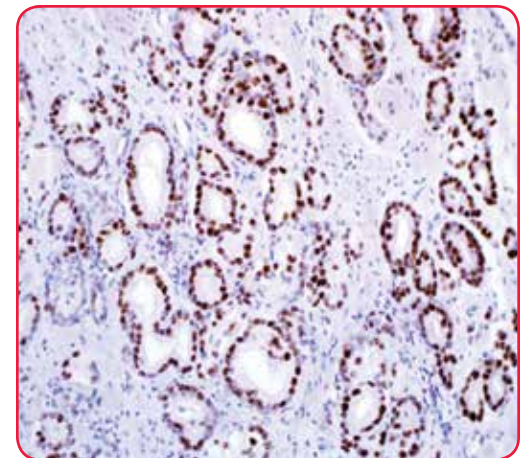


Volume	Part No.
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0.5 mL concentrate	395R-15
1 mL concentrate	395R-16
1 mL predilute	395R-17
7 mL predilute	395R-18

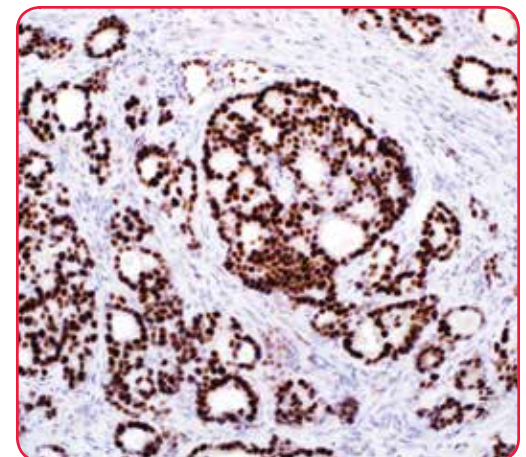
Please contact your distributor for details on product availability and regulatory status in your country.



Burkitt lymphoma

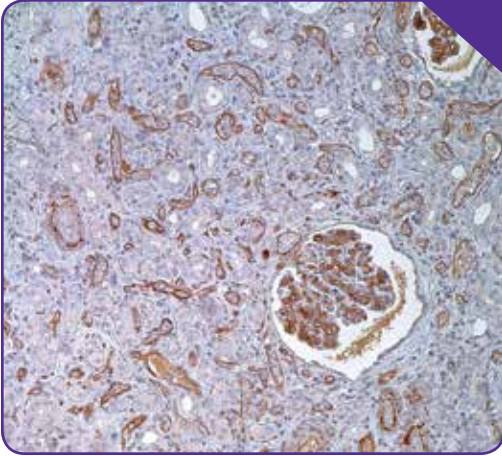


Prostate carcinoma

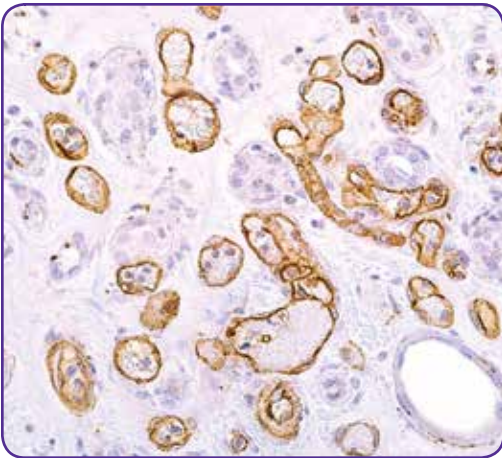


Prostate carcinoma

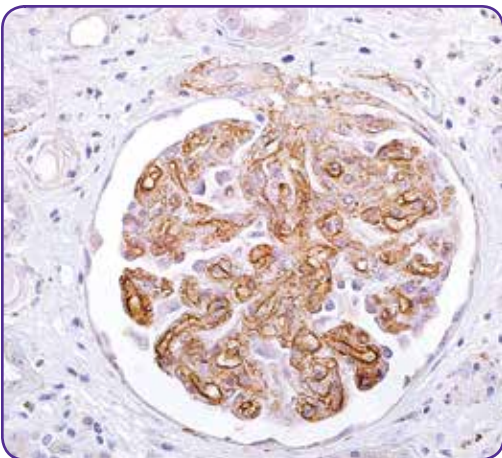
# C3d



Acute rejection kidney



Kidney



Kidney

Complement component C3 is an integral part of the classical, lectin, and alternative complement pathways, and its cleavage products are involved in immune responses such as opsonization and cell lysis. C3d is a fragment of C3 that normally binds to pathogen surfaces to promote B-cell activation. However, deposition of C3d has also been observed in peritubular capillaries of transplanted kidneys undergoing acute allograft rejection.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** acute rejected kidney transplant

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

## Reference

1. Bickerstaff A, et al. An experimental model of acute humoral rejection of renal allografts associated with concomitant cellular rejection. *Am J Pathol.* 2008; 173:347-57.
2. Kuypers DR, et al. C3D deposition in peritubular capillaries indicates a variant of acute renal allograft rejection characterized by a worse clinical outcome. *Transplantation.* 2003; 76:102-8.
3. Eggertsen G, et al. Complement deposition in renal allografts with early malfunction. *APMIS.* 2001; 109:825-34.

## Ordering Information

### C3d

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	403A-74
0.5 mL concentrate	403A-75
1 mL concentrate	403A-76
1 mL predilute	403A-77
7 mL predilute	403A-78

*Please contact your distributor for details on product availability and regulatory status in your country.*

# C4d

Acute humoral rejection is mediated by antibodies to the donor endothelium that activate the classical complement pathway.<sup>1-3</sup> This leads to a number of split products of complement proteins. C4d is a fragment of C4 complement released during activation of the classic complement pathway by the antigen antibody complex.<sup>3</sup> C4d deposits in peritubular capillaries and is regarded as an indirect sign of an antibody response.<sup>3,6</sup> C4d can be a useful tool for indicating acute renal allograft rejection.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** lymph node, tonsil, acute rejected kidney transplant

**Stability** up to 36 mos. at 2-8°C

**Isotype** SP91: IgG

## Associated Specialties

Anatomic Pathology

## Reference

1. Jianghua C, et al. C4d as a significant predictor for humoral rejection in renal allografts. *Clin Transplant.* 2005; 19:785-91.
2. Kayler LK, et al. Acute renal allograft rejection: diagnostic significance of focal peritubular capillary C4d. *Transplantation.* 2008; 85:813-20.
3. Ranjan P, et al. The role of C4d immunostaining in the evaluation of the causes of renal allograft dysfunction. *Nephrol Dial Transplant.* 2008; 23:1735-41.
4. Nadasdy GM, et al. Comparative study for the detection of peritubular capillary C4d deposition in human renal allografts using different methodologies. *Hum Pathol.* 2005; 36:1178-85.
5. Seemayer CA, et al. C4d staining of renal allograft biopsies: a comparative analysis of different staining techniques. *Nephrol Dial Transplant.* 2007; 22:568-76.
6. Bouron-Dal Soglio D, et al. An immunohistochemical evaluation of C4d deposition in pediatric inflammatory liver diseases. *Hum Pathol.* 2008; 39:1103-10.

## Ordering Information

### C4d

Rabbit Polyclonal Antibody

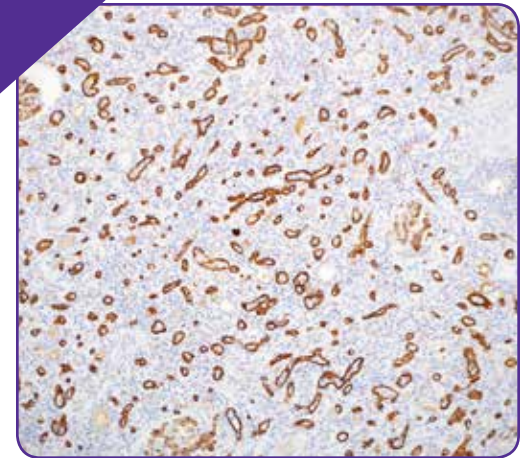
Volume	Part No.
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0.5 mL concentrate	404A-15
1 mL concentrate	404A-16
1 mL predilute	404A-17
7 mL predilute	404A-18

### C4d (SP91)

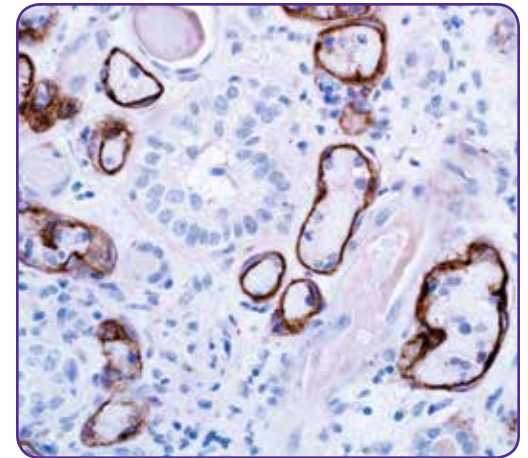
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	404R-14
0.5 mL concentrate	404R-15
1 mL concentrate	404R-16
1 mL predilute	404R-17
7 mL predilute	404R-18
25 mL predilute	404R-10

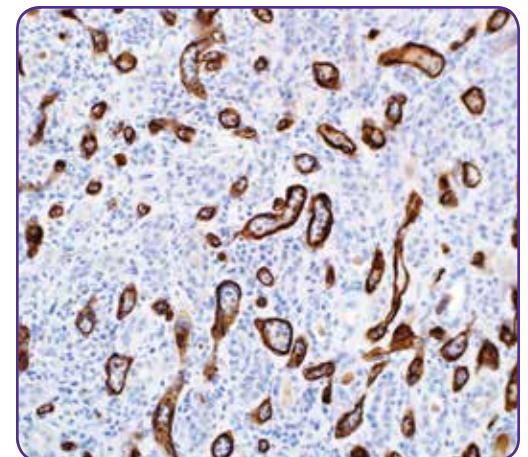
*Please contact your distributor for details on product availability and regulatory status in your country.*



Acute rejected kidney

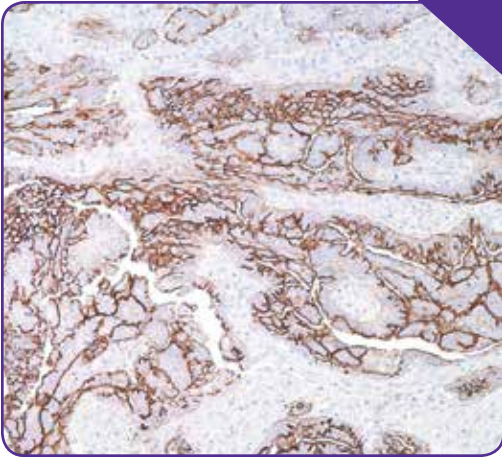


Acute rejected kidney

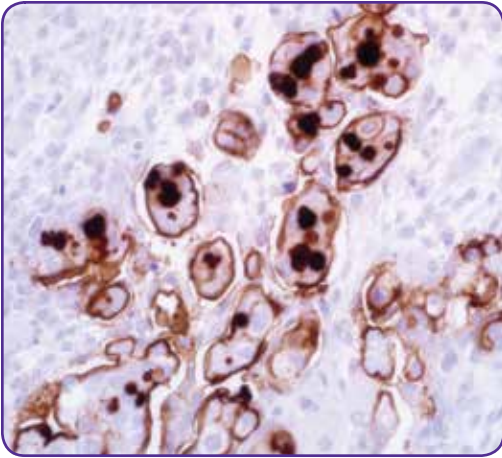


Kidney

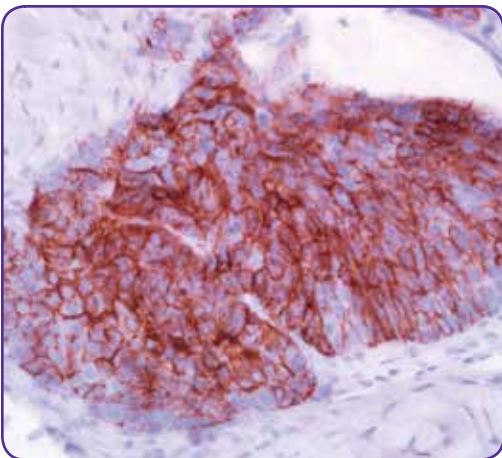
# CA-125



Ovarian serous carcinoma



Ovarian serous carcinoma



Endometrioid carcinoma

Anti-CA-125 reacts with epithelioid malignancies of the ovary, papillary serous carcinoma of the cervix, adenocarcinoma of the endometrium, clear cell adenocarcinoma of the bladder, and epithelioid mesothelioma.<sup>1-4</sup> The antigen is formalin resistant, permitting the detection of ovarian cancer by immunohistochemistry, although serum assays for this protein are widely used to monitor ovarian cancer.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic and membranous

**Control** ovarian serous carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Colon vs. Ovarian Carcinoma	294
Ovarian Carcinomas	303

## Reference

1. Kabawat S, et al. Tissue distribution of a coelomic-epithelium-related antigen recognized by the monoclonal antibody OC125. *Int J Gynecol Pathol.* 1983; 2:275-285.
2. Davis H, et al. Characterization of the CA 125 antigen associated with human epithelial ovarian carcinomas. *Cancer Res.* 1986; 46:6143-6148.
3. Zhou C, et al. Papillary serous carcinoma of the uterine cervix: a clinicopathologic study of 17 cases. *Am J Surg Pathol.* 1998; 22:113-20.
4. Mylonas I, et al. Immunohistochemical expression of the tumour marker CA-125 in normal, hyperplastic and malignant endometrial tissue. *Anticancer Res.* 2003; 23:1075-80.
5. Fukazawa I, et al. Relation between serum levels of tissue polypeptide antigen (TPA) and cancer antigen 125 (CA125) and their immunohistochemical identification in benign and malignant gynecological disease. *Arch Gynecol Obstet.* 1988; 243:41-50.

## Ordering Information

### CA-125 (OC125)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	325M-14
0.5 mL concentrate	325M-15
1 mL concentrate	325M-16
1 mL predilute	325M-17
7 mL predilute	325M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CA19-9

Carbohydrate Antigen 19-9 (CA19-9) is a sialylated Lewis A blood group antigen.<sup>1</sup> It is synthesized by glycosyltransferases and has been identified as a component of gangliosides, glycoproteins and mucins.<sup>1,2</sup> Anti-CA19-9 reacts with epithelial cells of normal pancreas, stomach, and colon as well as various adenocarcinomas, including pancreatic, gastric, and colorectal adenocarcinomas.<sup>3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** colon

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Colon vs. Prostate Adenocarcinoma	294
Breast Carcinoma	302
Pancreatic Epithelial Tissues and Tumors	308

## Reference

1. Wu E, et al. CA 19-9 and Pancreatic Cancer. Clin Adv Hematol Oncol. 2013; 11:53-5.
2. Partyka K, et al. Diverse monoclonal antibodies against the CA 19-9 antigen show variation in binding specificity with consequences for clinical interpretation. Proteomics. 2012; 12:2212-20.
3. Remmers N, et al. Aberrant expression of mucin core proteins and O-linked glycans associated with progression of pancreatic cancer. Clin Cancer Res. 2013; 19:1981-93.
4. Terada T. An immunohistochemical study of primary signet-ring cell carcinoma of the stomach and colorectum: III expressions of EMA, CEA, CA19-9, CDX-2, p53, Ki-67 antigen, TTF-1, vimentin, and p63 in normal mucosa and in 42 cases. Int J Clin Exp Pathol. 2013; 6:630-8.

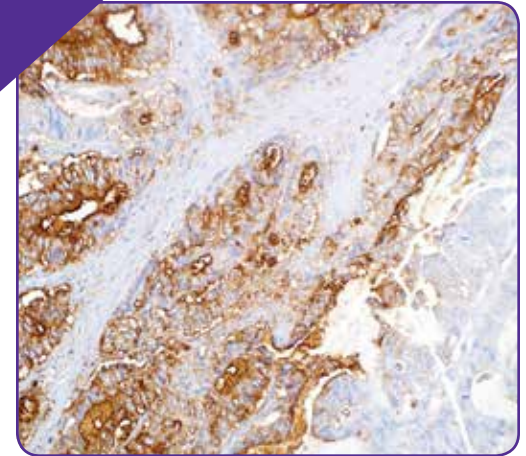
## Ordering Information

### CA19-9 (121SLE)

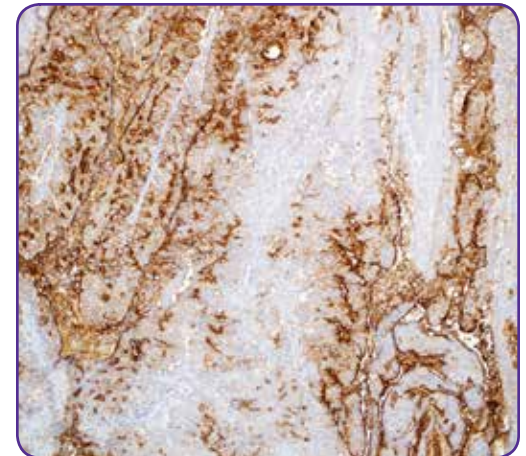
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	399M-15
1 mL concentrate	399M-16
1 mL predilute	399M-17
7 mL predilute	399M-18

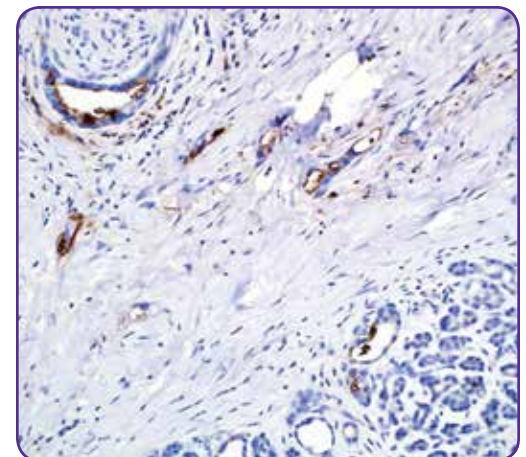
Please contact your distributor for details on product availability and regulatory status in your country.



Colorectal adenocarcinoma



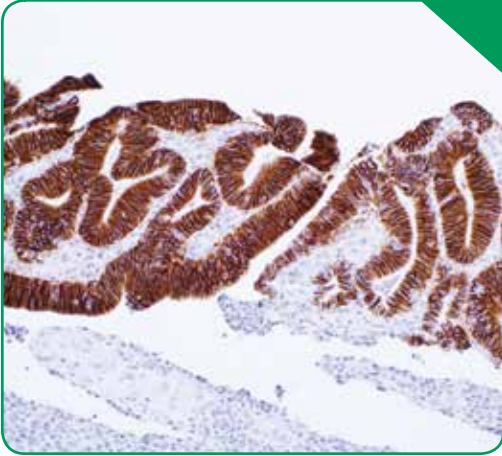
Colorectal adenocarcinoma



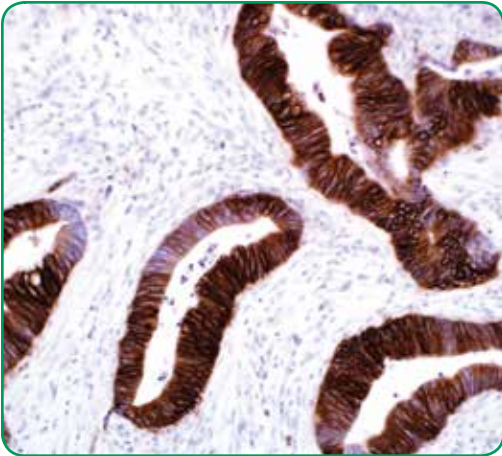
Pancreatic ductal carcinoma



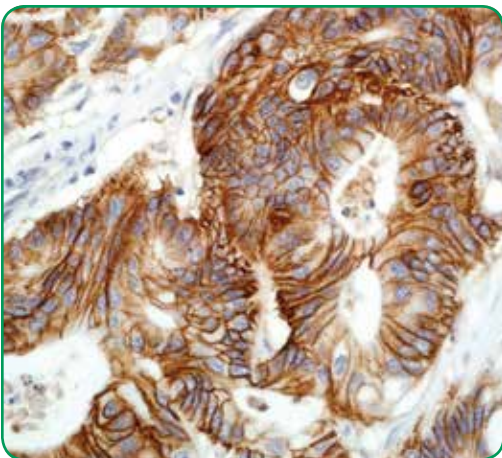
# Cadherin-17



Colon



Colon



Colon

Cadherin-17, also called liver-intestinal (LI) cadherin or human peptide transporter-1, is a member of the cadherin superfamily. Unlike some classic cadherins, such as E-, N-, and P-cadherins, cadherin-17 has seven cadherin repeats instead of five within the extracellular domain and only 20 amino-acid residues in the cytoplasmic domain.<sup>1-2</sup> The markedly short cytoplasmic domain lacks homology with other cadherins and the adhesive function of cadherin-17 is not dependent on association with other cytoplasmic proteins. The subcellular distribution of cadherin-17 is also different from classic cadherins. In intestinal epithelial cells, E-cadherin is concentrated in adherens junctions whereas cadherin-17 is evenly distributed along the lateral contact area. Human normal tissues that are strongly stained with cadherin-17 include appendicular epithelium, colonic epithelium, and small intestinal epithelium.<sup>1</sup> Other normal human tissues are not stained with cadherin-17.<sup>1</sup> The results above indicate cadherin-17 can be used as a marker for identification of primary sites of tumors. In-house studies have shown that cadherin-17 expression is usually diffuse and strong in colorectal adenocarcinomas, whereas it is usually focal or scattered in adenocarcinomas of the stomach, pancreas and bile duct, and is virtually absent in tumors of other anatomic sites.

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** colorectal carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

LI-cadherin

Human peptide transporter-1

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Colon vs. Ovarian Carcinoma	294
Differential Diagnosis of Metastatic Adenocarcinomas	295

## Reference

1. Su MC, et al. Cadherin-17 is a useful diagnostic marker for adenocarcinomas of the digestive system. *Mod Pathol.* 2008; 21:1379-86.
2. Gessner R, et al. Intestinal cell adhesion molecules. Liver-intestine cadherin. *Ann N Y Acad Sci.* 2000; 915:136-43.

## Ordering Information

### Cadherin-17 (SP183)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	378R-14
0.5 mL concentrate	378R-15
1 mL concentrate	378R-16
1 mL predilute	378R-17
7 mL predilute	378R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Calcitonin

Calcitonin (thyrocalcitonin) is a 32-amino-acid linear polypeptide hormone that participates in calcium and phosphorus metabolism.<sup>1</sup> Immunohistochemical staining with anti-calcitonin is an effective way of demonstrating calcitonin-producing parafollicular C-cells in the thyroid.<sup>2,3</sup> Immunohistochemical studies of C-cell hyperplasia and medullary thyroid carcinomas stain will predominantly stain positive for calcitonin.<sup>2</sup> Other tissues such as the lungs and intestinal tract can also synthesize calcitonin.<sup>1</sup> Expression of calcitonin in both non-neoplastic and neoplastic neuroendocrine cells of these organs, such as carcinoids and small cell lung carcinomas, may be seen.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** thyroid, thyroid medullary carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** SP17: IgG

## Associated Specialties

Cytopathology

Head/Neck Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Thyroid and Parathyroid Tumors	295, 311
Neuroendocrine Neoplasms	298
Thyroid: Malignant vs. Benign	301

## Reference

1. Calcitonin. PathologyOutlines.com website. <http://www.pathologyoutlines.com/topic/stainscalcitonin.html>. Accessed May 3, 2017.
2. Matias-Guiu X, et al. Medullary thyroid carcinoma: a 25-year perspective. *Endocr Pathol.* 2014; 25:21-9.
3. Fisher S, et al. Application of immunohistochemistry to thyroid neoplasms. *Arch Pathol Lab Med.* 2008; 132:359-72.
4. Tsutsumi Y. Immunohistochemical analysis of calcitonin and calcitonin gene-related peptide in human lung. *Hum Pathol.* 1989; 20:869-902.

## Ordering Information

### Calcitonin

Rabbit Polyclonal Antibody

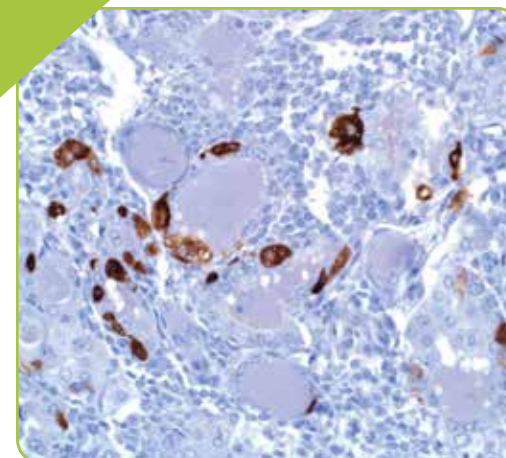
Volume	Part No.
0.1 mL concentrate	229A-14
0.5 mL concentrate	229A-15
1 mL concentrate	229A-16
1 mL predilute	229A-17
7 mL predilute	229A-18

### Calcitonin (SP17)

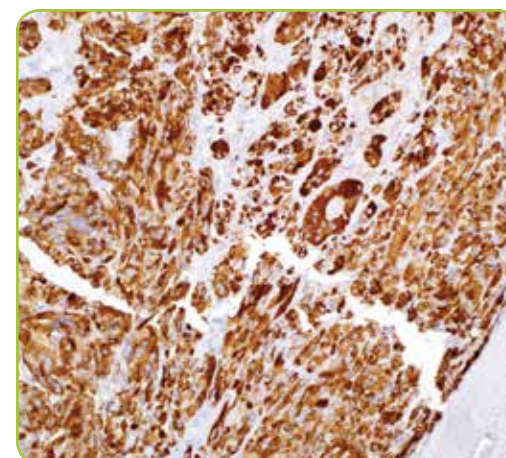
Rabbit Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	229R-15
1 mL concentrate	229R-16
1 mL predilute	229R-17
7 mL predilute	229R-18

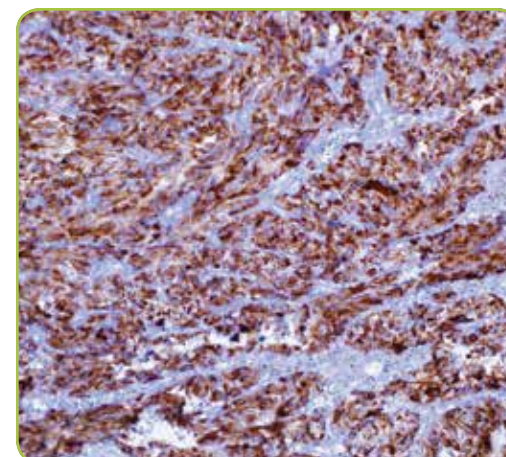
*Please contact your distributor for details on product availability and regulatory status in your country.*



Thyroid, C-cells

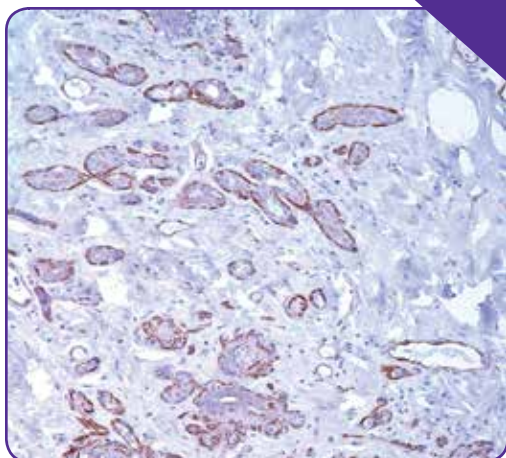


Medullary thyroid carcinoma

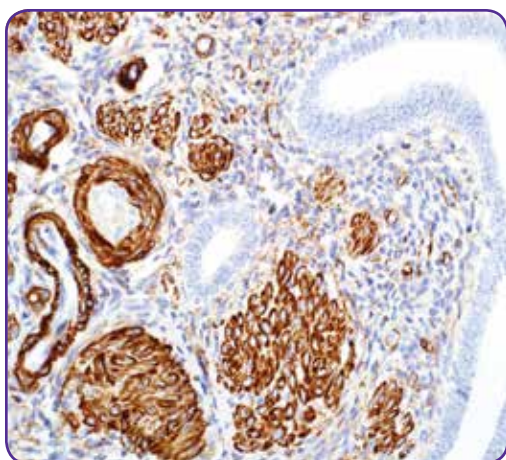


Medullary thyroid carcinoma

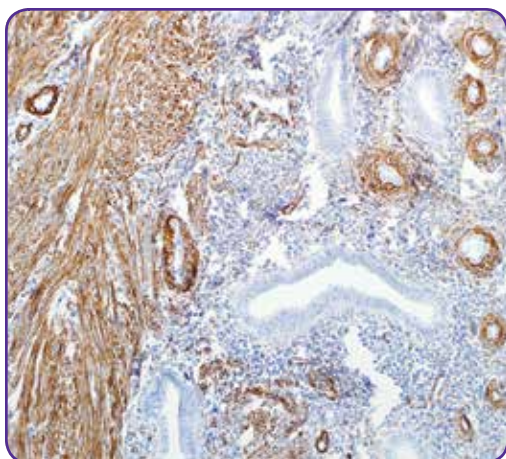
# Caldesmon



Breast myoepithelium



Uterus



Uterus

Anti-caldesmon is a regulatory protein found in smooth muscle and other tissues which interacts with actin, myosin, tropomyosin, and calmodulin. Anti-caldesmon antibody labels smooth muscle and tumors of smooth muscle, myofibroblastic, and myoepithelial differentiation.<sup>1-3</sup> Anti-caldesmon has also been used to differentiate epithelioid mesothelioma from serous papillary carcinoma of the ovary.<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** appendix, breast

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
PEComa	299
Spindle Cell Tumors	300
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320
Muscle Malignant Tumors	321
Small Blue Round Cell Tumors	322
Soft Tissue Tumors	322, 323

## Reference

1. Miettinen M, et al. Gastrointestinal stromal tumors: review on morphology, molecular pathology, prognosis, differential diagnosis. Arch Pathol Lab Med. 2006; 130:1466-78.
2. Watanabe K, et al. h-Caldesmon in leiomyosarcoma and tumors with smooth muscle cell-like differentiation: its specific expression in the smooth muscle cell tumor. Hum Pathol. 1999; 30:392-6.
3. McCluggage WC. A critical appraisal of the value of immunohistochemistry in diagnosis of uterine neoplasms. Adv Anat Pathol. 2004; 11:162-71.
4. Comin CE, et al. h-Caldesmon, a useful positive marker in the diagnosis of pleural mesothelioma, epithelioid type. Am J Surg Pathol. 2006; 30:463-9.
5. Comin CE, et al. h-Caldesmon, calretinin, estrogen receptor, and Ber-EP4: a useful combination of immunohistochemical markers for differentiating epithelioid peritoneal mesothelioma from serous papillary carcinoma of the ovary. Am J Surg Pathol. 2007; 31:1139-48.

## Ordering Information

### Caldesmon (E89)

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	230R-14
0.5 mL concentrate	230R-15
1 mL concentrate	230R-16
1 mL predilute	230R-17
7 mL predilute	230R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# Calponin-1

Calponin is a 34-kD polypeptide that interacts with actin, tropomyosin, and calmodulin. It is involved in smooth muscle contraction mechanism and is restricted exclusively to smooth muscle tissue. Anti-calponin has been found to be useful in staining myoepithelium and is, therefore, useful for differentiating benign sclerosing adenosis of the breast from infiltrating ductal carcinoma.<sup>1</sup> Calponin positivity has also been noted in malignant myoepithelioma<sup>2,5</sup> and pleomorphic adenoma<sup>3</sup> of salivary gland origin, as well as angiomatoid malignant fibrous histiocytoma.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** appendix

**Stability** up to 36 mos. at 2-8°C

### Isotype

- CALP: IgG<sub>1</sub>/k
- EP798Y: IgG

## Associated Specialties

Anatomic Pathology  
Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Spindle Cell Tumors	300
Non-Invasive Breast Lesions vs. Invasive Ductal Carcinoma	303
Bladder Tissue	308
Muscle Malignant Tumors	321
Small Blue Round Cell Tumors	322
Soft Tissue Tumors	322, 323

## Reference

1. Wang NP, et al. Appl Immunohistochem. 1997; 5:141-151.
2. Nagao T, et al. Cancer. 1998; 83:1292-9.
3. Savara AT, et al. Mod Pathol. 1997; 10:1093-1100.
4. Fanburg-Smith JC, et al. Hum Pathol. 1999; 30:1336-43.
5. Hornick JL, et al. Am J Surg Pathol. 2003; 27: 1183-96.

## Ordering Information

### Calponin (CALP)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	231M-14
0.5 mL concentrate	231M-15
1 mL concentrate	231M-16
1 mL predilute	231M-17
7 mL predilute	231M-18

### Calponin-1 (EP798Y)

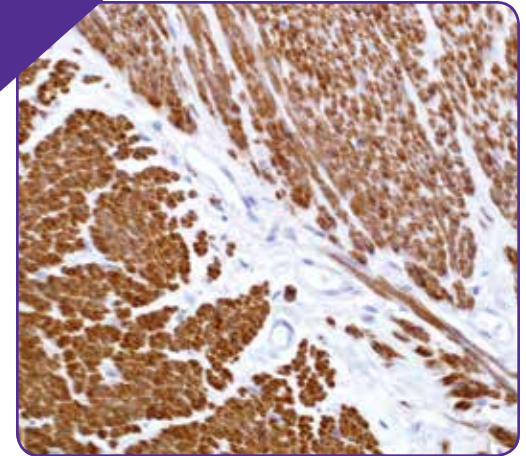
Rabbit Monoclonal

Primary Antibody

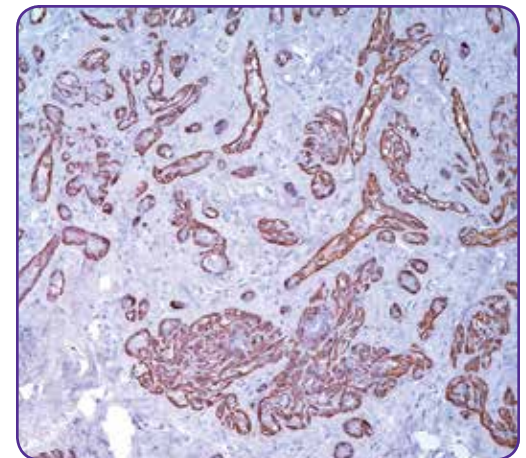


Volume	Part No.
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0.5 mL concentrate	231R-15
1 mL concentrate	231R-16
1 mL predilute	231R-17
7 mL predilute	231R-18

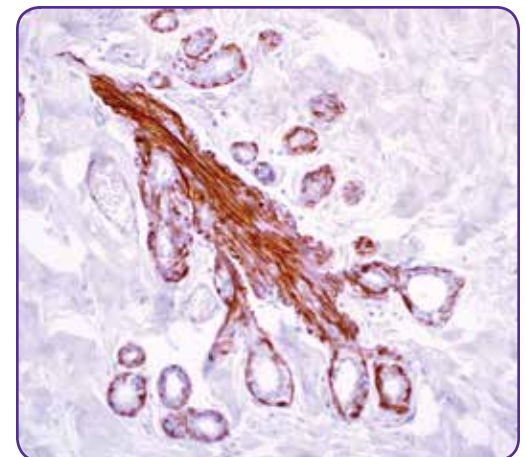
*Please contact your distributor for details on product availability and regulatory status in your country.*



Appendix

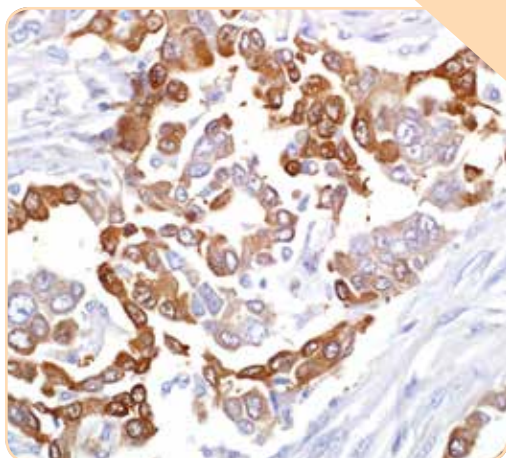


Breast sclerosing adenosis

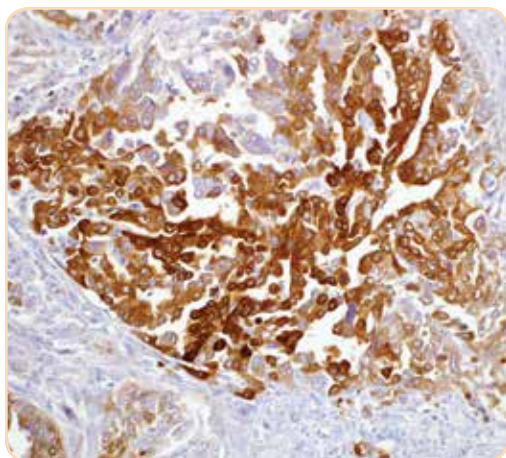


Breast

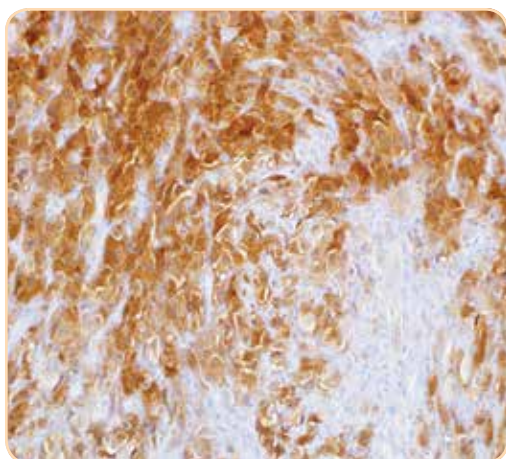
# Calretinin



Mesothelioma



Mesothelioma



Mesothelioma

Calretinin is a 29-kD calcium-binding protein thought to play a role in the cell cycle.<sup>1</sup> Anti-calretinin labels mesothelial and Leydig cells under normal and neoplastic conditions.<sup>2,3</sup> Anti-calretinin has been shown to be useful in differentiating mesothelioma from adenocarcinomas of the lung and other sources.<sup>4-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** mesothelioma

**Stability** up to 36 mos. at 2-8°C

**Isotype** SP13: IgG<sub>1</sub>

## Associated Specialties

Cytopathology

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Adrenal Neoplasms	292
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Sex Cord Stromal Tumors	303
RCC vs. Hemangioblastoma	310
Epithelioid Mesothelioma vs. Carcinoma	319
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320
Thoracic Solitary Fibrous Tumor vs. Potential Mimics	320
Soft Tissue Neoplasms	322
Soft Tissue Tumors	322, 323

## Reference

1. Rogers JH. Calretinin: a gene for a novel calcium-binding protein expressed principally in neurons. *J Cell Biol.* 1987; 105:1343-53.
2. Doglioni C, et al. Calretinin: a novel immunocytochemical marker for mesothelioma. *Am J Surg Pathol.* 1996; 20:1037-46.
3. Augusto D, et al. Calretinin: a valuable marker of normal and neoplastic Leydig cells of the testis. *Appl Immunohistochem Mol Morphol.* 2002; 10:159-62.
4. Barberis MC, et al. Calretinin. A selective marker of normal and neoplastic mesothelial cells in serous effusions. *Acta Cytol.* 1997; 41:1757-61.

*For the complete list of references see the product IFU.*

## Ordering Information

### Calretinin

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	232A-74
0.5 mL concentrate	232A-75
1 mL concentrate	232A-76
1 mL predilute	232A-77
7 mL predilute	232A-78

### Calretinin (SP13)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	232R-14
0.5 mL concentrate	232R-15
1 mL concentrate	232R-16
1 mL predilute	232R-17
7 mL predilute	232R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Carbonic Anhydrase IX (CA IX)

Carbonic Anhydrase IX (CA IX) is part of a family of zinc containing metalloproteins that catalyze the reversible hydration of CO<sub>2</sub>.<sup>1</sup> Among these, CA IX is anchored to the cell membrane and is expressed in the human gastrointestinal tract, chiefly in the stomach.<sup>1</sup> Data suggests consistent immunoreactivity for anti-CA IX in clear cell renal cell carcinoma (CCRCC) and clear cell papillary renal cell carcinoma (CpapRCC)<sup>2</sup> making it a useful marker in the differential diagnosis of the various types of renal cell carcinomas (CCRCC and CpapRCC vs other RCCs).<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** clear cell renal cell carcinoma, gall bladder epithelium

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP161: IgG
- MRQ-54: IgG<sub>2b</sub>

## Synonyms and Abbreviations

CA IX

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Differential Diagnosis of Metastatic Adenocarcinomas	295

## Reference

1. Leppilampi M, et al. Carbonic anhydrase isozymes IX and XII in gastric tumors. World J Gastroenterol. 2003; 9:1398-1403.
2. Williamson SR, et al. Clear cell papillary renal cell carcinoma: differential diagnosis and extended immunohistochemical profile. Mod Pathol. 2013; 26:697-708.
3. Gupta R, et al. Diagnostic implications of transcription factor Pax 2 protein and transmembrane enzyme complex carbonic anhydrase IX immunoreactivity in adult renal epithelial neoplasms. Am J Surg Pathol. 2009; 33:241-7.

## Ordering Information

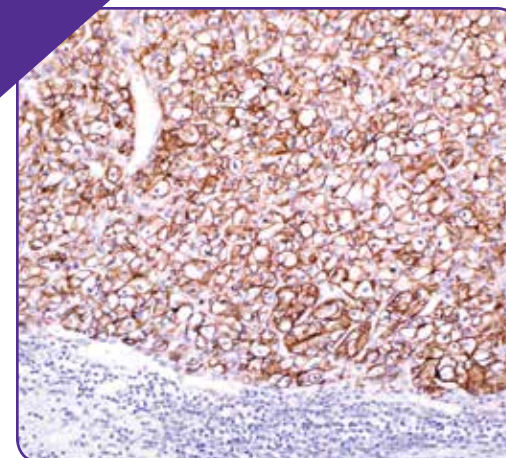
### Carbonic Anhydrase IX (CA IX) (EP161)

Rabbit Monoclonal Primary Antibody

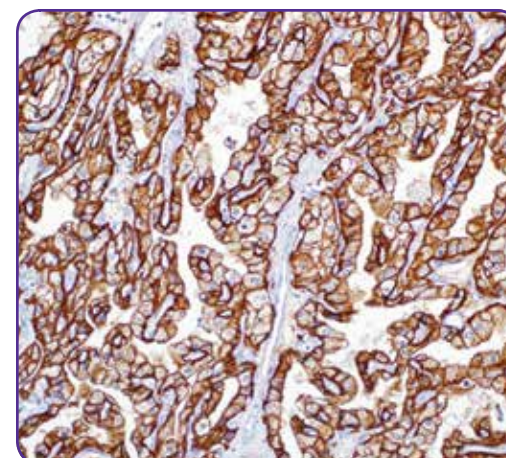


Volume	Part No.
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0.5 mL concentrate	379R-15
1 mL concentrate	379R-16
1 mL predilute	379R-17
7 mL predilute	379R-18

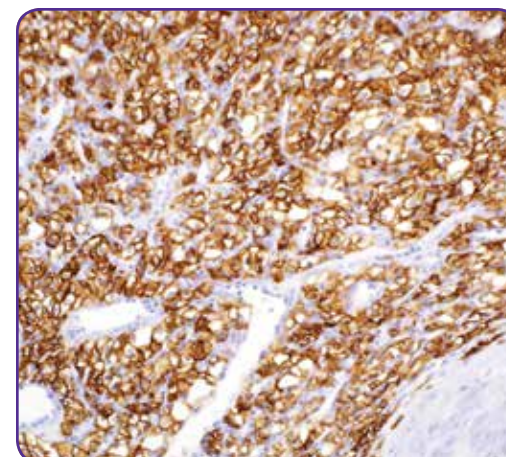
*Please contact your distributor for details on product availability and regulatory status in your country.*



Renal cell carcinoma

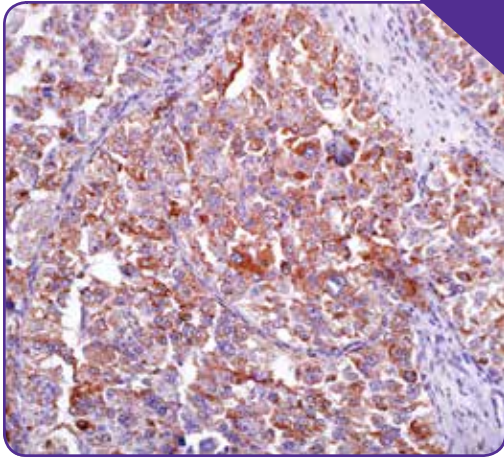


Renal cell carcinoma

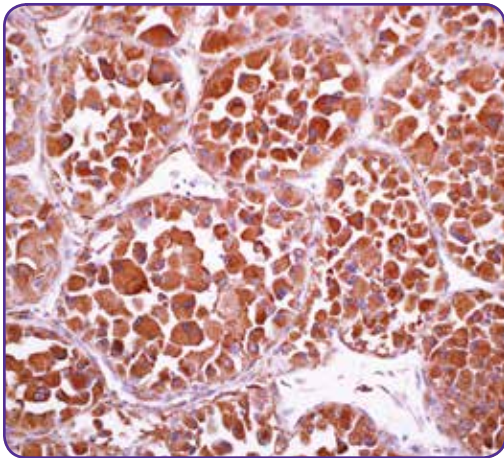


Renal cell carcinoma

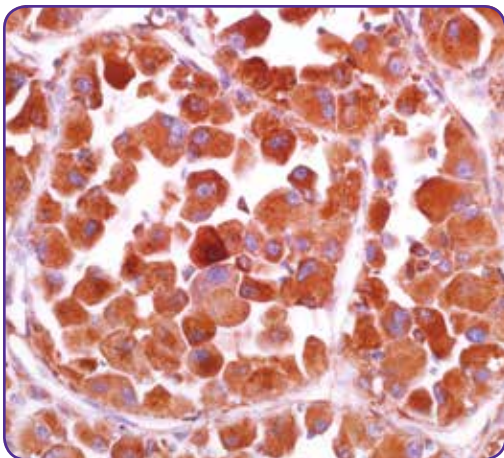
# Cathepsin K



Translocation renal cell carcinoma



Alveolar soft part sarcoma



Alveolar soft part sarcoma

Cathepsin K is a papain-like cysteine protease that plays an important role in osteoclast function and has been identified as a target of the MiTF transcription factor family.<sup>1</sup> Cathepsin K expression has been observed in translocation renal cell carcinoma (RCC), while other subtypes of RCC such as clear cell RCC do not react.<sup>2</sup> Anti-Cathepsin K has been reported as a useful marker for several of the MiTF family of tumors including translocation RCC, melanoma and alveolar soft part sarcoma.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** Xp11.2 translocation RCC

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Kidney, Urothelial, and Soft Tissue Neoplasms	321

## Ordering Information

### Cathepsin K (3F9)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	402M-14
0.5 mL concentrate	402M-15
1 mL concentrate	402M-16
1 mL predilute	402M-17
7 mL predilute	402M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

## Reference

1. Motyckova G, et al. Linking osteopetrosis and pycnodysostosis: Regulation of cathepsin K expression by the microphthalmia transcription factor family. *Proc Natl Acad Sci USA*. 2001; 98:5798-803.
2. Martignoni G, et al. Cathepsin-K immunoreactivity distinguishes MiTF/TFE family renal translocation carcinomas from other renal carcinomas. *Mod Pathol*. 2009; 22:1016-22.
3. Rao Q, et al. Cathepsin K in the immunohistochemical diagnosis of melanocytic lesions. *Int J Clin Exp Pathol*. 2014; 7:1132-9.

# Caveolin-1

Caveolin-1 (CAV-1) is a cell membrane-associated structural component of flask-shaped plasma membrane invaginations termed caveolae.<sup>1</sup> CAV-1 is expressed at different levels in different tissues, with the highest in adipocytes, endothelial cells, fibroblasts, alveolar type I pneumocytes, and mesothelial cells.<sup>1-2</sup> Anti-caveolin-1 immunoreactivity is seen in the vast majority of epithelioid mesotheliomas and Ewing sarcoma/PNET, whereas reactivity in lung adenocarcinomas is only occasionally seen and in a weak and focal pattern.<sup>2-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** mesothelioma, Ewing sarcoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

CAV-1

## Associated Specialties

Cytopathology

Pulmonary Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Epithelioid Mesothelioma vs. Carcinoma	319

## Reference

1. Cohen AW, et al. Role of caveolae and caveolins in health and disease. *Physiol Rev.* 2004; 84:1341-79.
2. Amatya VJ, et al. Caveolin-1 is a novel Immunohistochemical marker to differentiate Epithelioid Mesothelioma from Lung Adenocarcinoma. *Histopathology.* 2009; 55:10-9.
3. Liombart-Bosch A, et al. Histological heterogeneity of Ewing's sarcoma/PNET: An immunohistochemical analysis of 415 genetically confirmed cases with clinical support. *Virchows Arch.* 2009; 455:397-411.

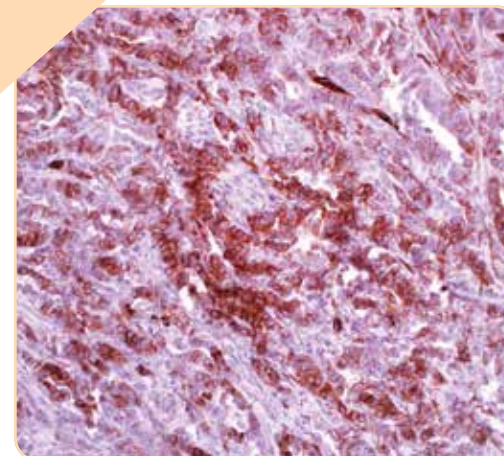
## Ordering Information

### Caveolin-1 (2297)

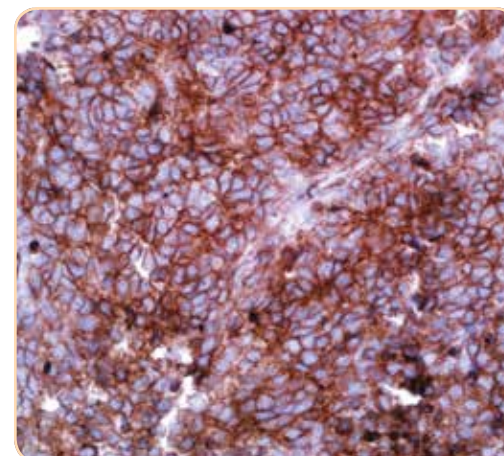
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	412M-15
1 mL concentrate	412M-16
1 mL predilute	412M-17
7 mL predilute	412M-18

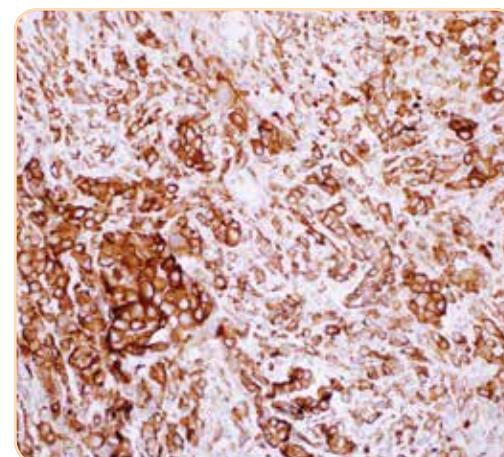
*Please contact your distributor for details on product availability and regulatory status in your country.*



Mesothelioma



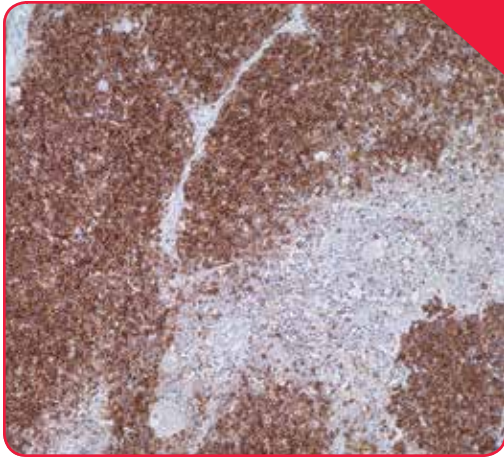
Ewing sarcoma



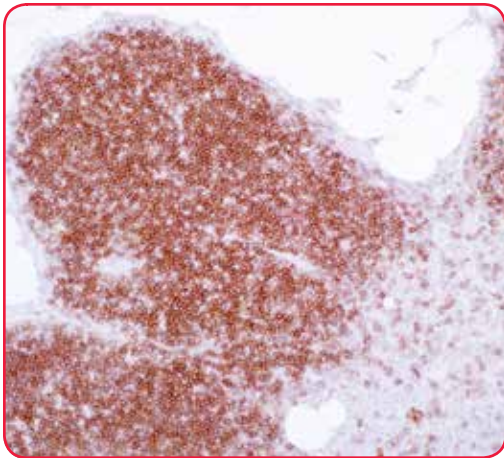
Pleura



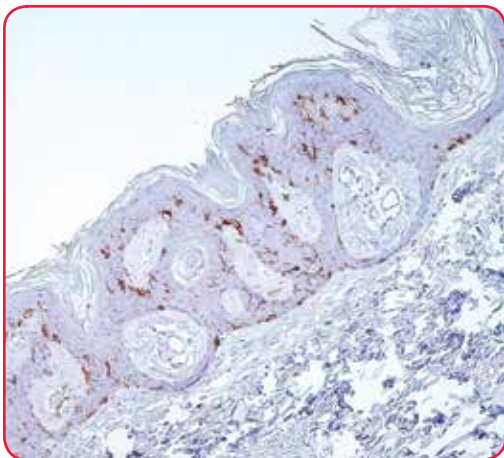
# CD1a



Thymic cortical lymphocytes



Thymus cortex medulla



Skin

CD1a is a non-polymorphic, major histocompatibility complex, class I-related cell surface glycoprotein (45 to 55-kD) and is expressed in association with  $\beta$ -microglobulin.<sup>1</sup> In normal tissues, anti-CD1a reacts with cortical thymocytes, Langerhans cells, interdigitating cells, and rare antigen-presenting cells of the lymph node.<sup>2</sup> CD1a positivity has also been seen in Langerhans cell histiocytosis (histiocytosis X)<sup>3</sup>, and a subset of pre-T lymphoblastic lymphoma/leukemia (cortical T LBL/L).<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** membranous  
**Control** skin, thymus  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymph Node	297
Thymus	301
Histiocytic and Dendritic Cell Lesions	313, 320
Histiocytic and Dendritic Cell Neoplasms	313
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Histiocytic Proliferation	319

## Reference

1. Krenacs L, et al. Immunohistochemical detection of CD1A antigen in formalin-fixed and paraffin-embedded tissue sections with monoclonal antibody O10. *J Pathol.* 1993; 171:99-104.
2. Angel CE, et al. Distinctive localization of antigen-presenting cells in human lymph nodes. *Blood.* 2009; 113:1257-67.
3. Emile JF, et al. Langerhans' cell histiocytosis. Definitive diagnosis with the use of monoclonal antibody O10 on routinely paraffin-embedded samples. *Am J Surg Pathol.* 1995; 19:636-41.
4. Stefano AP, et al. Acute leukemia immunophenotyping in bone-marrow routine sections. *Br J Haematol.* 1999; 105:394-401.
5. Han X, et al. Precursor T-cell acute lymphoblastic leukemia/lymphoblastic lymphoma and acute biphenotypic leukemias. *Am J Clin Pathol.* 2007; 127:528-44.

## Ordering Information

**CD1a (EP3622)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	101R-14
0.5 mL concentrate	101R-15
1 mL concentrate	101R-16
1 mL predilute	101R-17
7 mL predilute	101R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# CD2

CD2 is one of the earliest T-cell lineage restricted antigens to appear during T-cell differentiation and only rare CD2+ cells can be found in the bone marrow. Anti-CD2 is a pan-T-cell antigen marker. Anti-CD2 is therefore useful for the identification of virtually all normal T-lymphocytes. It is also very useful in the assessment of lymphoid malignancies as it is expressed in the majority of precursor and mature T-cell lymphomas and leukemias. As with other pan-T-cell antigens, CD2 may be aberrantly deleted in some neoplastic T-cell populations, especially peripheral T-cell lymphomas. When combined with anti-CD25, anti-CD2 may assist in the identification of systemic mastocytosis and mastocytic leukemia.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP222: IgG
- MRQ-11: IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Mastocytosis	315
NK Cell Leukemia/Lymphoma	316
T-cell Lymphomas	317

## Reference

1. Aguilera NS, et al. Gene rearrangement and comparative genomic hybridization studies of classic Hodgkin lymphoma expressing T-cell antigens. Arch Pathol Lab Med. 2006; 130:1772-9.
2. Barrionuevo C, et al. Extranodal NK/T-cell lymphoma, nasal type: study of clinicopathologic and prognosis factors in a series of 78 cases from Peru. Appl Immunohistochem Mol Morphol. 2007; 15:38-44.
3. Bovenschen HJ, et al. Plaque psoriasis vs. atopic dermatitis and lichen planus: a comparison for lesional T-cell subsets, epidermal proliferation and differentiation. Br J Dermatol. 2005; 153:72-8.
4. Foon KA, et al. Immunologic classification of leukemia and lymphoma. Blood 1986; 68:1-31.

## Ordering Information

**CD2 (EP222)**  
Rabbit Monoclonal  
Primary Antibody

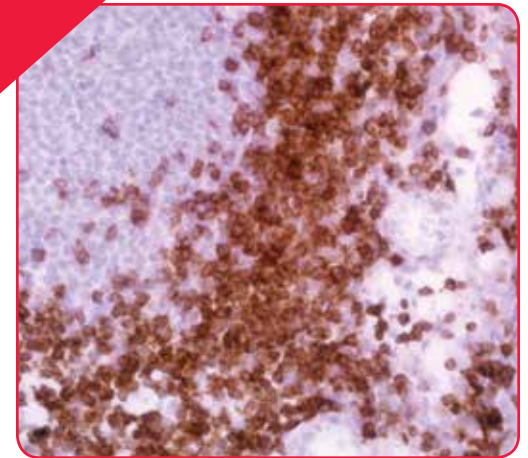


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0.5 mL concentrate	102R-15
1 mL concentrate	102R-16
1 mL predilute	102R-17
7 mL predilute	102R-18

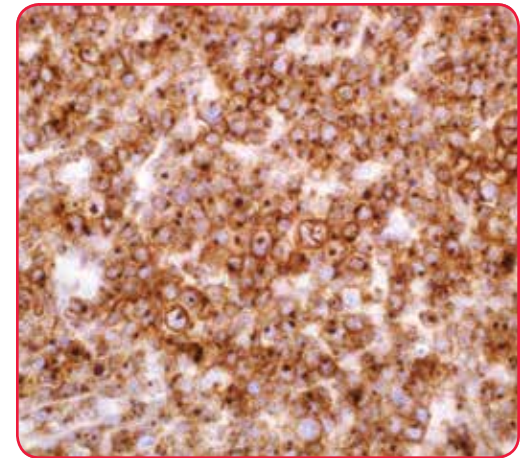
**CD2 (MRQ-11)**  
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	102M-15
1 mL concentrate	102M-16
1 mL predilute	102M-17
7 mL predilute	102M-18

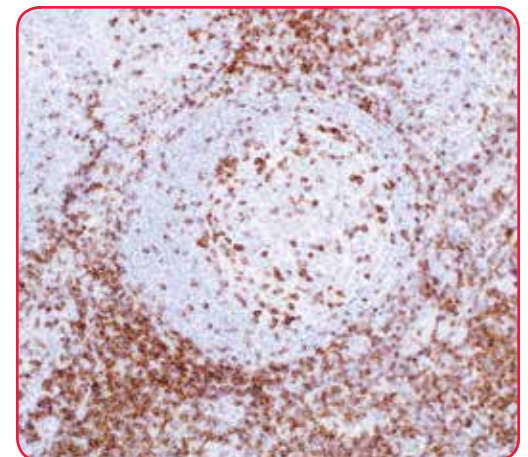
*Please contact your distributor for details on product availability and regulatory status in your country.*



Tonsil

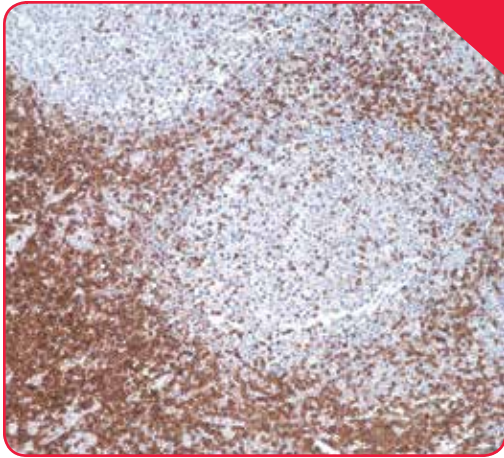


Angioimmunoblastic T-cell lymphoma

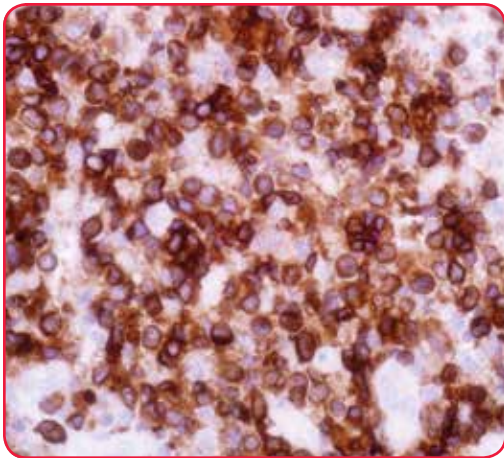


Interfollicular T-lymphocytes

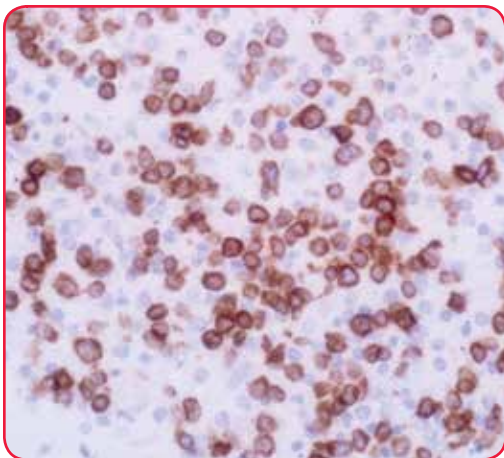
# CD3



Tonsil



Angioimmunoblastic T-cell lymphoma



Spleen

CD3's immunohistochemical detection locates the cytoplasmic component of CD3 protein. Anti-CD3 is considered to be a pan-T-cell marker and reacts with an antigen present at the surface and in the cytoplasm of T lymphocytes. Anti-CD3 is widely used for the identification of immature and mature T-cell malignancies.<sup>1-8</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** MRQ-39: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Histiocytic Lesions	313
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Lymphomas and Myeloid Sarcoma	315
Mature B-cell and T-cell Neoplasms	315
NK Cell Leukemia/Lymphoma	316
T-cell Lymphomas	317

## Reference

1. Denning SM, et al. Activation of human thymocytes via CD3 and CD2 molecules. In: McMichael AJ, et al. eds. Leucocyte Typing III, White Cell Differentiation Antigens. Oxford-New York-Tokyo. Oxford University Press. 1987; 144-7.
2. Beverley PC, et al. Distinctive functional characteristics of human "T" lymphocytes defined by E rosetting or a monoclonal anti-T cell antibody. Eur J Immunol. 1981; 11:329-34.
3. Clevers H, et al. The transmembrane orientation of the epsilon chain of the TcR/CD3 complex. Eur J Immunol. 1988; 18:705-10.
4. Campana D, et al. The cytoplasmic expression of CD3 antigens in normal and malignant cells of the T lymphoid lineage. J Immunol. 1987; 138:648-55.
5. Hedvat CV, et al. Application of tissue microarray technology to the study of non-Hodgkin and Hodgkin lymphoma. Hum Pathol. 2002; 33:968-74.
6. Karube K, et al. Non-B, non-T neoplasms with lymphoblast morphology: further clarification and classification. Am J Surg Pathol. 2003; 27:1366-74.

For the complete list of references see the product IFU.

## Ordering Information

### CD3 (MRQ-39)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	103R-94
0.5 mL concentrate	103R-95
1 mL concentrate	103R-96
1 mL predilute	103R-97
7 mL predilute	103R-98

### CD3

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	103A-74
0.5 mL concentrate	103A-75
1 mL concentrate	103A-76
1 mL predilute	103A-77
7 mL predilute	103A-78
25 mL predilute	103A-70

Please contact your distributor for details on product availability and regulatory status in your country.

# CD4

CD4 is a 55-kD glycoprotein expressed on the surface of T-helper/regulatory T-cells, monocytes, macrophages, and dendritic cells. Anti-CD4 is used in the immunophenotyping of lymphoproliferative disorders.<sup>1</sup> The majority of peripheral T-cell lymphomas are derived from the T-helper/regulatory cell subset so that most mature T-cell neoplasms are CD4+ CD8-.<sup>2</sup> As with other T-cell antigens, CD4 may be aberrantly expressed in neoplastic T-cells so that the evaluation of such tumors requires the application of a panel of markers in order to identify tumors with CD4 aberrant expression.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP204: IgG
- SP35: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Histiocytic Lesions	313
T-cell Lymphomas	317

## Reference

1. Leong AS-Y, et al. Manual of diagnostic antibodies for immunohistochemistry. 2nd edition. Greenwich Medical Media Ltd. 2003.
2. Akiyama T, et al. CD8+, CD56+ (natural killer-like) T-cell lymphoma involving the small intestine with no evidence of enteropathy: clinicopathology and molecular study of five Japanese patients. *Pathol Int.* 2008; 58:626-34.
3. Garcia-Herrera A, et al. Primary cutaneous small/medium CD4+ T-cell lymphomas: a heterogeneous group of tumors with different clinicopathologic features and outcome. *J Clin Oncol.* 2008; 26:3364-71.

## Ordering Information

**CD4 (EP204)**  
Rabbit Monoclonal  
Primary Antibody

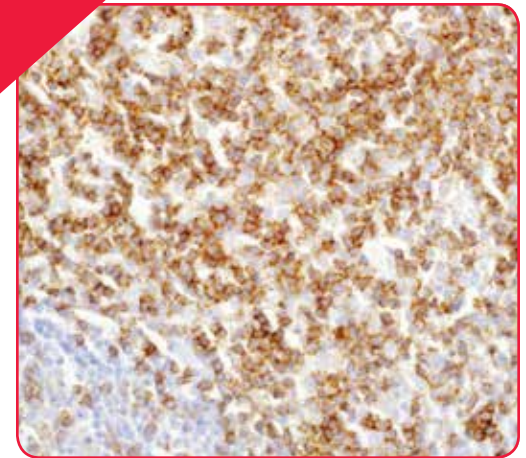


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0.5 mL concentrate	104R-25
1 mL concentrate	104R-26
1 mL predilute	104R-27
7 mL predilute	104R-28

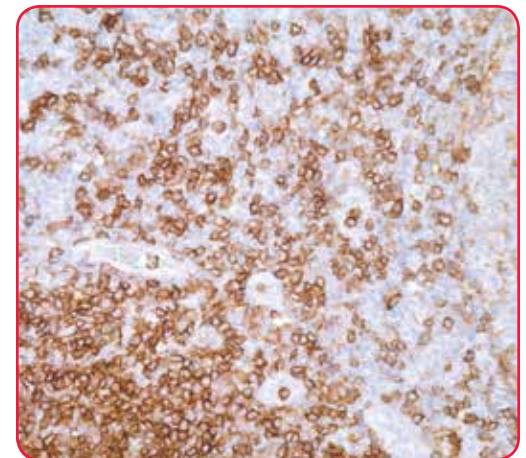
**CD4 (SP35)**  
Rabbit Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	104R-15
1 mL concentrate	104R-16
1 mL predilute	104R-17
7 mL predilute	104R-18

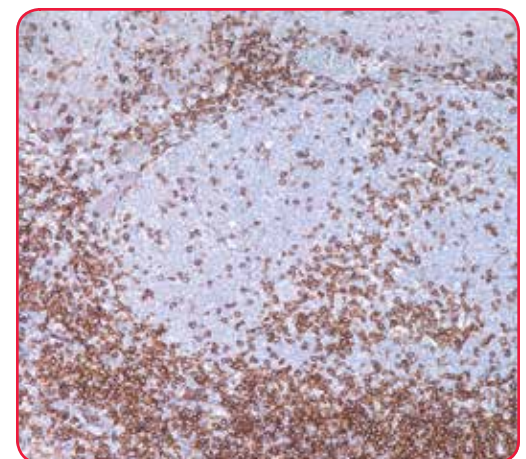
*Please contact your distributor for details on product availability and regulatory status in your country.*



Tonsil

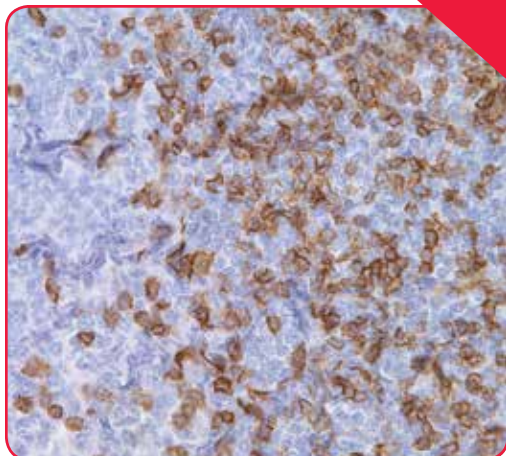


Tonsil

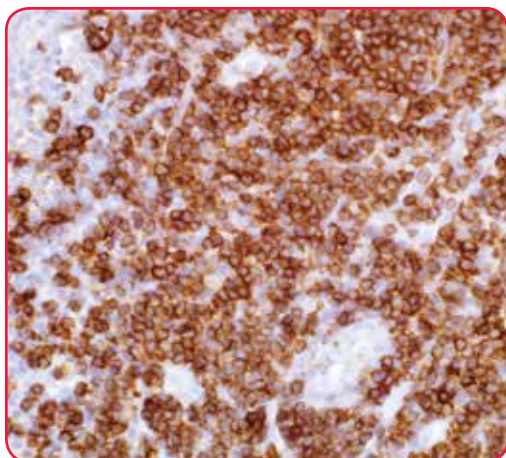


Interfollicular T-lymphocytes

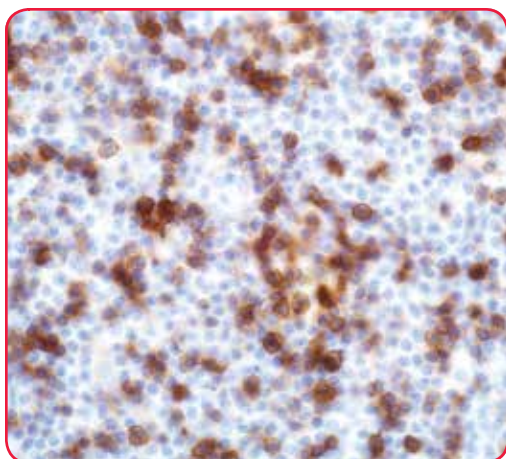
# CD5



Tonsil



Tonsil



Small lymphocytic lymphoma

Anti-CD5 is a pan T-cell marker that also reacts with a range of neoplastic B-cells, e.g. chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL), mantle cell lymphoma, and a subset (~10%) of diffuse large B-cell lymphoma.<sup>1,2</sup> CD5 aberrant expression is useful in identification of mature T-cell neoplasms.<sup>3,4,5</sup> Anti-CD5 detection is diagnostic in CLL/SLL within a panel of other B-cell markers, especially one that includes anti-CD23.<sup>1,3</sup> Anti-CD5 is also very useful in differentiating among mature small lymphoid cell malignancies.<sup>1,6</sup> In addition, anti-CD5 can be used in distinguishing thymic carcinoma (+) from thymoma (-). Anti-CD5 does not react with granulocytes or monocytes.<sup>1,2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 4C7: IgG/k
- EP77: IgG
- SP19: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Thymus	301
B-cell Lymphomas	311
CD5 in B-cell Neoplasms	312
Small and Medium/Large B-Cell Neoplasms	317
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Mature B-cell Neoplasms	315
T-cell Lymphomas	317

## Reference

1. Chan JKC, et al. A proposal for classification of lymphoid neoplasms (by the International Lymphoma Study Group). *Histopathology*. 1994; 25:517-536.
2. Jones NH, et al. Isolation of complementary DNA clones encoding the human lymphocyte glycoprotein T1/leu-1. *Nature*. 1986; 323:346-349.
3. Tan SH, et al. Cutaneous lymphomas other than mycosis fungoides in Singapore: a clinicopathological analysis using recent classification systems. *Br J Dermatol*. 2003; 149:542-53.
4. Chang CC, et al. CD5+ T-cell/histiocyte-rich large B-cell lymphoma. *Mod Pathol*. 2002; 15:1051-7.
5. Hatano B, et al. Peripheral T-cell lymphoma with a nodular growth pattern. *Pathol Int*. 2002; 52:400-5.
6. West RB, et al. The usefulness of immunohistochemistry in the diagnosis of follicular lymphoma in bone marrow biopsy specimens. *Am J Clin Pathol*. 2002; 117:636-43.

## Ordering Information

### CD5 (4C7)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	205M-14
0.5 mL concentrate	205M-15
1 mL concentrate	205M-16
1 mL predilute	205M-17
7 mL predilute	205M-18

### CD5 (EP77)

Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	205R-24
0.5 mL concentrate	205R-25
1 mL concentrate	205R-26
1 mL predilute	205R-27
7 mL predilute	205R-28

### CD5 (SP19)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	205R-14
0.5 mL concentrate	205R-15
1 mL concentrate	205R-16
1 mL predilute	205R-17
7 mL predilute	205R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# CD7

CD7 antigen is a 40-kD cell surface glycoprotein that is a member of the immunoglobulin gene superfamily.<sup>1,2</sup> While its precise function is not known, it is suggested that CD7 plays a role in T-cell interactions as it is one of the earliest T-cell lineage associated antigens expressed during T-cell ontogeny.<sup>2,3</sup> CD7 is expressed in thymocytes, mature peripheral T-cells, natural killer cells, and lymphoid and myeloid progenitors.<sup>1,2,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, peripheral T-cell lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP132: IgG
- MRQ-56: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Lymphomas and Myeloid Sarcoma	315
T-cell Lymphomas	317

## Reference

1. Stillwell R, et al. T cell signal transduction and the role of CD7 in costimulation. *Immunol Res.* 2001; 24:31-52.
2. Schanberg LE, et al. Isolation and characterization of the genomic human CD7 gene: structural similarity with the murine Thy-1 gene. *Proc Natl Acad Sci USA.* 1991; 88:603-7.
3. Chabannon C, et al. Expression of CD7 on normal human myeloid progenitors. *J Immunol.* 1992; 149:2110-3.
4. Rabinowich H, et al. Expression and function of CD7 molecule on human natural killer cells. *J Immunol.* 2003; 152: 517-26.

## Ordering Information

**CD7 (EP132)**  
Rabbit Monoclonal  
Primary Antibody

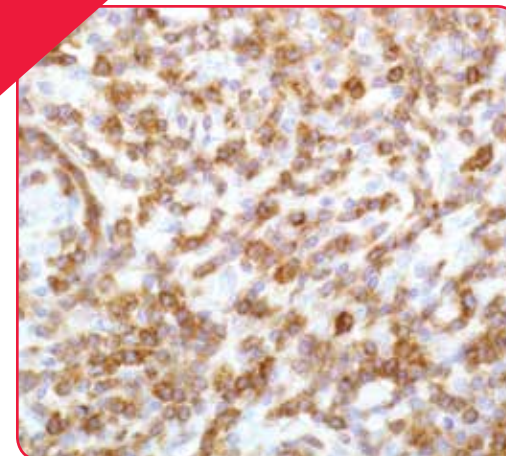


Volume	Part No.
0.1 mL concentrate	107R-14
0.5 mL concentrate	107R-15
1 mL concentrate	107R-16
1 mL predilute	107R-17
7 mL predilute	107R-18

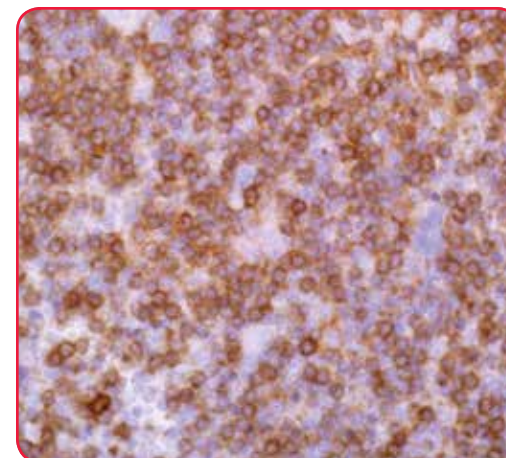
**CD7 (MRQ-56)**  
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	107M-25
1 mL concentrate	107M-26
1 mL predilute	107M-27
7 mL predilute	107M-28

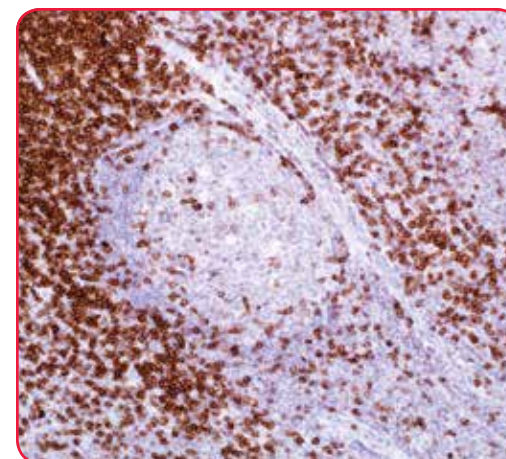
*Please contact your distributor for details on product availability and regulatory status in your country.*



Cutaneous T-cell lymphoma

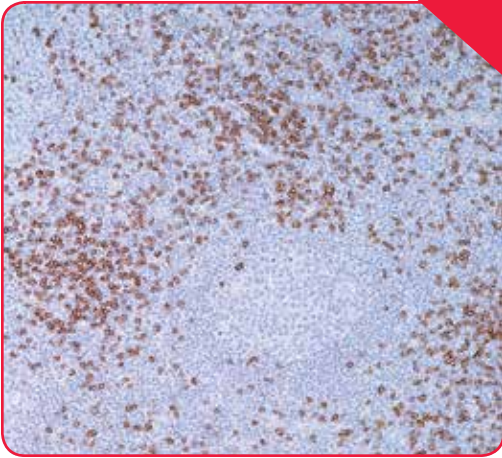


Lymph node

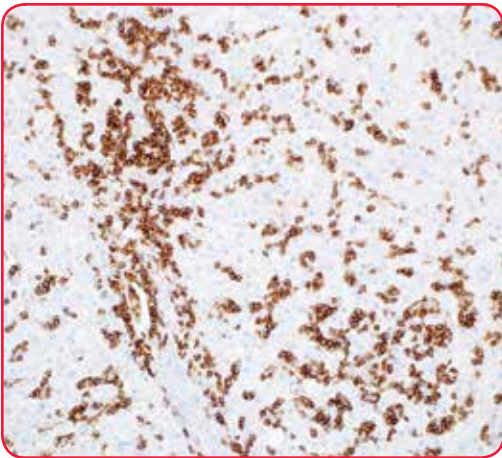


Tonsil, paracortical

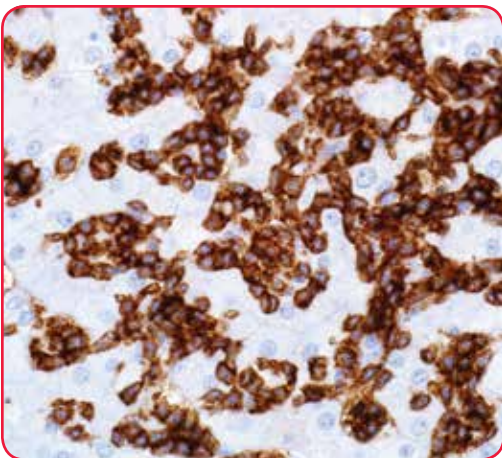
# CD8



Tonsil



Liver, chronic hepatitis



Liver, chronic hepatitis

The CD8 (cluster of differentiation 8) antigen is a cell surface glycoprotein made up of two subunits alpha and beta.<sup>1</sup> Anti-CD8 is a T-cell marker for the detection of cytotoxic/suppressor lymphocytes.<sup>2</sup> CD8 is also detected on NK cells, some thymocytes, some null cells and bone marrow cells. This antibody, along with other markers, can be used to distinguish between reactive and neoplastic T-cells.<sup>3</sup> CD8 expression has been found to be negative in mycosis fungoides.<sup>4</sup> Rarely does anti-CD8 label non-hematolymphoid neoplasms.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- C8/144B: IgG<sub>1</sub>/k
- SP16: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
T-cell Lymphomas	317

## Reference

1. Gao G, et al. Molecular interactions of coreceptor CD8 and MHC class I: the molecular basis for functional coordination with T-cell receptor. *Immunology Today*. 2000; 21:630-6.
2. Kavathas P, et al. Isolation of the gene encoding the human T-lymphocyte differentiation antigen Leu-2 (T8) by gene transfer and Cdna subtraction. *Proc Natl Acad Sci*. 1984; 81:7688-92.
3. Dabbs DJ. *Diagnostic Immunohistochemistry*. Fourth Edition. Saunders. 2006; p. 134-135.
4. Bakels V, et al. Immunophenotyping and gene rearrangement analysis provide additional criteria to differentiate between cutaneous T-cell lymphomas and pseudo-T-cell lymphomas. *Am J Pathol*. 1997; 150:1941-9.
5. Chu PG, et al. Expression of T/NK-cell and plasma cell antigens in nonhematopoietic epithelioid neoplasms. An immunohistochemical study of 447 cases. *Am J Clin Pathol*. 2003; 120:64-70.

## Ordering Information

### CD8 (C8/144B)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	108M-94
0.5 mL concentrate	108M-95
1 mL concentrate	108M-96
1 mL predilute	108M-97
7 mL predilute	108M-98

### CD8 (SP16)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	108R-14
0.5 mL concentrate	108R-15
1 mL concentrate	108R-16
1 mL predilute	108R-17
7 mL predilute	108R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD10

CD10, common acute lymphoblastic leukemia antigen, is expressed by a subset of T follicular helper cells.<sup>1,2</sup> CD10 has a direct role in cell growth and apoptosis and has been implicated in tumor cells proliferation.<sup>3</sup> CD10 expression has been reported in a variety of tissues; including renal cell carcinoma, hepatocellular carcinoma (in a canalicular pattern), and follicular lymphoma.<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** kidney, lymph node, tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Non-Invasive Breast Lesions vs. Invasive Ductal Carcinoma	303
Liver Neoplasms	297
Cutaneous Neoplasms	304
Skin: Dermatofibrosarcoma Protuberans (DFSP) vs. Dermatofibroma Fibrous Histiocytoma (DF-FH)	306
Pancreatic Epithelial Tissues and Tumors	308
Kidney: Epithelial Neoplasms	309
Kidney Neoplasms	310
RCC vs. Hemangioblastoma	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310
B-cell Lymphomas	311
CD5 in B-cell Neoplasms	312
Small and Medium/Large B-Cell Neoplasms	317
c-Myc in Diffuse Large B-cell Lymphoma (DLBCL)	312
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Lymphomas and Myeloid Sarcoma	315
Mature B-cell Neoplasms	315

## Ordering Information

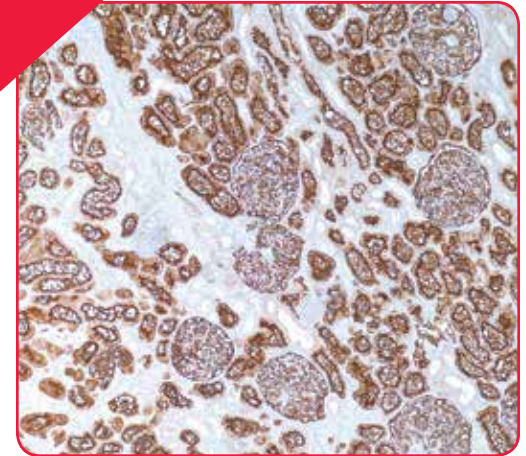
**CD10 (56C6)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	110M-14
0.5 mL concentrate	110M-15
1 mL concentrate	110M-16
1 mL predilute	110M-17
7 mL predilute	110M-18
25 mL predilute	110M-10

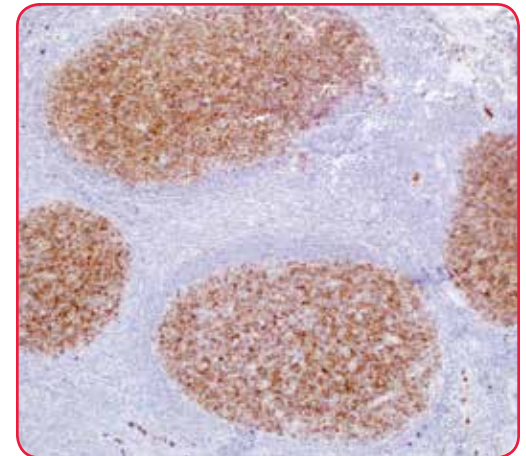
Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

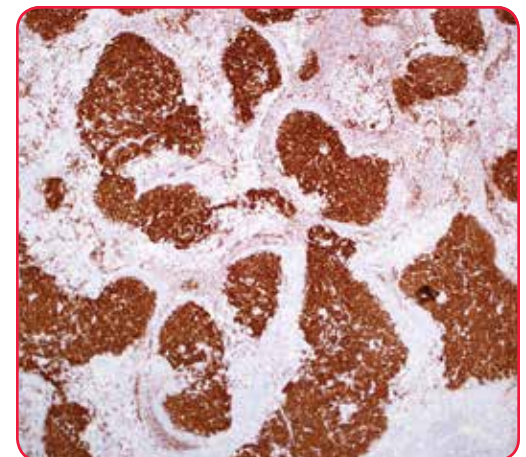
- Maguer-Satta V, et al. Concise review: neutral endopeptidase (CD10): a multifaceted environment actor in stem cells, physiological mechanisms, and cancer. *Stem Cells*. 2011; 29:389-96.
- Laurent C, et al. A novel subset of T-helper cells: follicular T-helper cells and their markers. *Haematologica*. 2010; 95: 356-8.
- Onak NK, et al. CD10 expression in urothelial bladder carcinomas: staining patterns and relationship with pathologic parameters. *Turk J Med Sci*. 2010; 40:177-84.
- Chu P, et al. Paraffin-section detection of CD10 in 505 nonhematopoietic neoplasms. *Am J Clin Pathol*. 2000; 113: 374-82.
- Swerdlow S, et al. WHO classification of tumours of hematopoietic and lymphoid tissues. 4th edition. 2008. P. 220,233,255,265,309.



Kidney



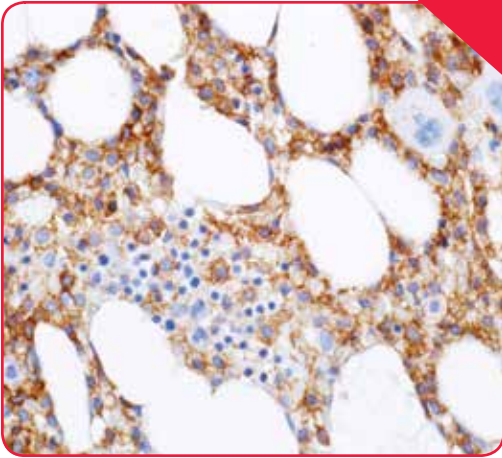
Tonsil, germinal center cells



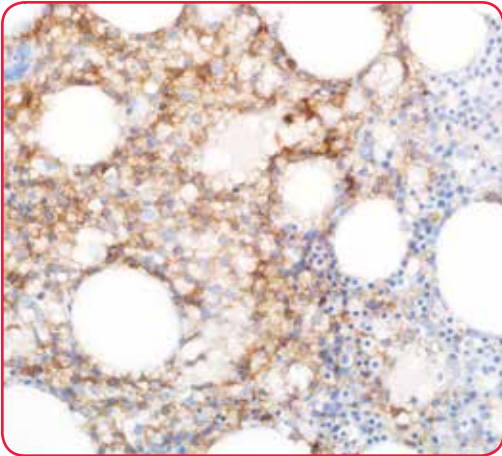
Follicular lymphoma



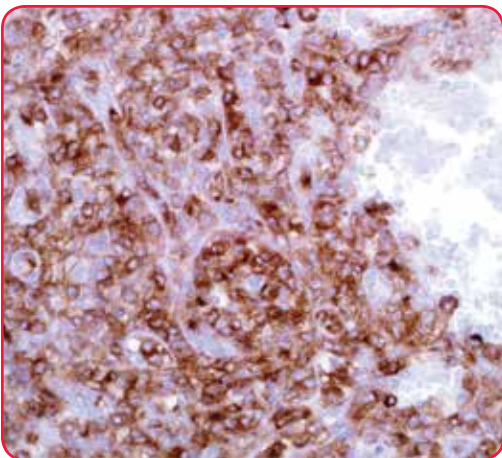
# CD11c



Bone marrow, Hairy cell leukemia



Bone marrow, Hairy cell leukemia



Spleen

CD11c is an adhesion receptor of the leukocyte function-associated family of molecules. Reportedly CD11c is expressed in hairy cell leukemia whereas the majority of other small B-cell lymphomas do not express CD11c antigen. This indicates that immunohistochemical staining of formalin-fixed biopsies with anti-CD11c can be useful for identification of hairy cell leukemia.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** hairy cell leukemia, granulocytes, monocytes, bone marrow

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 5D11: IgG<sub>2a</sub>
- EP157: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312

## Reference

1. Korinna J, et al. A novel CD I monoclonal antibody effective in formalin-fixed tissue for the diagnosis of hairy cell leukemia. *Pathobiology*. 2008; 75:252-6.
2. Went PT, et al. High specificity of combined TRAP and DBA.44 expression for hairy cell leukaemia. *Am J Surg Pathol*. 2005; 29:474-8.
3. Miranda RN, et al. Immunohistochemical detection of cyclin D1 using optimized conditions is highly specific for mantle cell lymphoma and hairy cell leukaemia. *Modern Pathology*. 2000; 13:1308-14.
4. Marotta G, et al. Expression of the CD11c antigen in B-cell chronic lymphoproliferative disorders. *Leuk Lymphoma*. 2000; 37:145-9.

## Ordering Information

### CD11c (5D11)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	111M-14
0.5 mL concentrate	111M-15
1 mL concentrate	111M-16
1 mL predilute	111M-17
7 mL predilute	111M-18

### CD11c (EP157)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	111R-14
0.5 mL concentrate	111R-15
1 mL concentrate	111R-16
1 mL predilute	111R-17
7 mL predilute	111R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD13

CD13 (aminopeptidase-N) is a transmembrane protease present in many tissues and cell types (e.g., endothelial and epithelial cells, fibroblasts, and leukocytes).<sup>1</sup> CD13 is found in various solid and hematological malignancies in humans, including acute myeloid leukemia (AML), and is thought to influence tumor progression.<sup>2</sup> It has also been reported that CD13 is expressed in both normal and neoplastic liver tissue, where it exhibits a canalicular distribution pattern.<sup>3</sup> Thus, anti-CD13 can be a useful marker for identifying AML and hepatocellular carcinoma (HCC).<sup>1,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** liver

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP117: IgG
- SP187: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Leukemia	314

## Reference

1. Bauvois B, et al. Aminopeptidase-N/CD13 (EC 3.4.11.2) inhibitors: chemistry, biological evaluations, and therapeutic prospects. *Med Res Rev.* 2006; 26:88-130.
2. Piedfer M, et al. Aminopeptidase-N/CD13 is a potential pro-apoptotic target in human myeloid tumor cells. *FASEB J.* 2011; 25:2831-42.
3. Rocken C, et al. Canalicular immunostaining of aminopeptidase N (CD13) as a diagnostic marker for hepatocellular carcinoma. *J ClinPathol.* 2005; 58:1069-75.

## Ordering Information

### CD13 (EP117)

Rabbit Monoclonal  
Primary Antibody



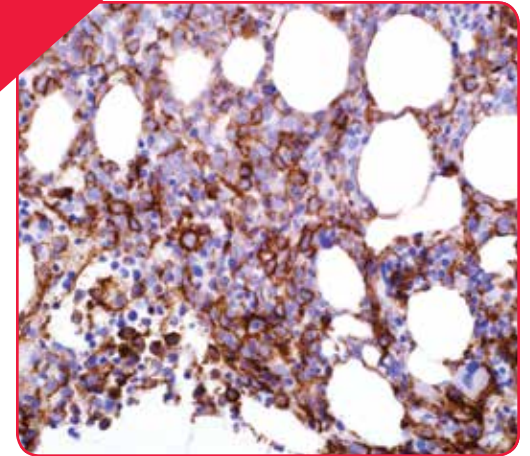
Volume	Part No.
0.1 mL concentrate	113R-24
0.5 mL concentrate	113R-25
1 mL concentrate	113R-26
1 mL predilute	113R-27
7 mL predilute	113R-28

### CD13 (SP187)

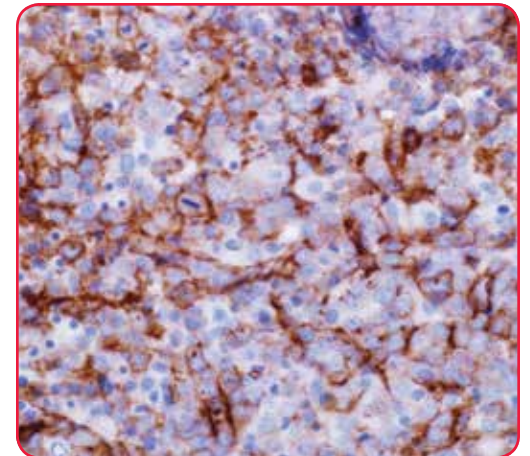
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	113R-14
0.5 mL concentrate	113R-15
1 mL concentrate	113R-16
1 mL predilute	113R-17
7 mL predilute	113R-18

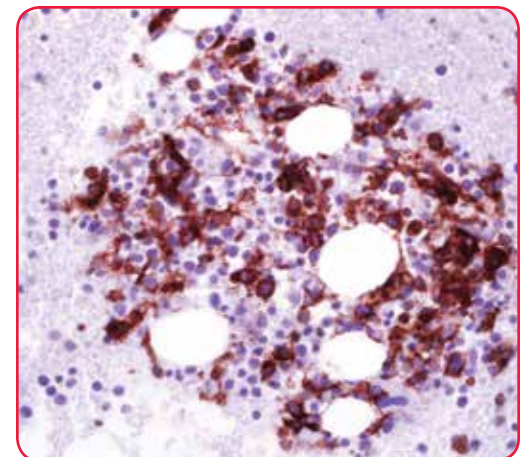
*Please contact your distributor for details on product availability and regulatory status in your country.*



Bone marrow, acute myeloid leukemia

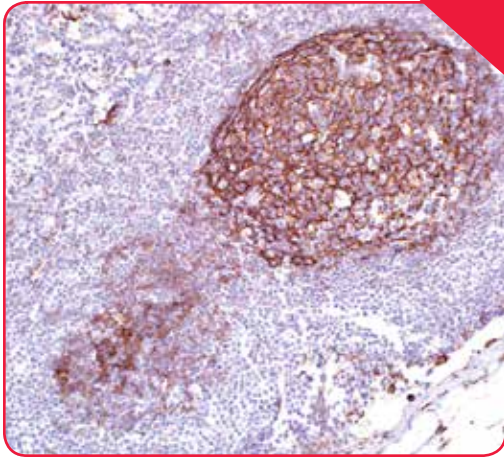


Bone marrow, acute myeloid leukemia

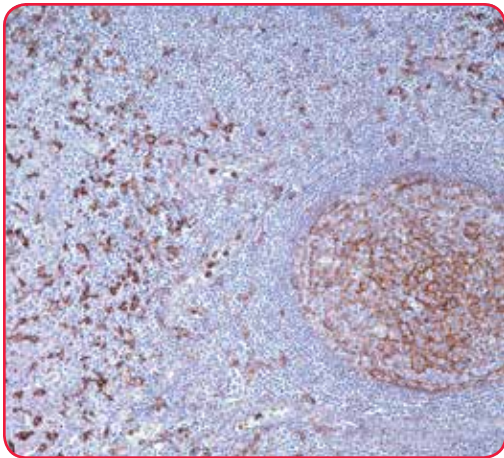


Bone marrow

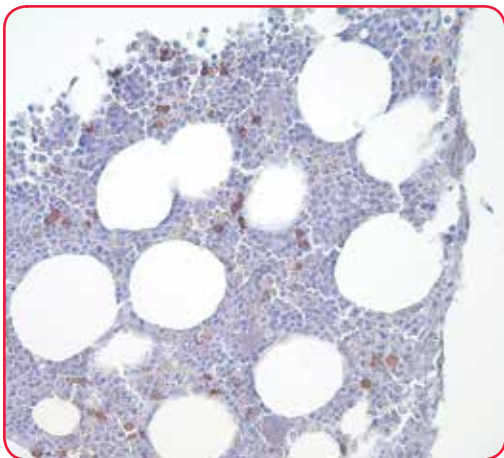
# CD14



Lymph node



Tonsil, macrophages



Bone marrow

CD14 is a 55-kD glycosyl-phosphatidylinositol-linked membrane protein, involved in endotoxin binding and recognition of apoptotic cells.<sup>1</sup> CD14 is expressed on monocytes, macrophages, follicular dendritic cells, and granulocytes.<sup>2-4</sup> Anti-CD14 can detect these cells, including monocyte-derived cells which are frequently increased in diffuse large B-cell lymphoma (DLBCL),<sup>3</sup> as well as in neoplastic cells in acute myeloid leukemia with monocytic differentiation and chronic myelomonocytic leukemia.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, lymph node, appendix, colon, myeloid leukemia

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymph Node	297
Histiocytic and Dendritic Cell Neoplasms	313
Leukemia	314

## Reference

1. Gregory CD, et al. CD14 and apoptosis. *Apoptosis*. 1999; 4:11-20.
2. Wright SD, et al. CD14, a receptor for complexes of lipopolysaccharide (LPS) and LPS binding protein. *Science*. 1990; 249:1431-33.
3. Marmey B, et al. CD14 and CD169 expression in human lymph nodes and spleen: specific expansion of CD14+CD169- monocyte-derived cells in diffuse large B-cell lymphomas. *Hum Pathol*. 2006; 37:68-77.
4. Smeltzer JP, et al. Pattern of CD14+ Follicular Dendritic Cells and PD1+ T Cells Independently Predicts Time to Transformation in Follicular Lymphoma. *Clin Cancer Res*. 2014; 20:2862-72.
5. Rollins-Raval MA, et al. The value of immunohistochemistry for CD14, CD123, CD33, myeloperoxidase and CD68R in the diagnosis of acute and chronic myelomonocytic leukaemias. *Histopathology*. 2012; 60:933-42.

## Ordering Information

**CD14 (EPR3653)**

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	114R-14
0.5 mL concentrate	114R-15
1 mL concentrate	114R-16
1 mL predilute	114R-17
7 mL predilute	114R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD15

CD15 is a carbohydrate antigen with the common trisaccharide structure 3-fucosyl-N-acetyl-lactosamine, also known as Lewis x (Lex) or stage-specific embryonic antigen 1 (SSEA-1).<sup>1-3</sup> CD15 is expressed in myeloid cells and mediates neutrophil adhesion to dendritic cells.<sup>2-3</sup> CD15 is also expressed in Reed-Sternberg cells and is thus a useful marker for identifying Hodgkin lymphoma.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** Hodgkin lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Skin Adnexal Tumors	305
Hodgkin vs. Non-Hodgkin Lymphomas	314
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314

## Reference

1. Pellegrini W, et al. MMA monoclonal antibody is a superior anti-CD15 reagent for the diagnosis of classical Hodgkin lymphoma. *Haematologica*. 2007; 92:708-9.
2. Stocks SC, et al. Expression of the CD15 differentiation antigen (3-fucosyl-N-acetyl-lactosamine, LeX) on putative neutrophil adhesion molecules CR3 and NCA-160. *Biochem J*. 1990; 268: 275-80.
3. Gadhoun SZ, et al. CD15 expression in human myeloid cell differentiation is regulated by sialidase activity. *Nat Chem Biol*. 2008; 4:751-7.

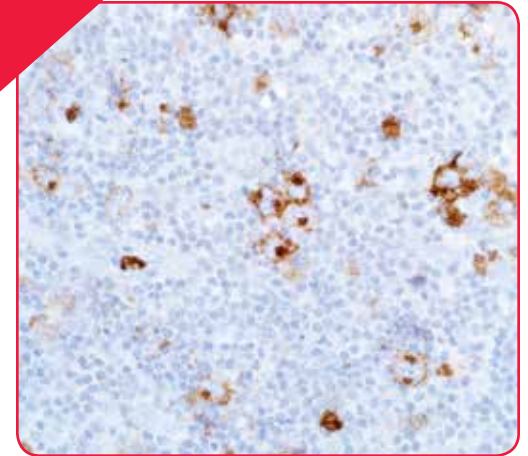
## Ordering Information

### CD15 (MMA)

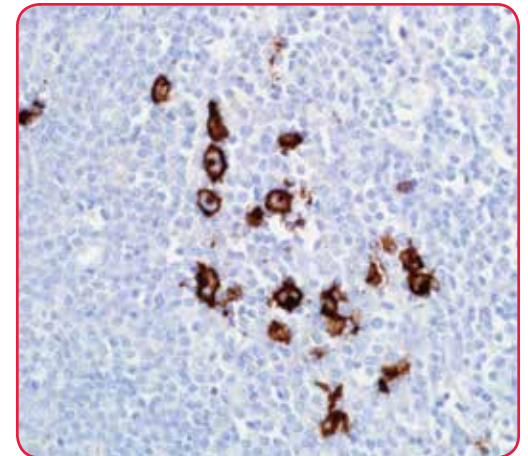
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	115M-15
1 mL concentrate	115M-16
1 mL predilute	115M-17
7 mL predilute	115M-18

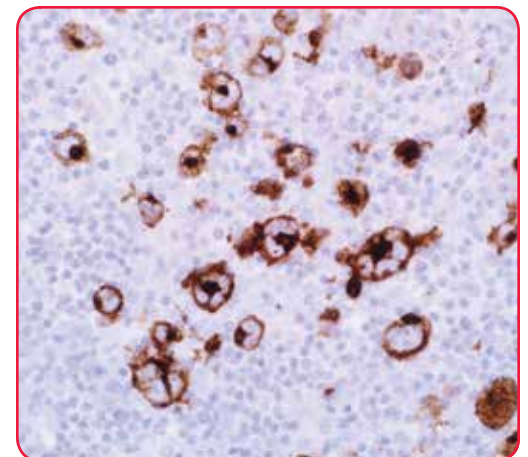
*Please contact your distributor for details on product availability and regulatory status in your country.*



Classic Hodgkin lymphoma

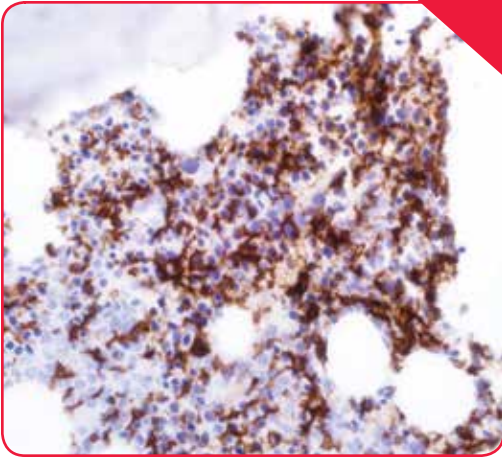


Classic Hodgkin lymphoma

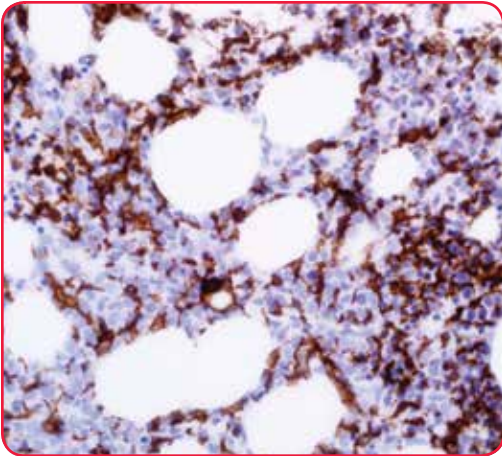


Classic Hodgkin lymphoma

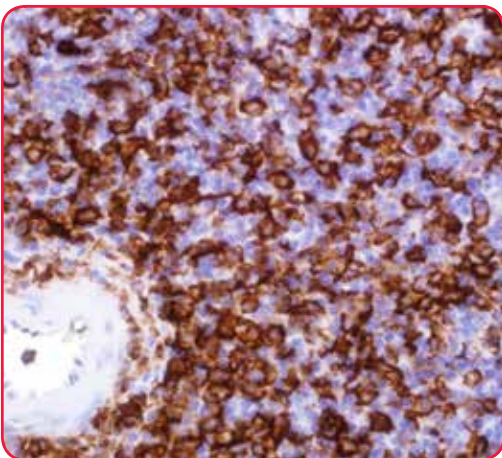
# CD16



Bone marrow, acute myeloid leukemia



Bone marrow



Natural killer T-cell lymphoma

CD16 is a receptor on monocytes and natural killer (NK) cells, which facilitates antibody-dependent cellular cytotoxicity.<sup>1</sup> CD16 is a useful marker in NK neoplasms and in certain T-cell neoplasms such as T-cell large granular lymphocytic leukemia.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Leukemia	314
NK Cell Leukemia/Lymphoma	316

## Reference

1. Liang X, et al. Natural killer cell neoplasms. *Cancer*. 2008; 112:1425-36.
2. Mandelboim O, et al. Human CD16 as a lysis receptor mediating direct natural killer cell cytotoxicity. *Proc Natl Acad Sci U S A*. 1999; 96:5640-4.

## Ordering Information

### CD16 (SP175)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	116R-14
0.5 mL concentrate	116R-15
1 mL concentrate	116R-16
1 mL predilute	116R-17
7 mL predilute	116R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD19

CD19 is present in both normal and malignant B-cells and has long been considered to be the most reliable surface marker of this lineage over a wide range of maturational stages. In normal lymphoid tissue, CD19 is observed in germinal centers, mantle zone cells, and scattered cells in the interfollicular areas. Anti-CD19 exhibits an overall immunoreactivity pattern similar to those of the antibodies against CD20 and CD22. However, in contrast to CD20, CD19 is also expressed in immature B-cells; although recent studies have described CD19 loss in a few B-cell neoplasms.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP169: IgG
- MRQ-36: IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Thyroid: Malignant vs. Benign	301
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316

## Reference

1. Kimura M, et al. Clinicopathologic significance of loss of CD19 expression in diffuse large B-cell lymphoma. *Int J Hematol.* 2007; 85:41-8.
2. Masir N, et al. Loss of CD19 expression in B-cell neoplasms. *Histopathology.* 2006; 48:239-46.
3. Greenberg SA, et al. Plasma cells in muscle in inclusion body myositis and polymyositis. *Neurology.* 2005; 65:1782-7.

## Ordering Information

**CD19 (EP169)**  
Rabbit Monoclonal  
Primary Antibody

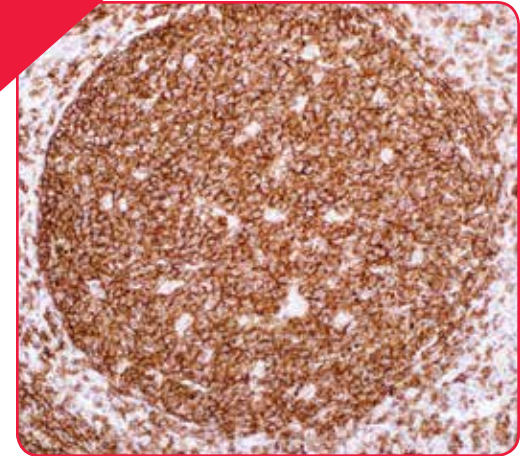


Volume	Part No.
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0.5 mL concentrate	119R-15
1 mL concentrate	119R-16
1 mL predilute	119R-17
7 mL predilute	119R-18

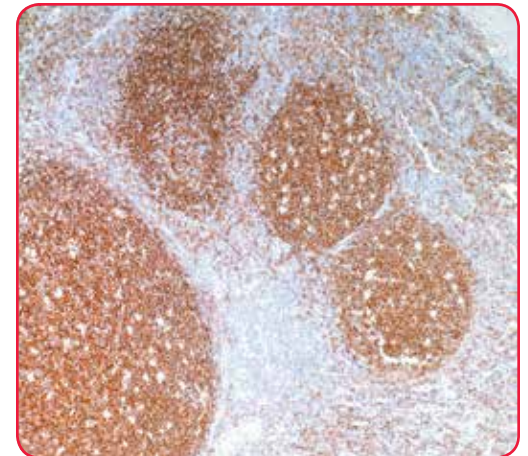
**CD19 (MRQ-36)**  
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	119M-15
1 mL concentrate	119M-16
1 mL predilute	119M-17
7 mL predilute	119M-18

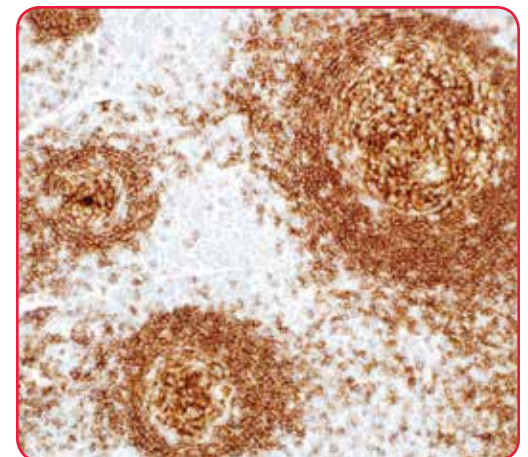
*Please contact your distributor for details on product availability and regulatory status in your country.*



Tonsil, germinal center

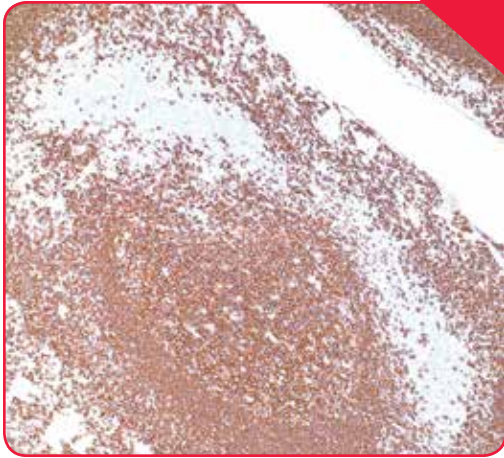


Tonsil, germinal centers

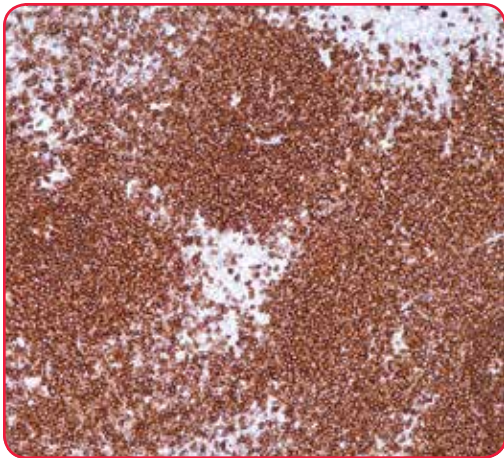


Tonsil

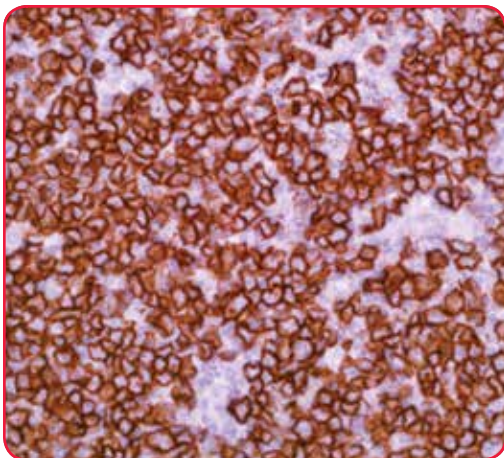
# CD20



Tonsil



Tonsil



Diffuse large B-cell lymphoma

CD20 is a transmembrane protein in late B-cell precursors and mature B-cells that plays a role in regulating proliferation and differentiation. CD20 expression is lost at the plasma cell stage of differentiation.<sup>1</sup> Anti-CD20 (pan B-cell)<sup>2</sup> has rarely been detected in T-cell malignancies, and is a dependable marker of B-cell lymphomas<sup>3</sup> such as DLBCL.<sup>4</sup> CD20 expression is present in some thymomas.

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- L26: IgG<sub>2a</sub>/k
- SP32: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
CD5 in B-cell Neoplasms	312
Histiocytic Lesions	313
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Mature B-cell and T-cell Neoplasms	315
Lymphomas and Myeloid Sarcoma	315
Mature B-cell Neoplasms	315
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316
Mature B-cell Neoplasms with Reduced CD20 Expression	316

## Reference

1. Tedder T, et al. CD20: a regulator of cell-cycle progression of B lymphocytes. *Immunol Today*. 1994; 15:450-4.
2. Mason DY, et al. Antibody L26 recognizes an intracellular epitope on the B-cell-associated CD20 antigen. *Am J Pathol*. 1990; 136:1215-22.
3. Norton AJ, et al. Monoclonal antibody L26: an antibody that is reactive with normal and neoplastic B lymphocytes in routinely fixed and paraffin wax embedded tissues. *J Clin Pathol*. 1987; 40:1405-12.
4. Suzuki Y, et al. Association of CD20 levels with clinicopathological parameters and its prognostic significance for patients with DLBCL. *Ann Hematol*. 2012; 91:997-1005.

## Ordering Information

### CD20 (L26)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	120M-84
0.5 mL concentrate	120M-85
1 mL concentrate	120M-86
1 mL predilute	120M-87
7 mL predilute	120M-88
25 mL predilute	120M-80

### CD20 (SP32)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	120R-14
0.5 mL concentrate	120R-15
1 mL concentrate	120R-16
1 mL predilute	120R-17
7 mL predilute	120R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD21

CD21 (also known as complement receptor 2 (CR2), C3d receptor, or EBV receptor) is a 140-kD membrane protein on B-lymphocytes to which the Epstein-Barr virus (EBV) binds during infection of these cells.<sup>1</sup> The antigen is absent on T-lymphocytes, monocytes, and granulocytes.<sup>2,3</sup>

Anti-CD21 is useful in the identification of follicular dendritic cell matrix found in normal lymph node and tonsillar tissue. This antibody also labels follicular dendritic cell sarcomas.<sup>2,4,5</sup> Anti-CD21 is valuable in differentiating follicular lymphoma with marginal zone differentiation from marginal zone lymphoma with follicular involvement. It also plays a role in distinguishing among nodular lymphocyte predominant Hodgkin lymphoma, lymphocyte-rich classic Hodgkin lymphoma, and T-cell/histiocyte-rich B-cell lymphoma in combination with other B-cell and T-cell markers.<sup>6</sup> Anti-CD21 is also useful in identifying abnormal follicular dendritic cell pattern in angioimmunoblastic T-cell lymphoma and follicular T-cell lymphoma.<sup>7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- 2G9: IgG<sub>2a</sub>
- EP3093: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymph Node	297
Histiocytic and Dendritic Cell Lesions	313, 320
Histiocytic and Dendritic Cell Neoplasms	313

## Reference

1. Cheuk W, et al. Am J Surg Pathol. 2001; 25:721-31.
2. Pileri SA, et al. Histopathology. 2002; 41:1-29.
3. Maeda K, et al. J Histochem Cytochem. 2002; 50:1475-1486.
4. Biddle DA, et al. Mod Pathol. 2002; 15:50-8.
5. Chan AC, et al. Histopathology. 2001; 38:510-8.
6. Chang KC, et al. J Pathol. 2003; 201:404-12.
7. Chuang SS, et al. Int J Hematol. 2010; 91:687-91.

## Ordering Information

### CD21 (2G9)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	121M-14
0.5 mL concentrate	121M-15
1 mL concentrate	121M-16
1 mL predilute	121M-17
7 mL predilute	121M-18

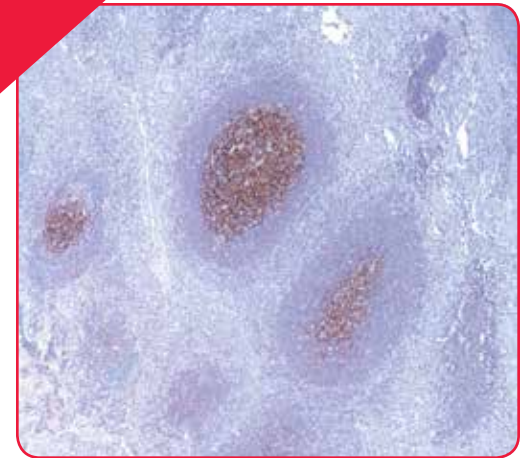
### CD21 (EP3093)

Rabbit Monoclonal  
Primary Antibody

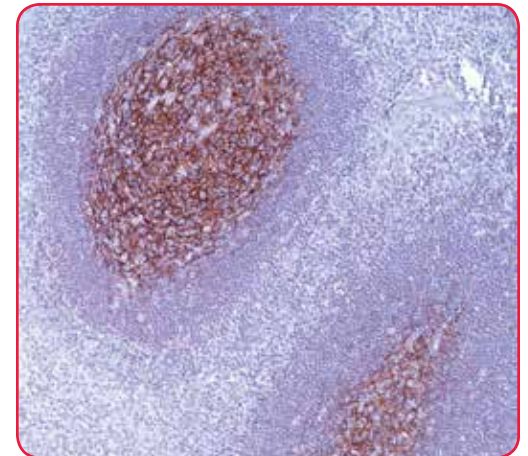


Volume	Part No.
0.1 mL concentrate	121R-14
0.5 mL concentrate	121R-15
1 mL concentrate	121R-16
1 mL predilute	121R-17
7 mL predilute	121R-18

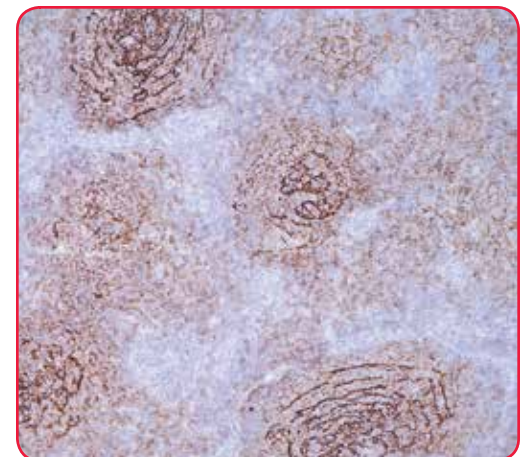
Please contact your distributor for details on product availability and regulatory status in your country.



Tonsil, germinal center follicular dendritic cells



Tonsil, germinal center follicular dendritic cells



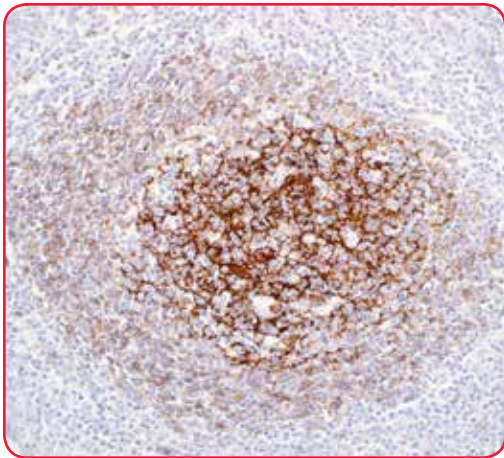
Tonsil



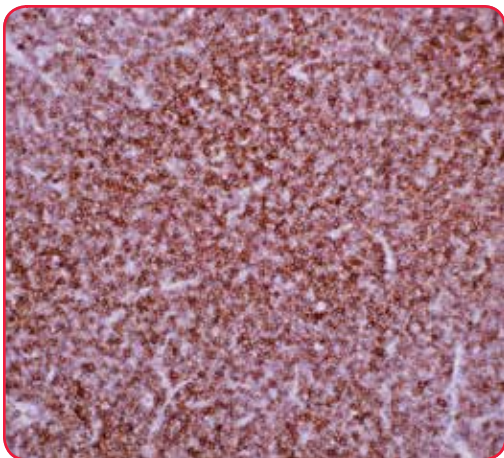
# CD23



Tonsil, germinal center follicular dendritic cells



Tonsil, germinal center follicular dendritic cells



Small lymphocytic lymphoma

CD23 antigen is a 45-60-kD membrane glycoprotein identified as a low affinity receptor for IgE production as well as a receptor for lymphocyte growth factor.<sup>1</sup> CD23 is found in some mature B-cell lymphomas and in Reed-Sternberg cells in Hodgkin disease.<sup>2</sup> Follicular dendritic cells and some activated B-cells within germinal centers express CD23 in high density and mantle zone B-cells are stained.<sup>3</sup> The majority of chronic lymphocytic leukemias/small lymphocytic lymphomas are anti-CD23 positive, whereas mantle cell lymphomas are generally negative, so this marker is useful when applied with other markers to separate the small cell lymphomas.<sup>1,3</sup> Precursor B and T lymphomas, myeloid neoplasms, and mature T-cell lymphomas are CD23 negative and other small cell lymphomas are occasionally positive.<sup>4</sup> Anti-CD23 is expressed in activated mature B-cells expressing IgM or IgD, monocytes/macrophages, follicular dendritic cells, T-cell subsets, eosinophils, Langerhans cells and small lymphocytic lymphoma/chronic lymphocytic leukemia.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, lymph node, chronic lymphocytic leukemia/small lymphocytic lymphoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- 1B12: IgG<sub>1</sub>/k
- EP75: IgG
- MRQ-57: IgG<sub>2a</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
CD5 in B-cell Neoplasms	312
Histiocytic and Dendritic Cell Lesions	313, 320
Mature B-cell Neoplasms	315
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Fournier S, et al. CD23 antigen regulation and signaling in chronic lymphocytic leukemia. *J Clin. Invest.* 1992; 89:1312-21.
2. Rowlands DC, et al. Immunohistochemical determination of CD23 expression in Hodgkin disease using paraffin sections. *J Pathol.* 1990; 160:239-43.
3. DiRaimondo F, et al. The clinical and diagnostic relevance of CD23 expression in the chronic lymphoproliferative disease. *Cancer.* 2002; 94:1721-30.

For the complete list of references see the product IFU.

## Ordering Information

### CD23 (1B12)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	123M-14
0.5 mL concentrate	123M-15
1 mL concentrate	123M-16
1 mL predilute	123M-17
7 mL predilute	123M-18

### CD23 (EP75)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	123R-24
0.5 mL concentrate	123R-25
1 mL concentrate	123R-26
1 mL predilute	123R-27
7 mL predilute	123R-28

### CD23 (MRQ-57)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	123M-24
0.5 mL concentrate	123M-25
1 mL concentrate	123M-26
1 mL predilute	123M-27
7 mL predilute	123M-28

Alternate Clones Available

- CD23 (SP23) Rabbit Monoclonal Antibody
- Contact us for more information.

Please contact your distributor for details on product availability and regulatory status in your country.

# CD25

CD25, Interleukin-2 receptor alpha chain, is the alpha subunit of the cell surface receptor which regulates regulatory T-cells.<sup>1</sup> CD25 has been detected in various hematological malignancies including adult T-cell leukemia/lymphoma, and hairy cell leukemia.<sup>2-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** lesions of mastocytosis

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312
Mastocytosis	315
T-cell Lymphomas	317

## Reference

1. Létourneau S, et al. IL-2- and CD25-dependent immunoregulatory mechanisms in the homeostasis of T-cell subsets. *Clin Immunol.* 2009; 123:758-62.
2. De Toter D, et al. Expression of the IL2 receptor alpha, beta and gamma chains in hairy cell leukemia. *Leuk Lymphoma.* 1994; 104:412-9.
3. Qayyum S, et al. Adult T-Cell Leukemia/ Lymphoma. *Archives of Pathology & Lab Med.* 2014; 138:282-6.

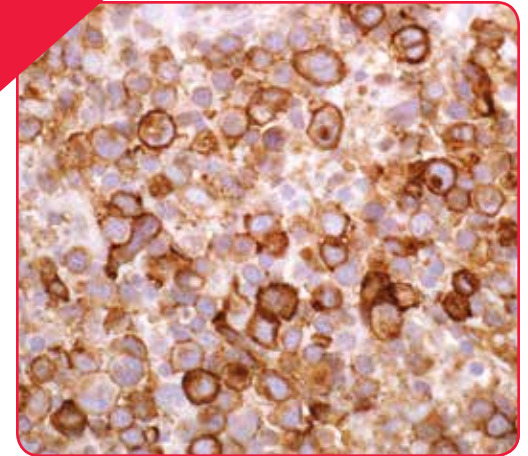
## Ordering Information

### CD25 (4C9)

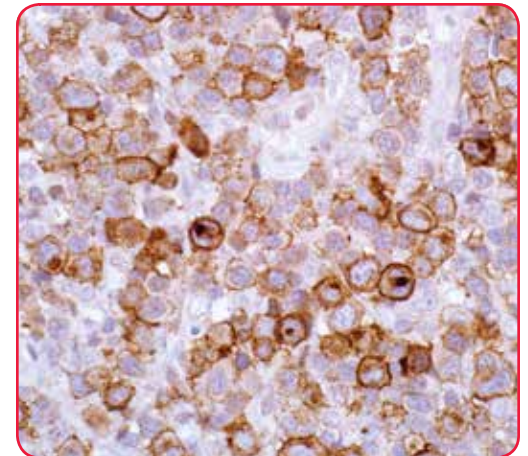
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	125M-14
0.5 mL concentrate	125M-15
1 mL concentrate	125M-16
1 mL predilute	125M-17
7 mL predilute	125M-18

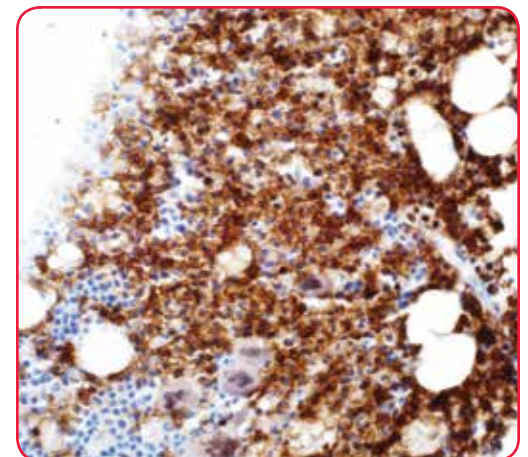
*Please contact your distributor for details on product availability and regulatory status in your country.*



Adult T-cell lymphoma/leukemia

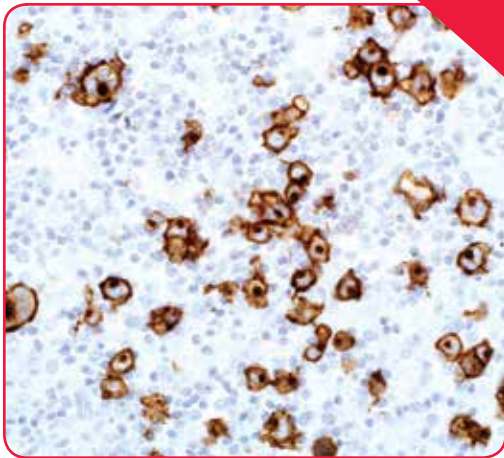


Adult T-cell lymphoma/leukemia

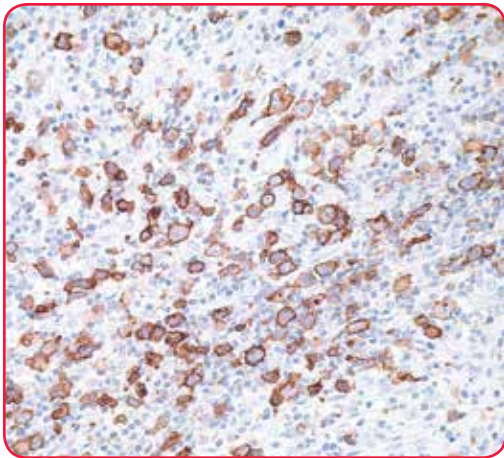


Bone marrow

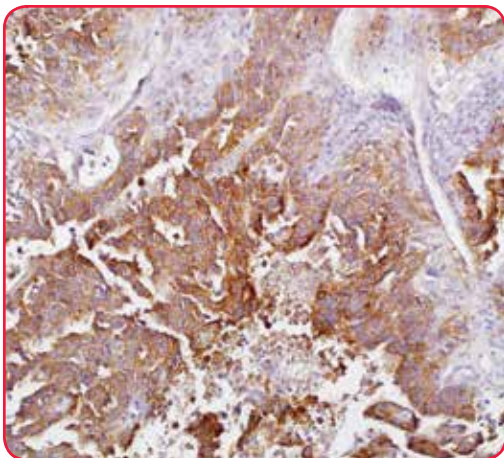
# CD30



Classic Hodgkin lymphoma, Reed-Sternberg cells



Lymph node, anaplastic large cell lymphoma



Ovary, embryonal carcinoma

Anti-CD30 detects a formalin-resistant epitope that is expressed by Reed-Sternberg cells in classic Hodgkin lymphoma, the majority of anaplastic large cell lymphomas (ALCL), primary cutaneous CD30 positive T-cell lymphoproliferative disorders,<sup>1-3</sup> and in embryonal carcinomas.<sup>4</sup> Occasionally diffuse large B-cell lymphoma stains with this antibody.<sup>3</sup> This antibody also stains plasma cells in paraffin-embedded tissue as well as reactive immunoblasts. The staining pattern of anti-CD30 in lymphoma and embryonal carcinoma is different, with the former being membranous and exhibiting Golgi zone accentuation in location, and the latter being membranous only.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** classic Hodgkin lymphoma, lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314
Hodgkin vs. Non-Hodgkin Lymphomas	314
Mature B-cell Neoplasms with Reduced CD20 Expression	316

## Reference

1. Swarting R, et al. BER-H2: a new anti-Ki-1 (CD30) monoclonal antibody directed at a formalin-resistant epitope. *Blood*. 1989; 74:1678-89.
2. George DH, et al. Primary anaplastic large cell lymphoma of the central nervous system: prognostic effect of ALK-1 expression. *Am J Surg Pathol*. 2003; 27:487-93.
3. Hedvat CV, et al. Application of tissue microarray technology to the study of non-Hodgkin and Hodgkin Lymphoma. *Hum Pathol*. 2002; 33:968-74.
4. Dabbs DJ. *Diagnostic Immunohistochemistry Theranostic and Genomic Applications*. 4th Edition Saunders Elsevier. 2014; p.702.

## Ordering Information

### CD30 (Ber-H2)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	130M-94
0.5 mL concentrate	130M-95
1 mL concentrate	130M-96
1 mL predilute	130M-97
7 mL predilute	130M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD31

CD31 has cytoplasmic, membranous expression in non-neoplastic and neoplastic vascular endothelial cells.<sup>1</sup> It has been used as a tool to identify the vascular origin of neoplasms such as angiosarcomas, Kaposi sarcomas and epithelioid hemangioendothelioma.<sup>1,2</sup> Immunohistochemical study with CD31 has also been shown useful to detect areas of tumor lymphovascular invasion.<sup>3</sup> Additionally, detection of weak diffuse cytoplasmic CD31 immunoreactivity has been seen in cases of various carcinomas with occasional membranous staining in ductal carcinomas of the breast as well as in intratumoral macrophages.<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP78: IgG
- JC70: IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology  
Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Skin: Spindle Cell Tissues and Tumors	306, 307
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324

## Reference

1. Parums DV, et al. JC70: a new monoclonal antibody that detects vascular endothelium associated antigen on routinely processed tissue sections. *J Clin Pathol.* 1990; 43:752-7.
2. Attanoos RL, et al. Malignant vascular tumors of the pleura in "asbestos" workers and endothelial differentiation in malignant mesothelioma. *Thorax.* 2000; 55:860-3.
3. Alexander-Sefre F, et al. Detection of tumour lymphovascular space invasion using dual cytokeratin and CD31 immunohistochemistry. *J Clin Pathol.* 2003; 56:786-8.
4. Ortiz-Hidalgo C, et al. CD31 with strong membrane-based immunoreactivity in ductal carcinoma of the breast. *Appl Immunohistochem Mol Morphol.* 2000; 8:334-5.
5. McKenney JK, et al. CD 31 expression in intratumoral macrophages: a potential diagnostic pitfall. *Am J of Surg Pathol.* 2001; 25:1167-73.

## Ordering Information

**CD31 (EP78)**  
Rabbit Monoclonal  
Primary Antibody

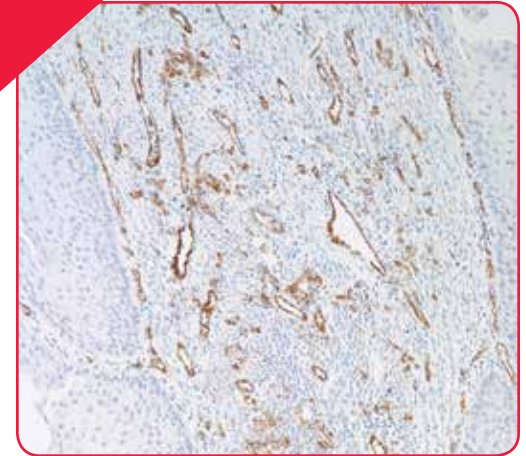


Volume	Part No.
0.1 mL concentrate	131R-24
0.5 mL concentrate	131R-25
1 mL concentrate	131R-26
1 mL predilute	131R-27
7 mL predilute	131R-28

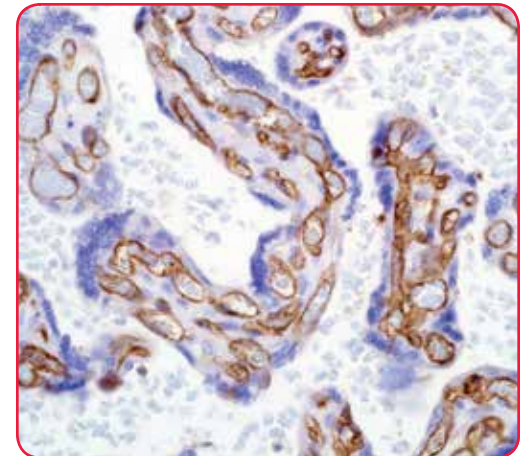
**CD31 (JC70)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	131M-94
0.5 mL concentrate	131M-95
1 mL concentrate	131M-96
1 mL predilute	131M-97
7 mL predilute	131M-98

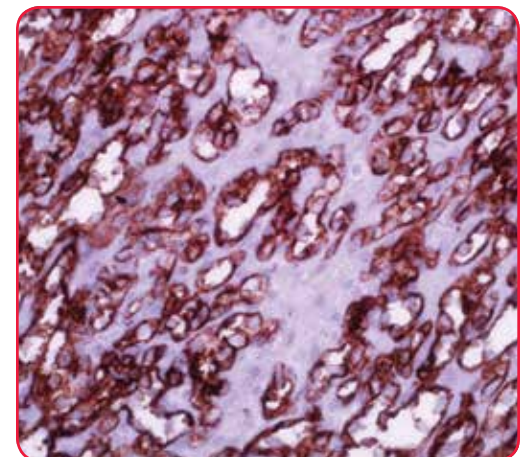
*Please contact your distributor for details on product availability and regulatory status in your country.*



Tonsil

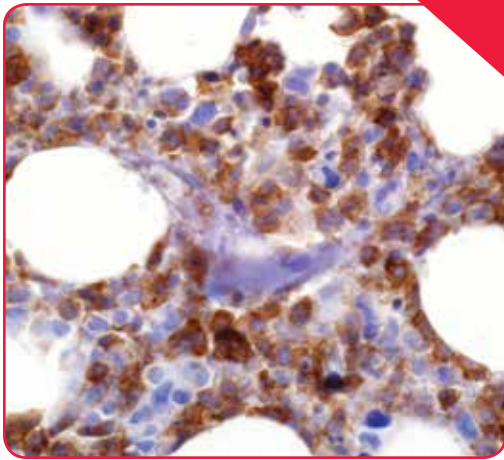


Placenta

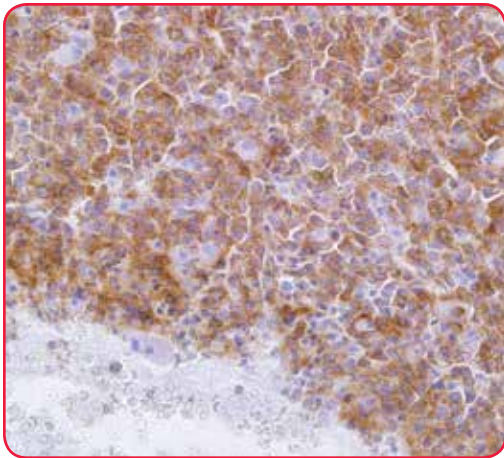


Hepatic hemangioendothelioma

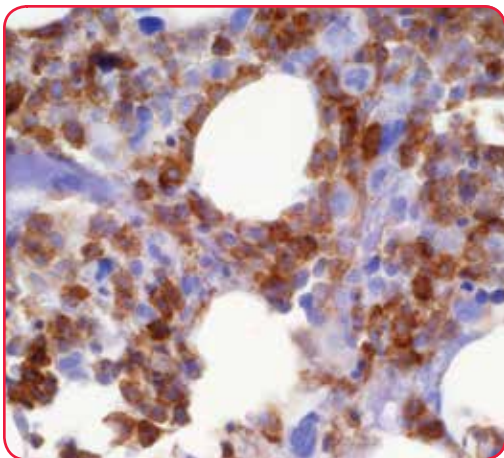
# CD33



Acute myelomonocytic leukemia



Acute myelomonocytic leukemia



Bone marrow

CD33, also known as gp67 or SIGLEC-3, is a 67-kD glycosylated transmembrane protein that is a member of the sialic acid-binding immunoglobulin-like lectin (siglec) family.<sup>1-3</sup> Although the precise physiological function of CD33 is unknown, it may mediate cell to cell adhesion and modulate inflammatory and immune response.<sup>1-3</sup> In normal tissue, anti-CD33 labels myeloid cells (especially myeloid precursors), liver Kupffer cells, lung alveolar macrophages, and placental syncytiotrophoblasts.<sup>2,3</sup> In neoplastic tissue, anti-CD33 is useful for the identification of acute myeloid leukemia.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** acute myeloid leukemia with monocytic differentiation or with minimal differentiation, placenta syncytiotrophoblasts

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Leukemia	314

## Reference

1. Freeman SD, et al. Characterization of CD33 as a new member of the sialoadhesin family of cellular interaction molecules. *Blood*. 1995; 85:2005-12.
2. Hoyer JD, et al. CD33 detection by immunohistochemistry in paraffin-embedded tissues: a new antibody shows excellent specificity and sensitivity for cells of myelomonocytic lineage. *Am J Clin Pathol*. 2008; 129:316-23.
3. Laszlo GS, et al. Expression and functional characterization of CD33 transcript variants in human acute myeloid leukemia. *Oncotarget*. 2016; 7:43281-94.

## Ordering Information

### CD33 (PWS44)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	133M-14
0.5 mL concentrate	133M-15
1 mL concentrate	133M-16
1 mL predilute	133M-17
7 mL predilute	133M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD34

CD34 is a cell surface glycoprophosphoprotein expressed on human hematopoietic progenitor cells, vascular endothelial cells, and embryonic fibroblasts.<sup>1</sup> The exact function of CD34 has not yet been determined, though studies have found it may enhance proliferation and block differentiation of stem or progenitor cells, and promote lymphocyte adhesion to vascular endothelium in lymphoid tissues.<sup>2</sup> CD34 expression has also been observed in some gastrointestinal stromal tumors (GIST).<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, placenta

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP88: IgG
- QBEnd/10: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Carcinomas and Sarcomas with Epithelioid Morphology (Features)	293
Epithelioid Cell Neoplasms	296
Liver: Malignant vs. Benign	297
Identification of Meningiomas from Histologic Mimics	296
Spindle Cell Tumors	300
Spindle Cell Lesions	300
Cutaneous Neoplasms	304
Skin: DFSP vs. DF-FH	306
Skin: Spindle Cell Tissues and Tumors	306, 307
GIST Mutation vs. Wild Type	307
Leukemia	314
Splenic Hematopoietic Proliferations in Neoplastic and Benign Disorders	317
Meningeal Solitary Fibrous Tumor (SFT)	318
Thoracic SFT vs. Potential Mimics	320
Kidney, Urothelial, and Soft Tissue Neoplasms	321
Soft Tissue Neoplasms	322
Soft Tissue Tumors	322, 323
SFT vs. Other Soft Tissue Tumors	323
Vascular Tumors	324

## Ordering Information

### CD34 (EP88)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	134R-14
0.5 mL concentrate	134R-15
1 mL concentrate	134R-16
1 mL predilute	134R-17
7 mL predilute	134R-18

### CD34 (QBEnd/10)

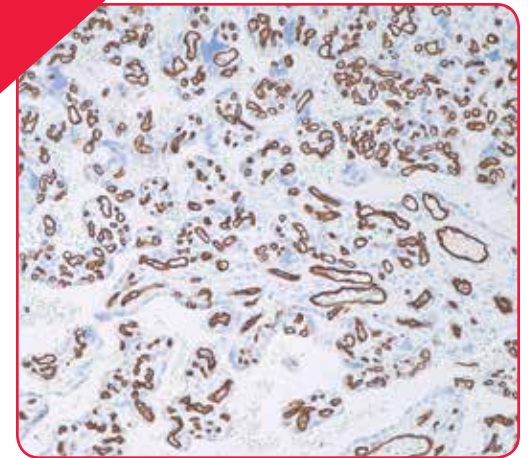
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	134M-15
1 mL concentrate	134M-16
1 mL predilute	134M-17
7 mL predilute	134M-18

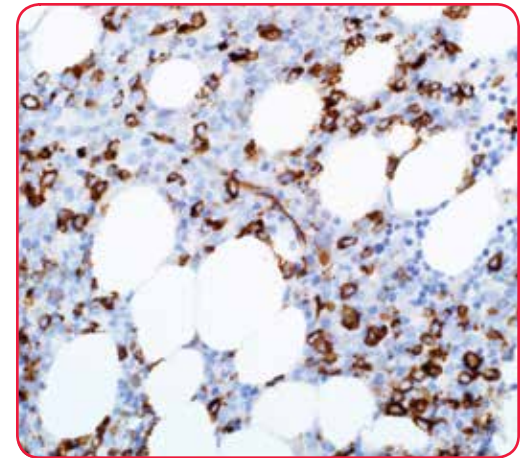
Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

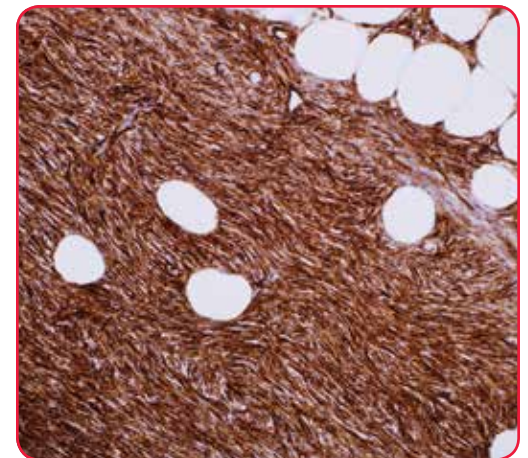
1. Torlakovic G, et al. CD34/QBEND10 immunostaining in the bone marrow trephine biopsy: a study of CD34-positive mononuclear cells and megakaryocytes. Arch Pathol Lab Med. 2002; 126:823-8.
2. Nielsen JS, et al. Novel functions of the CD34 family. J Cell Sci. 2008; 121: 3683-92.
3. Kisluk J, et al. Immunohistochemical diagnosis of gastrointestinal stromal tumors - an analysis of 80 cases from 2004 to 2010. Adv. Clin Exp Med. 2013; 22:33-9.



Placenta

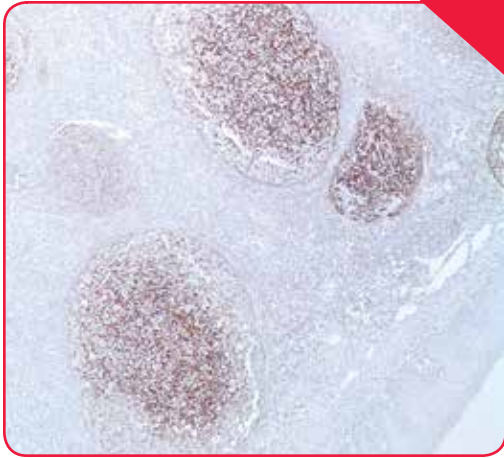


Acute monoblastic leukemia

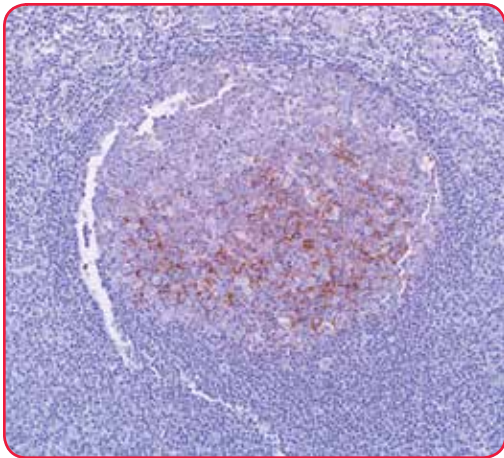


Subcutis, dermatofibrosarcoma protuberans

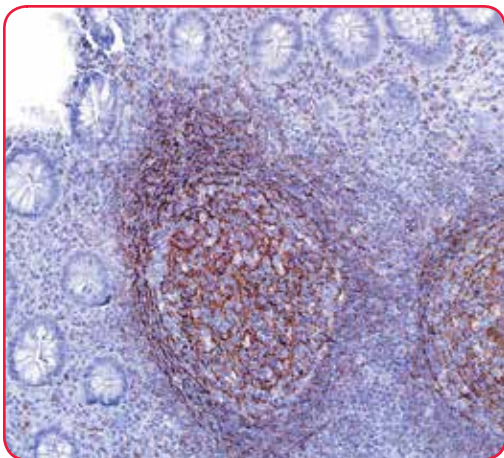
# CD35



Tonsil



Tonsil



Appendix

CD35, complement receptor 1, is a cell membrane-bound, monomeric glycoprotein on numerous cell types including erythrocytes, leukocytes, glomerular podocytes, and follicular dendritic cells. The primary function of CD35 is to serve as the cellular receptor for C3b and C4b, the most important components of the complement system leading to clearance of foreign macromolecules. The Knops blood group system is a system of antigens located on this protein. The protein mediates cellular binding to particles and immune complexes that have activated complement. Follicular dendritic cells (FDC) are restricted to the B-cell regions of secondary lymphoid follicles. CD35 antigen is found on erythrocytes, B cells, a subset of T cells, monocytes, as well as eosinophils, and neutrophils. Anti-CD35 is considered a mature B-cell marker which labels follicular dendritic reticulum cells and tumors derived from such cells such as follicular dendritic cell tumor/sarcoma.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP197: IgG
- RLB25: IgG<sub>2b</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymph Node	297
Histiocytic and Dendritic Cell Lesions	313, 320
Histiocytic and Dendritic Cell Neoplasms	313

## Reference

1. Dillon KM, et al. Mediastinal mixed dendritic cell sarcoma with hybrid features. *J Clin Pathol.* 2002; 55:791-4.
2. Pileri SA, et al. Tumours of histiocytes and accessory dendritic cells: an immunohistochemical approach to classification from the International Lymphoma Study Group based on 61 cases. *Histopathology.* 2002; 41:1-29.
3. Maeda K, et al. Immunohistochemical recognition of human follicular dendritic cells (FDCs) in routinely processed paraffin sections. *J Histochem Cytochem.* 2002; 50:1475-86.
4. Biddle DA, et al. Extranodal follicular dendritic cell sarcoma of the head and neck region: three new cases, with a review of the literature. *Mod Pathol* 2002; 15:50-8.
5. Cheuk W, et al. Inflammatory pseudotumor-like follicular dendritic cell tumor: a distinctive low-grade malignant intra-abdominal neoplasm with consistent Epstein-Barr virus association. *Am J Surg Pathol.* 2001; 25:721-31.
6. Chang KC, et al. Germinal centre-like versus undifferentiated stromal immunophenotypes in follicular lymphoma. *J Pathol.* 2003; 201:404-12.

## Ordering Information

### CD35 (EP197)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	135R-14
0.5 mL concentrate	135R-15
1 mL concentrate	135R-16
1 mL predilute	135R-17
7 mL predilute	135R-18

### CD35 (RLB25)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	135M-14
0.5 mL concentrate	135M-15
1 mL concentrate	135M-16
1 mL predilute	135M-17
7 mL predilute	135M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD38

CD38 molecule is a 46-kD type II transmembrane glycoprotein with a short N-terminal cytoplasmic tail (20 amino acids) and a long extracellular domain (256 amino acids). CD38 is expressed at low or moderate levels on various hematopoietic cells and in some solid tissues.<sup>1-3</sup> CD38 is one of the early markers of mature naive B-cell activation and it is useful in classifying functional mature B-lymphocyte subsets.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** plasma cell myeloma, plasma cells, lymph node, bone marrow

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
c-Myc in Diffuse Large B-cell Lymphoma (DLBCL)	312
Leukemia	314
Mature B-cell Neoplasms with Reduced CD20 Expression	316

## Reference

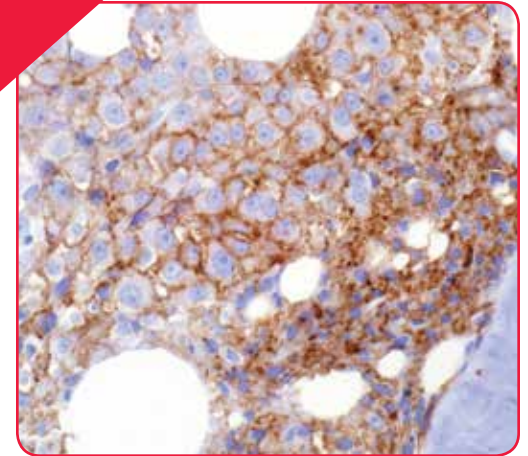
1. Martin F et al. Marginal-zone B cells. *Nat Rev Immunol.* 2002; 2:323-35.
2. Dono M, et al. Heterogeneity of tonsillar subepithelial B lymphocytes, the splenic marginal zone equivalents. *J Immunol.* 2000; 164:5596-5604.
3. Malavasi F, et al. Evolution and function of the ADP ribosyl cyclase/CD38 gene family in physiology and pathology. *Physiol Rev.* 2008; 88:841-86.

## Ordering Information

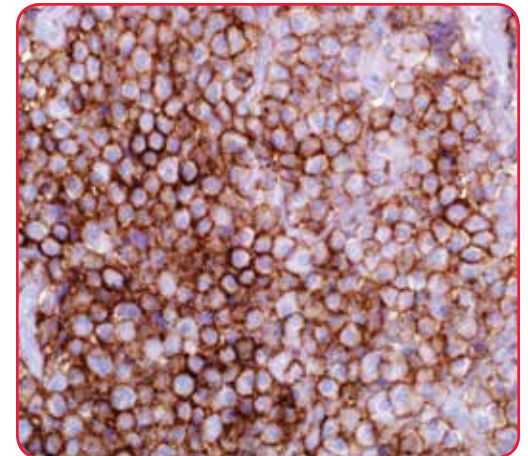
**CD38 (SP149)**  
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	118R-14
0.5 mL concentrate	118R-15
1 mL concentrate	118R-16
1 mL predilute	118R-17
7 mL predilute	118R-18

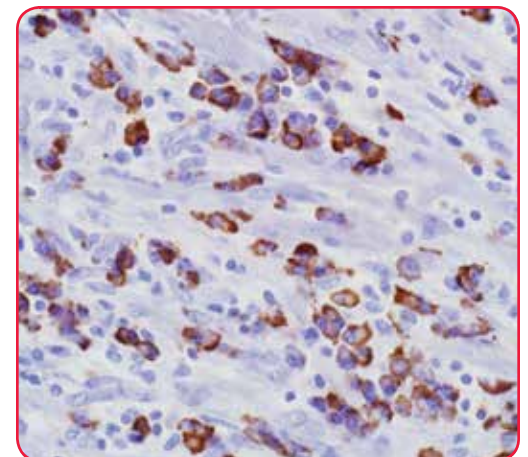
*Please contact your distributor for details on product availability and regulatory status in your country.*



Plasma cell myeloma



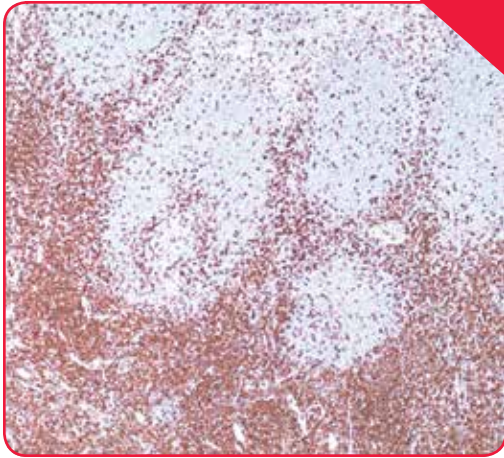
Plasma cell myeloma



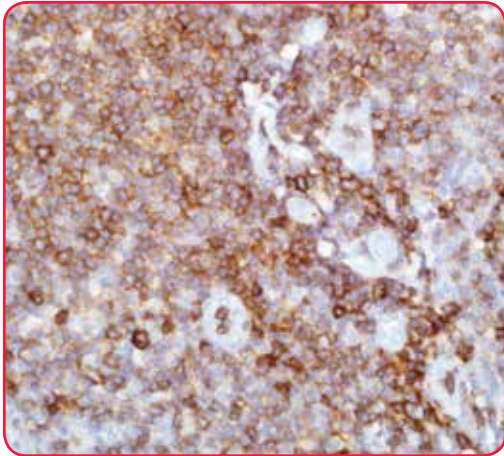
Soft tissue, plasma cells



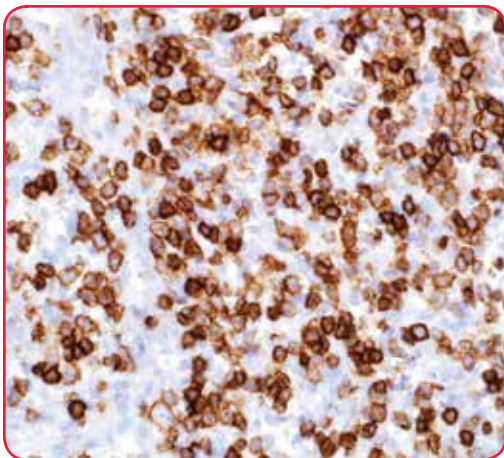
# CD43



Tonsil



Tonsil



Spleen

CD43 is a transmembrane protein involved in immune function and T-cell activation. Anti-CD43 reactivity is seen in T lymphocytes, monocytes, and granulocytes. No reactivity has been observed in normal or reactive B-cells. Reportedly, anti-CD43 reactivity is seen in the majority of T-cell lymphomas and some low grade B-cell lymphomas. Therefore, anti-CD43 is a useful immunohistochemical marker for the identification of T-cell lymphomas and some low grade B-cell lymphomas.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Lymphomas and Myeloid Sarcoma	315
Mature B-cell and T-cell Neoplasms	315
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316

## Reference

1. Leong AS-Y, et al. Manual of diagnostic antibodies for immunohistochemistry. 2nd edition. Greenwich Medical Media. London. 2003.
2. Dabbs DJ. Diagnostic Immunohistochemistry. Third Edition. Saunders. 2006.

## Ordering Information

### CD43 (MT1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	143M-14
0.5 mL concentrate	143M-15
1 mL concentrate	143M-16
1 mL predilute	143M-17
7 mL predilute	143M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD44

The CD44 family of glycoproteins exists in a number of variant isoforms, the most common being the standard 85-95-kD or hematopoietic variant (CD44s) that is found in mesodermal cells such as hematopoietic, fibroblastic, and glial cells, as well as in some carcinoma cell lines.<sup>1</sup> Higher molecular weight isoforms have been described in epithelial cells (CD44v) and are thought to function in intercellular adhesion and stromal binding.<sup>1</sup> While many human tumors express CD44, a positive correlation between CD44v expression and tumor dedifferentiation has been demonstrated.<sup>2-4</sup> Anti-CD44 may be useful in discrimination of urothelial carcinoma *in situ* from non-neoplastic changes in the urothelium.<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** benign urothelium

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

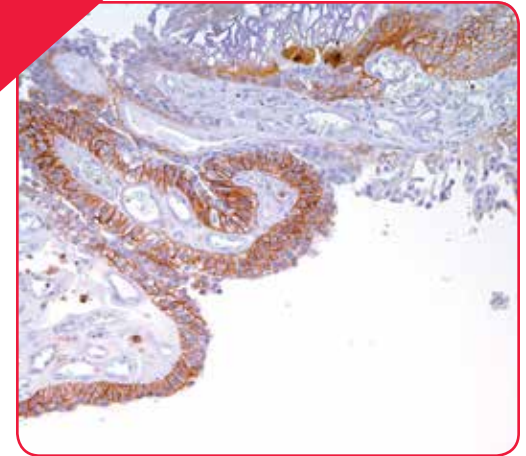
Hematopathology

## Associated Grids

Grid	Page No.
Bladder Urothelium: Dysplasia vs. Reactive Changes	308
c-Myc in Diffuse Large B-cell Lymphoma (DLBCL)	312

## Reference

1. Hudson D, et al. Altered expression of CD44 isoforms in squamous-cell carcinomas and cell lines derived from them. *Int J Cancer*. 1996; 66:457-63.
2. East JA, et al. CD44 and its role in tumor progression and metastasis. *Eur J Cancer*. 1993; 29A:1921-2.
3. Gadalla HA, et al. Expression of CD44 protein in bilharzial and non-bilharzial bladder cancers. *BJU Int*. 2004; 93:151-5.
4. McKenney JK, et al. Discriminatory immunohistochemical staining of urothelial carcinoma *in situ* and non-neoplastic urothelium: an analysis of cytokeratin 20, p53, and CD44 antigens. *Am J Surg Pathol*. 2001; 25:1074-8.
5. Lopez-Beltran A, et al. Urothelial dysplasia of the bladder: diagnostic features and clinical significance. *Anal Quant Cytopathol Histopathol*. 2013; 35:121-9.



Urinary bladder

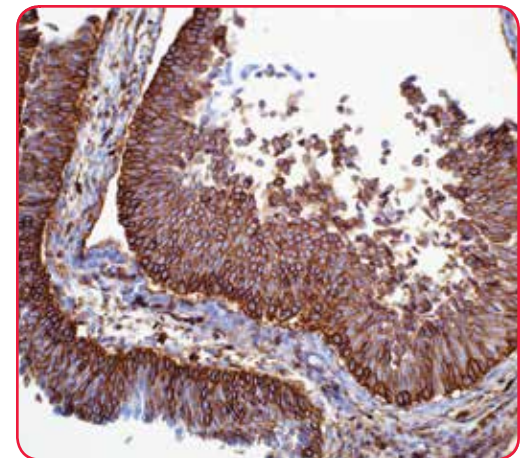
## Ordering Information

### CD44 (MRQ-13)

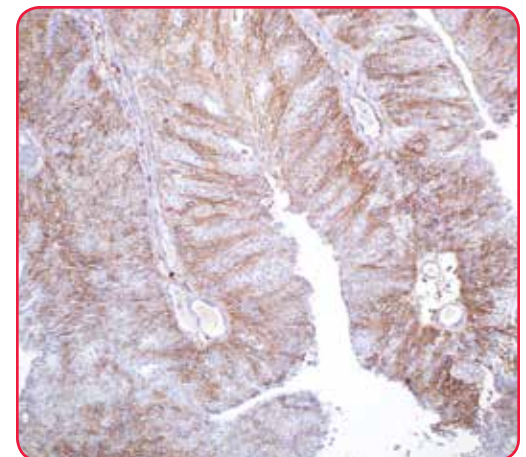
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	144M-94
0.5 mL concentrate	144M-95
1 mL concentrate	144M-96
1 mL predilute	144M-97
7 mL predilute	144M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*



Low-grade urothelial carcinoma

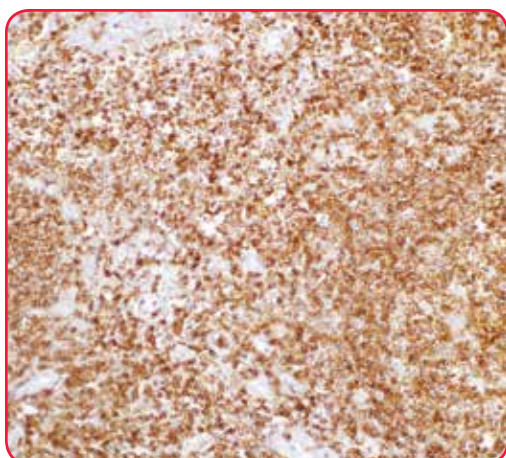


Low-grade papillary urothelial cell carcinoma

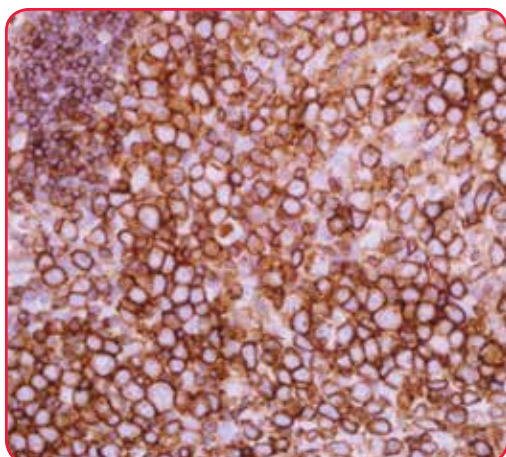
# CD45 (LCA)



Tonsil



Tonsil



Hodgkin lymphoma cells

Anti-CD45 (anti-leukocyte common antigen) is routinely used to aid the differential diagnosis of undifferentiated neoplasms, whenever malignant lymphoma is suspected by the morphological or clinical data. It is a highly specific antibody; therefore a positive result is highly indicative of hematolymphoid origin. Certain types of hematolymphoid neoplasms may lack CD45 (most of classic Hodgkin lymphomas, some T-cell lymphomas, and some leukemias) so its absence does not rule out a hematolymphoid tumor. This antibody is expressed almost exclusively by cells of hematopoietic lineage and is present in most benign and malignant lymphocytes as well as plasma cell precursors.<sup>1-8</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** membranous  
**Control** tonsil, lymph node, lymphoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

LCA  
Leukocyte Common Antigen

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors	305
B-cell Lymphomas	311
Histiocytic Lesions	313
Hodgkin vs. Non-Hodgkin Lymphomas	314
Mature B-cell Neoplasms with Reduced CD20 Expression	316
T-cell Lymphomas	317
Neuroblastoma vs. Other Small Round Cell Tumors	321
Small Blue Round Cell Tumors	322

## Reference

1. Mason DY. Am J Pathol. 1987; 128:1-4.
2. Hall PA, et al. Histopathology. 1988; 13:149-160.
3. Kurtin PJ, et al. Hum Path. 1985; 16:353-365.
4. Maluf HM, et al. Mod Pathol. 1995; 8:155-9.
5. Caballero T, et al. J Clin Pathol. 1995; 48:743-8.

For the complete list of references see the product IFU.

## Ordering Information

**CD45 (LCA) (2B11 & PD7/26)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	145M-94
0.5 mL concentrate	145M-95
1 mL concentrate	145M-96
1 mL predilute	145M-97
7 mL predilute	145M-98
25 mL predilute	145M-90

Please contact your distributor for details on product availability and regulatory status in your country.

# CD45R

CD45R, also named MB1, is the isoform of CD45, the protein encoded by this gene is a member of the protein tyrosine phosphatase (PTP) family. PTPs are known to be signaling molecules that regulate a variety of cellular processes including cell growth, differentiation, mitotic cycle, and oncogenic transformation. CD45R is expressed in hematopoietic cells and has been shown to be an essential regulator of T- and B-cell antigen receptor signaling. CD45R immunohistochemical reactivity is reportedly seen in most B-lymphocytes such as follicle center cells, mantle cells, some medullary thymocytes, post-thymic naïve T-lymphocytes, and B-cell lymphomas.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** lymph node, tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Mature B-cell and T-cell Neoplasms	315

## Reference

1. Hall PA, et al. Demonstration of lymphoid antigens in decalcified bone marrow trephines. *J Clin Pathol.* 1987; 40:870-3.
2. Myskow MW, et al. Paraffin section immunophenotyping of non-Hodgkin lymphoma, using a panel of monoclonal antibodies. *Am J Clin Pathol.* 1988; 90:564-74.
3. Poppema S, et al. Monoclonal antibodies (MT1, MT2, MB1, MB2, MB3) reactive with leukocyte subsets in paraffin-embedded tissue sections. *Am J of Pathology.* 1987. 127:418-29.
4. Lauritzen AF, et al. Use of monoclonal antibodies for the typing of malignant lymphomas in routinely processed biopsy samples. *APMIS.* 1991; 99:631-9.
5. Sott CS, et al. Variant CD45R expression with autosomal dominant inheritance affects both helper/inducer (CD4+) and suppressor/cytotoxic (CD8+) T cell populations. *Clin Exp Immunol.* 1991; 86:500-5.
6. Master PS, et al. Patterns of membrane CD45 isoform expression by leukaemic blasts and normal mature myeloid cells. *Int J Hematol.* 1992; 55:235-42.

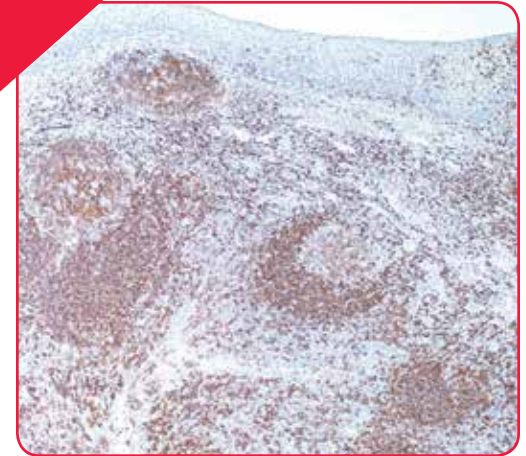
## Ordering Information

### CD45R (MB1)

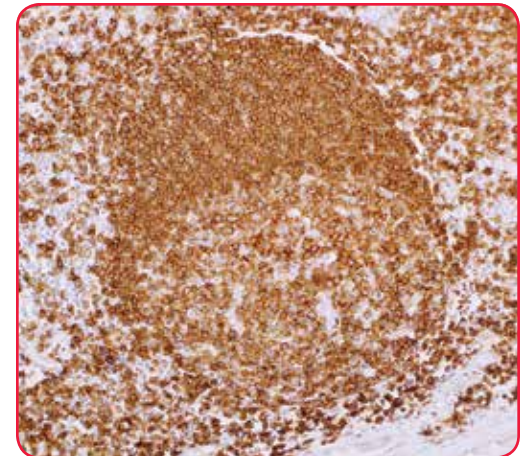
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	146M-14
0.5 mL concentrate	146M-15
1 mL concentrate	146M-16
1 mL predilute	146M-17
7 mL predilute	146M-18

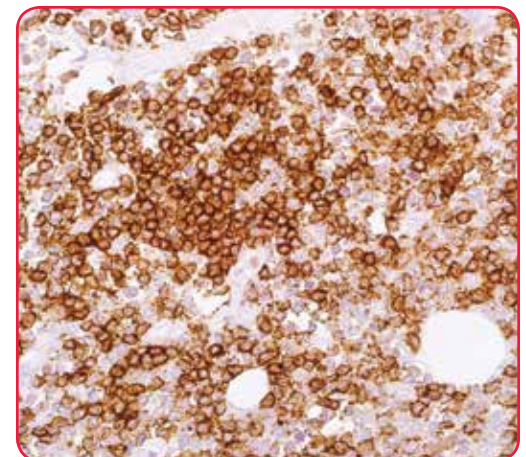
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Tonsil

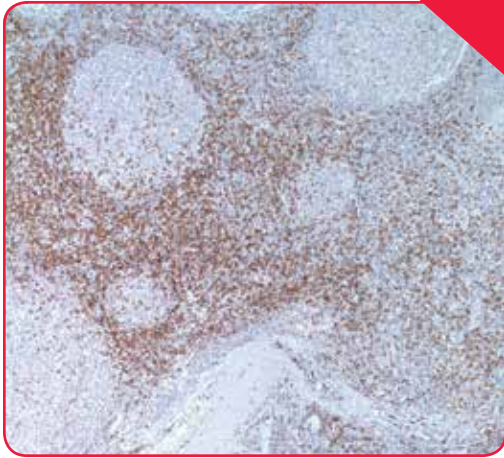


Tonsil

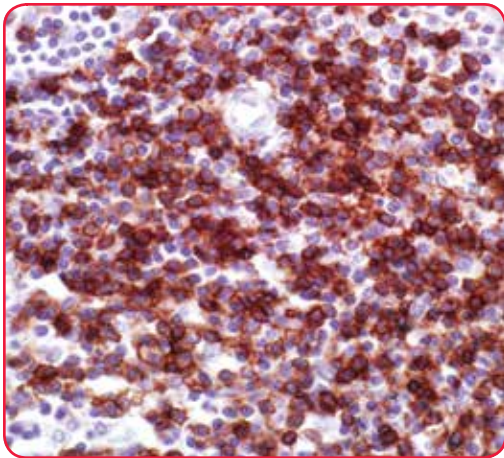


Mucosa associated lymphoid tissue (MALT lymphoma)

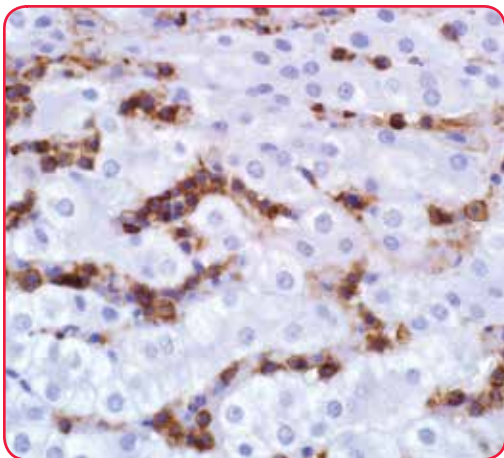
# CD45RO



Tonsil



Paracortical T-zone lymphocytes



Liver

Anti-CD45RO labels an isoform of the CD45 antigen also known as leukocyte common antigen. Anti-CD45RO reacts with thymocytes, mature activated T-cells, and a subpopulation of resting T-cells while showing no reactivity with B-cells, making this antibody helpful in identifying T-cell neoplasms.<sup>1-7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous, nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Mature B-cell and T-cell Neoplasms	315
T-cell Lymphomas	317

## Reference

1. Hall PA, et al. New marker of B lymphocytes, MB2: comparison with other lymphocyte subset markers active in conventionally processed tissue sections. *J Clin Pathol.* 1987; 40:151-6.
2. Smith SH, et al. Functional subsets of human helper-inducer cells defined by a new monoclonal antibody, UCHL1. *Immunology* 1986; 58:63-70.
3. Cabeçadas JM, et al. Phenotyping of T-cell lymphomas in paraffin sections--which antibodies? *Histopathology.* 1991; 19:419-24.
4. Tworek JA, et al. Flow cytometric and immunohistochemical analysis of small lymphocytic lymphoma, mantle cell lymphoma, and plasmacytoid small lymphocytic lymphoma. *Am J Clin Pathol.* 1998; 110:582-9.
5. Falini B, et al. Variable expression of leucocyte-common (CD45) antigen in CD30 (Ki1)-positive anaplastic large-cell lymphoma: implications for the differential diagnosis between lymphoid and nonlymphoid malignancies. *Hum Pathol.* 1990; 21:624-9.
6. Koch AE, et al. Distribution of CD45RA and CD45RO T-lymphocyte subsets in rheumatoid arthritis synovial tissue. *J Clin Immunol.* 1990; 10:192-9.
7. Ritter JH, et al. Paraffin section immunohistochemistry as an adjunct to morphologic analysis in the diagnosis of cutaneous lymphoid infiltrates. *J Cutan Pathol.* 1994; 21:481-93.

## Ordering Information

### CD45RO (UCHL-1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	147M-94
0.5 mL concentrate	147M-95
1 mL concentrate	147M-96
1 mL predilute	147M-97
7 mL predilute	147M-98

Please contact your distributor for details on product availability and regulatory status in your country.

# CD56

CD56, also known as neural cell adhesion molecule (NCAM), is a calcium-independent homophilic binding protein that belongs to a group of cell adhesion molecules including cadherins, selectins, and integrins.<sup>1-3</sup> CD56 is involved in cell-to-cell adhesion of neural cells during embryogenesis and is expressed on most neuroectodermally derived tissues.<sup>1-3</sup> In normal tissue, anti-CD56 labels neurons, glia, schwann cells, NK (natural killer) cells, and a subset of T-cells.<sup>3</sup> CD56 expression can be seen in most NK cell neoplasms, certain subtypes of T-cell lymphoma and in some plasma cell neoplasms.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** neuroblastoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 123C3.D5: IgG<sub>1</sub>/k
- MRQ-42: IgG<sub>1</sub>

## Synonyms and Abbreviations

NCAM

## Associated Specialties

Anatomic Pathology

Hematopathology

## Associated Grids

Grid	Page No.
Neuroendocrine Tumors from Different Anatomical Locations	299
Spindle Cell Tumors	300
Pancreatic Epithelial Tissues and Tumors	308
NK Cell Leukemia/Lymphoma	316
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316
T-cell Lymphomas	317
Soft Tissue Neoplasms	322

## Reference

1. Walmod PS, et al. Zippers make signals: NCAM-mediated molecular interactions and signal transduction. *Neurochem Res.* 2004; 29:2015-35.
2. Skog MS, et al. Expression of neural cell adhesion molecule and polysialic acid in human bone marrow-derived mesenchymal stromal cells. *Stem Cell Res Ther.* 2016; 7:113.
3. Cohavy O, et al. CD56 marks an effector T cell subset in the human intestine. *J Immunol.* 2007; 178:5524-32.
4. WHO Classification of tumors of Haematopoietic and Lymphoid Tissue. 4th Edition. 2008.

## Ordering Information

### CD56 (123C3.D5)

Mouse Monoclonal Antibody

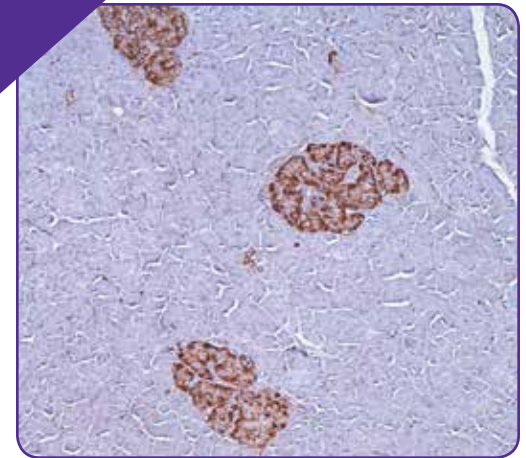
Volume	Part No.
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0.5 mL concentrate	156M-85
1 mL concentrate	156M-86
1 mL predilute	156M-87
7 mL predilute	156M-88

### CD56 (MRQ-42)

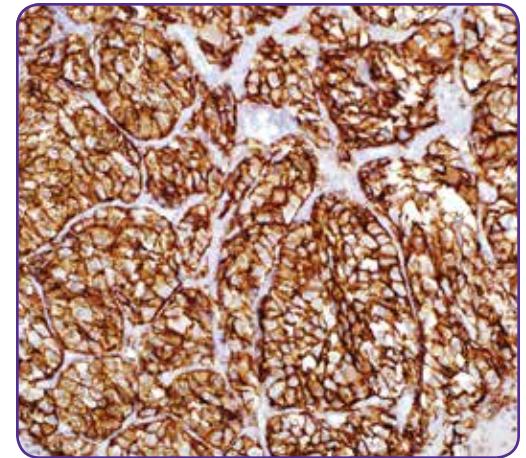
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	156R-94
0.5 mL concentrate	156R-95
1 mL concentrate	156R-96
1 mL predilute	156R-97
7 mL predilute	156R-98

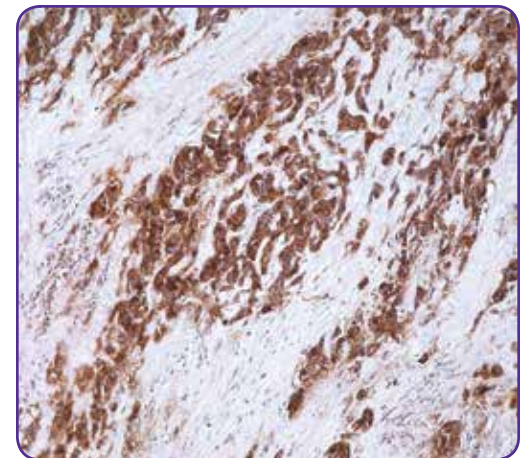
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreas

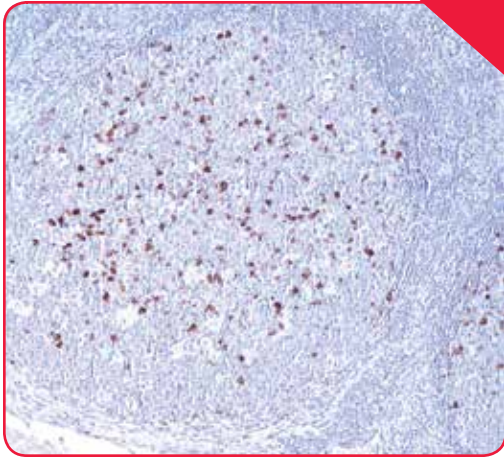


Pancreatic neuroendocrine carcinoma

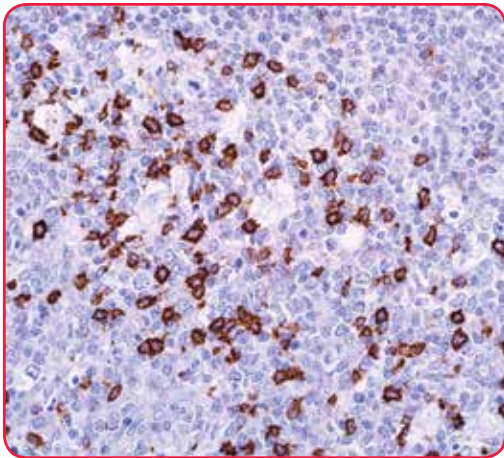


Lung, small cell carcinoma

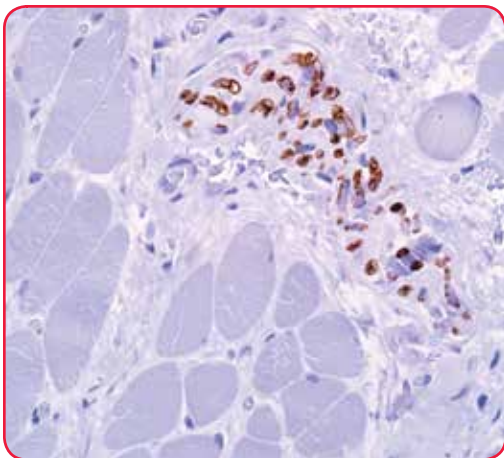
# CD57



Tonsil



Tonsil



Nerve fiber

CD57, also known as HNK-1 (human natural killer-1), is a cell surface carbohydrate epitope expressed on terminally differentiated T-cells and subsets of natural killer (NK) cells.<sup>1</sup> It has also been identified on cells of neural crest origin.<sup>2</sup> Anti-CD57 is often used to visualize the non-neoplastic bystander T-cells that may form rosettes around the neoplastic lymphocyte-predominant (LP) cells in nodular lymphocyte-predominant Hodgkin lymphoma (NLPHL).<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Thymus	301
Neuroid Skin Lesions	305
NK Cell Leukemia/Lymphoma	316
Small Blue Round Cell Tumors	322

## Reference

1. Kared H, et al. CD57 in human natural killer cells and T-lymphocytes. *Cancer Immunol Immunother.* 2016; 65:441-52.
2. Nielsen CM, et al. Functional significance of CD57 expression on human NK cells and relevance to disease. *Front Immunol.* 2013; 4:422.
3. Sattarzadeh A, et al. CD57+ T-cells are a subpopulation of T-follicular helper cells in nodular lymphocyte predominant Hodgkin lymphoma. *Exp Hematol Oncol.* 2015; 4:27.

## Ordering Information

### CD57 (NK-1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	157M-94
0.5 mL concentrate	157M-95
1 mL concentrate	157M-96
1 mL predilute	157M-97
7 mL predilute	157M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD61

CD61, also known as integrin beta chain beta 3 (ITGB3), is an integrin cell-surface protein associated with cellular adhesion and cell-surface mediated signaling. Immunohistochemical staining for CD61 can be useful in evaluating normal and abnormal megakaryocytes, which can aide in the identification of some hematopoietic malignancies. Anti-CD61 reactivity is also seen in platelets, osteoclasts and macrophages.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** bone marrow

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Hematopoietic Neoplasms and Anaplastic Large Cell Lymphoma	313

## Reference

1. Thiele J, et al. An immunomorphometric study on megakaryocyte precursor cells in bone marrow tissue from patients with chronic myeloid leukemia (CML). *Eur J Haematol.* 1990; 44:63-70.
2. Thiele J, et al. Megakaryocyte precursors (pro- and megakaryoblasts) in bone marrow tissue from patients with reactive thrombocytosis, polycythemia vera and primary (essential) thrombocythemia. An immunomorphometric study. *Virchows Archiv B Cell Pathol.* 1990; 58:295-302.
3. Fox SB, et al. Megakaryocytes in myelodysplasia: an immunohistochemical study on bone marrow trephines. *Histopathology.* 1990; 17:69-74.
4. Thiele J, et al. Megakaryocyte precursors (promegakaryoblasts and megakaryoblasts) in the normal human bone marrow. An immunohistochemical and morphometric study on routinely processed trephine biopsies. *Anal Quant Histol.* 1990; 12:285-9.

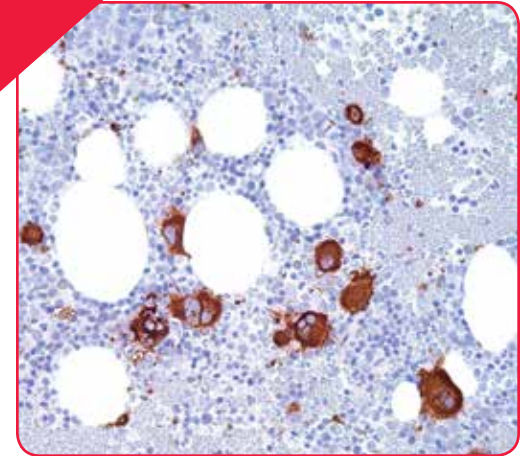
## Ordering Information

### CD61 (2f2)

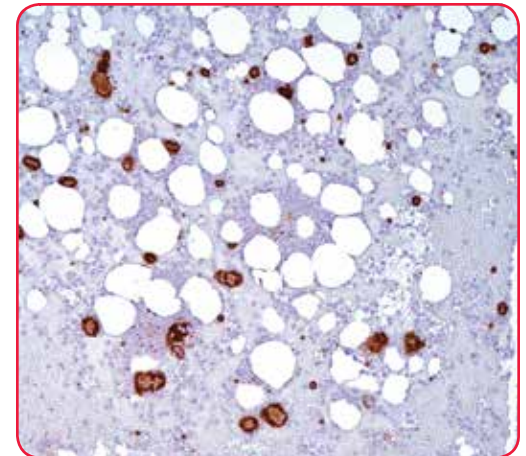
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	161M-15
1 mL concentrate	161M-16
1 mL predilute	161M-17
7 mL predilute	161M-18

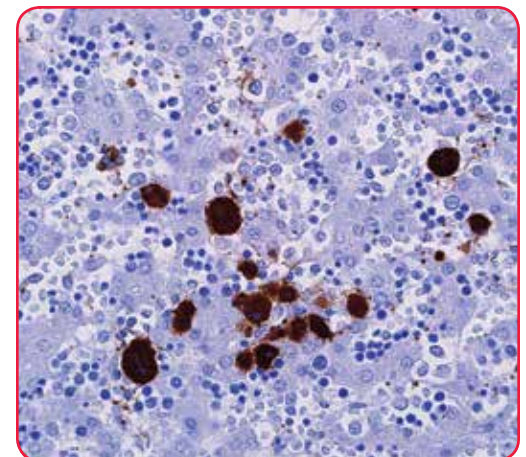
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Bone marrow, megakaryocytes



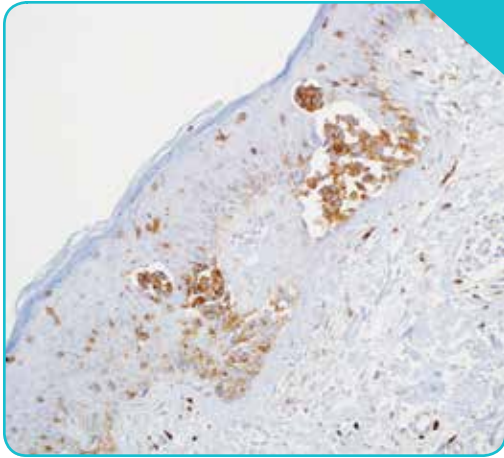
Bone marrow, megakaryocytes



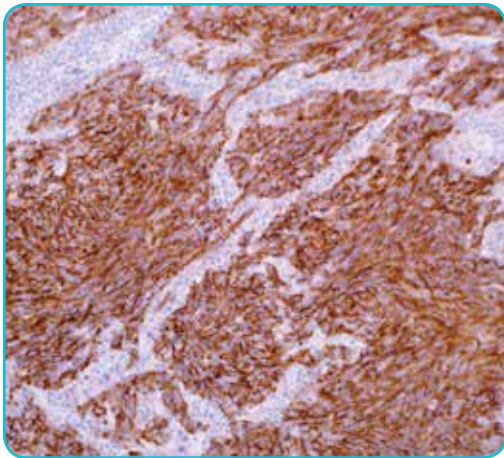
Bone marrow, megakaryocytes



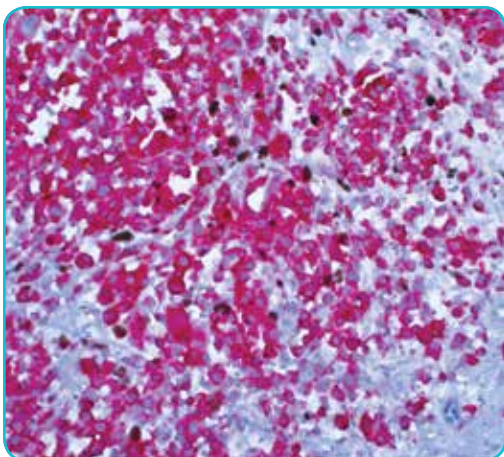
# CD63



Melanoma



Melanoma



Melanoma

CD63 is a 53-kD lysosomal membrane protein in the family of tetraspan moieties, and characterized as an activation dependent platelet surface antigen. Anti-CD63 reactivity is seen in the cytoplasm of many cell types including lymphoid, myeloid, endothelial cells, and the majority of malignant melanomas. Anti-CD63 is a useful immunohistochemical marker for the identification of malignant melanoma.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
PEComa	299
Spindle Cell Melanoma vs. Epithelioid Peripheral Nerve Sheath Tumor	300
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Melanotic Lesions	305

## Reference

1. Azorsa DO, et al. CD63/Pltgp40: a platelet activation antigen identical to the stage-specific, melanoma-associated antigen ME491. *Blood*. 1991; 78:280-4.
2. Barrio MM, et al. A new epitope on human melanoma-associated antigen CD63/ME491 expressed by both primary and metastatic melanoma. *Hybridoma*. 1998; 17:355-64.
3. Demetrick DJ, et al. ME491 melanoma-associated glycoprotein family: antigenic identity of ME491, NKI/C-3, neuroglandular antigen (NGA), and CD63 proteins. *J Natl Cancer Inst*. 1992; 84:422-9.
4. Mete O, et al. Can renal oncocytoma be differentiated from its renal mimics? The utility of anti-mitochondrial, caveolin 1, CD63 and cytokeratin 14 antibodies in the differential diagnosis. *Virchows Arch*. 2005; 447:938-46.

## Ordering Information

### CD63 (NKI/C3)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	263M-14
0.5 mL concentrate	263M-15
1 mL concentrate	263M-16
1 mL predilute	263M-17
7 mL predilute	263M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD68

Anti-CD68 marks cells of monocyte/macrophage lineage. This antibody is capable of staining monocytes, Kupffer cells, osteoclasts, granulocytes and their precursors; lymphomas are negative or show few granules. This antibody may be useful for the identification of myelomonocytic and histiocytic tumors. Since this detects a formalin-resistant epitope that may be associated with lysosomal granules, other lysosome-rich cells may also stain.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

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PEComa	299
Histiocytic and Dendritic Cell Lesions	313, 320
Histiocytic and Dendritic Cell Neoplasms	313
Histiocytic Lesions	313
Splenic Hematopoietic Proliferations in Neoplastic and Benign Disorders	317
Histiocytic Proliferation	319

## Reference

1. Holness CL, et al. Molecular cloning of CD68, a human macrophage marker related to lysosomal glycoproteins. *Blood*. 1993; 81:1607-13.
2. Leong A, et al. Manual of Diagnostic Antibodies for Immunohistochemistry. Greenwich Medical Media Ltd. 2003; p.135-6.
3. Lau SK, et al. CD163: a specific marker of macrophages in paraffin-embedded tissue samples. *Am J Clin Pathol*. 2004; 122:794-801.

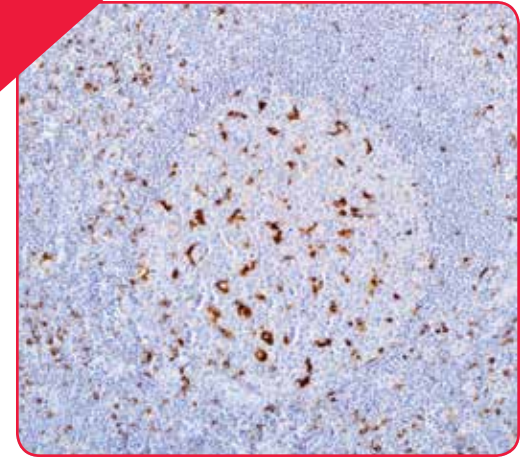
## Ordering Information

### CD68 (Kp-1)

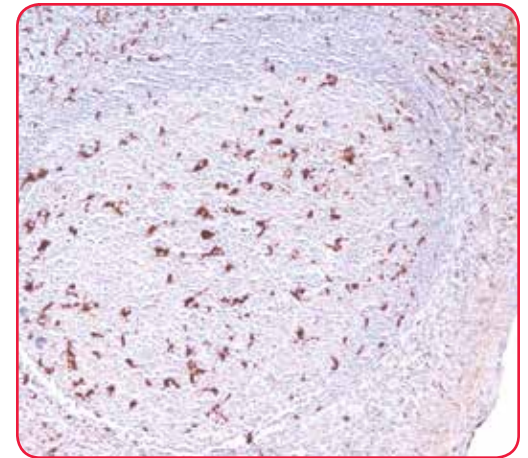
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	168M-94
0.5 mL concentrate	168M-95
1 mL concentrate	168M-96
1 mL predilute	168M-97
7 mL predilute	168M-98

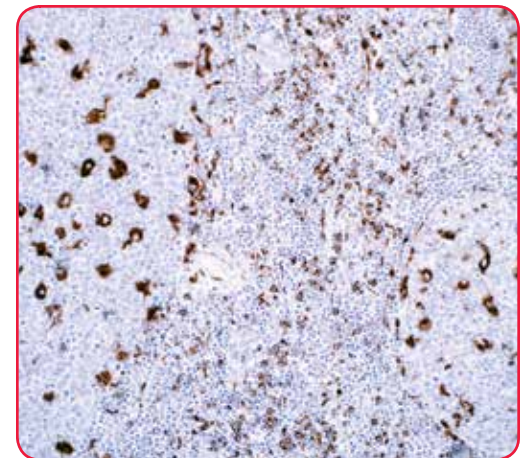
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Tonsil

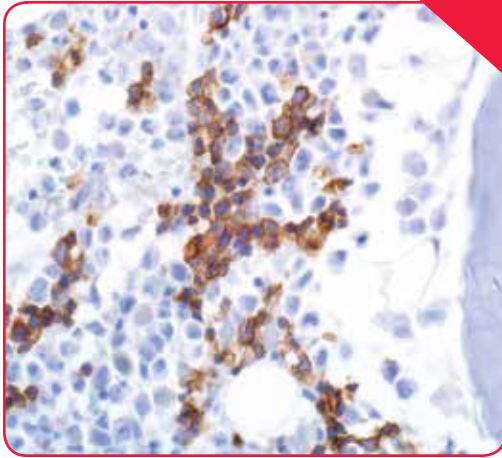


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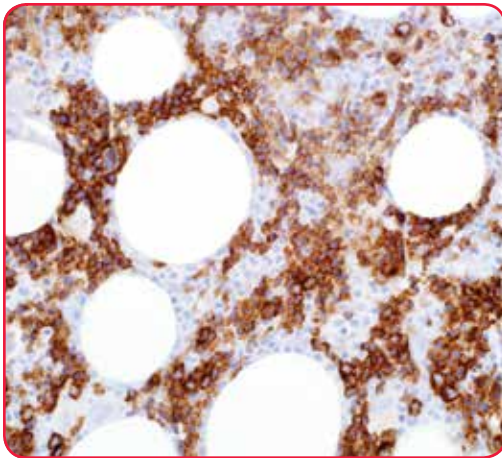


Tonsil

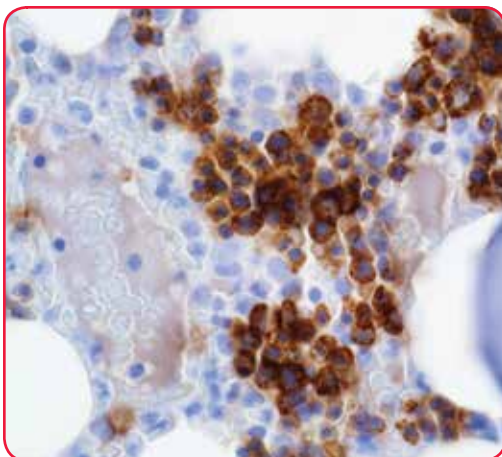
# CD71



Bone marrow



Bone marrow



Bone marrow erythroid precursors

Transferrin receptor 1 (CD71) is expressed on placental syncytiotrophoblasts, myocytes, basal keratinocytes, hepatocytes, endocrine pancreas, spermatocytes, and erythroid precursors. The level of transferrin receptor expression is highest in early erythroid precursors through the intermediate normoblast phase, after which expression decreases through the reticulocyte phase. The maturation of erythrocytes results in loss of transferrin receptor expression. Anti-CD71 is useful in identifying erythroid precursors. The high level of transferrin receptor within erythroid precursors makes anti-CD71 an excellent marker for evaluation of erythroid precursors within bone marrow biopsy specimens and shows the following features: 1) distinct membranous and cytoplasmic staining pattern, which is easily recognized in bone marrow biopsy; 2) restriction to erythroid lineage within bone marrow biopsy specimens; 3) CD71 expression decreases with the maturation of erythrocytes, with the highest level seen in early forms and the lowest level in late normoblast stage, and most importantly; 4) mature erythrocytes do not express CD71.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic, membranous  
**Control** bone marrow  
**Stability** up to 36 mos. at 2-8°C  
**Isotype**

- EP232: IgG
- MRQ-48: IgG<sub>1</sub>

## Synonyms and Abbreviations

Transferrin Receptor

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Erythroid	313
Hematopoietic Neoplasms and Anaplastic Large Cell Lymphoma	313
Leukemia	314

## Reference

1. Ponka P, et al. The transferrin receptor: role in health and disease. *Int J Biochem Cell Biol.* 1999; 31:1111-37.
2. Sieff C, et al. Changes in cell surface antigen expression during hemopoietic differentiation. *Blood.* 1982; 60:703-13.
3. Lesley J, et al. Expression of transferrin receptor on murine hematopoietic progenitors. *Cell Immunol.* 1984; 83:14-25.
4. Nakahata T, et al. Cell surface antigen expression in human erythroid progenitors: erythroid and megakaryocytic markers. *Leuk Lymphoma.* 1994; 13:401-9.
5. Marsee DK, et al. CD71 (transferrin receptor): an effective marker for erythroid precursors in bone marrow biopsy specimens. *Am J Clin Pathol.* 2010; 134:429-35.

## Ordering Information

**CD71 (EP232)**  
 Rabbit Monoclonal  
 Primary Antibody



Volume	Part No.
0.1 mL concentrate	171R-14
0.5 mL concentrate	171R-15
1 mL concentrate	171R-16
1 mL predilute	171R-17
7 mL predilute	171R-18

**CD71 (MRQ-48)**  
 Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	171M-94
0.5 mL concentrate	171M-95
1 mL concentrate	171M-96
1 mL predilute	171M-97
7 mL predilute	171M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD74

The CD74 antigen represents a membrane-bound subunit of the MHC Class II-associated invariant chain that is encoded by the gene located on chromosome 5. The antibody recognizes nuclear and cytoplasmic antigens of MW 35-kD and 31-kD respectively. Anti-CD74 stains predominantly germinal center lymphocytes and those in the mantle cell region of the lymph node. It stains the cell membrane but a paranuclear globular labeling is also noted. Plasma cells are not labeled. Thymocytes are negative but dendritic cells are often labeled by anti-CD74. Anti-CD74 labels about 90% of low grade B-cell lymphomas and 20% of low grade T-cell lymphomas. In high-grade lymphomas the discriminatory power (B-cell vs. T-cell) is diminished. Reed-Sternberg cells are also labeled in approximately 60% of cases.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic and membranous

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP167: IgG
- LN2: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315

## Reference

1. Leong A S-Y, et al. London, England: Greenwich Medical Media Ltd., 1999. Print.

## Ordering Information

### CD74 (EP167)

Rabbit Monoclonal  
Primary Antibody



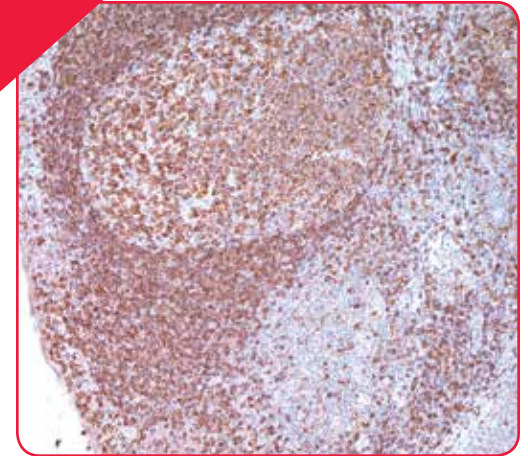
Volume	Part No.
0.1 mL concentrate	174R-14
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1 mL concentrate	174R-16
1 mL predilute	174R-17
7 mL predilute	174R-18

### CD74 (LN2)

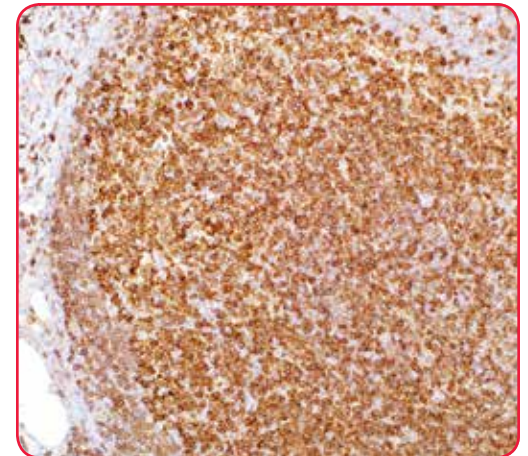
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	174M-14
0.5 mL concentrate	174M-15
1 mL concentrate	174M-16
1 mL predilute	174M-17
7 mL predilute	174M-18

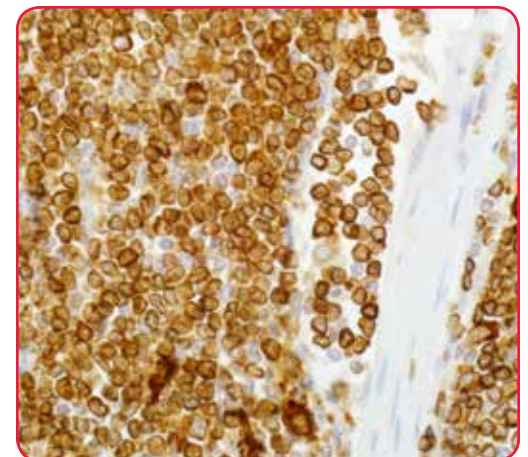
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Tonsil

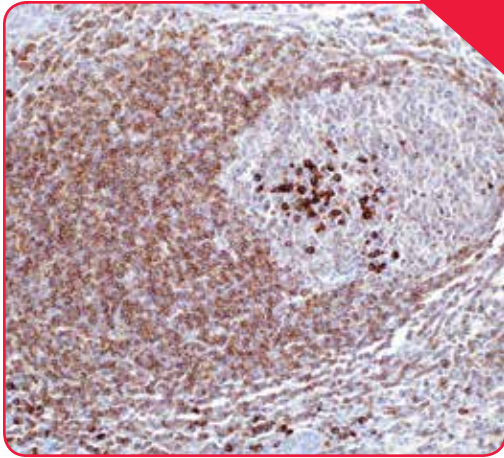


Tonsil

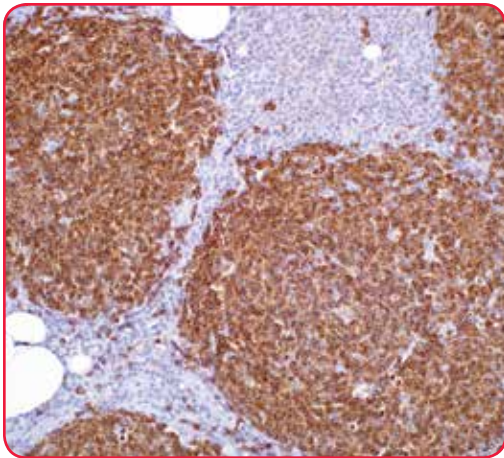


Small lymphocytic lymphoma

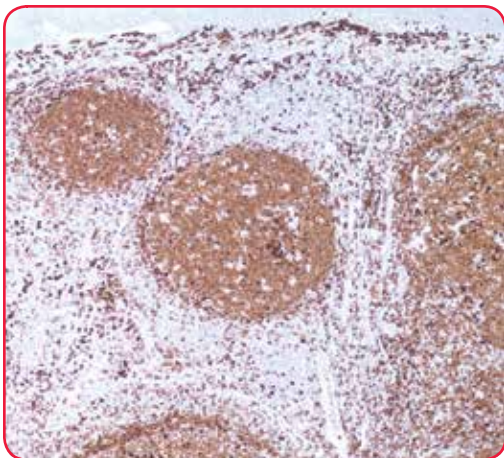
# CD79a



Tonsil



Tonsil



Tonsil

CD79 is a dimeric transmembrane protein with two distinct component chains: CD79a and CD79b.<sup>1-3</sup> CD79a is expressed in B cells from the pro-B stage through B-cell differentiation.<sup>2</sup> CD79a is a useful marker for B-cell neoplasms.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP82: IgG
- JCB117: IgG<sub>1</sub>/k
- SP18: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Hodgkin vs. Non-Hodgkin Lymphomas	314
Mature B-cell Neoplasms with Reduced CD20 Expression	316
Lymphomas and Myeloid Sarcoma	315
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316

## Reference

1. Mason DY, et al. CD79a: a novel marker for B-cell neoplasms in routinely processed tissue samples. *Blood*. 1995; 86:1453-9.
2. Bhargava P, et al. CD79a is heterogeneously expressed in neoplastic and normal myeloid precursors and megakaryocytes in an antibody clone-dependent manner. *Am J Clin Pathol*. 2007; 128:306-13.
3. Chu PG, et al. CD79: a review. *Appl Immunohistochem Mol Morphol*. 2001; 9:97-106.

## Ordering Information

### CD79a (EP82)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	179R-24
0.5 mL concentrate	179R-25
1 mL concentrate	179R-26
1 mL predilute	179R-27
7 mL predilute	179R-28

### CD79a (JCB117)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	179M-94
0.5 mL concentrate	179M-95
1 mL concentrate	179M-96
1 mL predilute	179M-97
7 mL predilute	179M-98

### CD79a (SP18)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	179R-14
0.5 mL concentrate	179R-15
1 mL concentrate	179R-16
1 mL predilute	179R-17
7 mL predilute	179R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# CD99

CD99, as detected with a variety of antibodies, is expressed by virtually almost all Ewing sarcoma and primitive peripheral neuroectodermal tumors (ES/PNET) and demonstrates strong and diffuse membranous staining.<sup>1-4</sup> Other tumors that may show CD99 expression include neuroendocrine carcinomas, mesenchymal chondrosarcomas, solitary fibrous tumors, synovial sarcomas, vascular tumors, small round blue cell tumors, lymphoblastic lymphoma, acute myeloid leukemia, and myeloid sarcoma.<sup>5</sup> However, strong and diffuse membranous reactivity for CD99 favors ES/PNET over the other diagnostic considerations.<sup>5</sup> The other CD99+ tumors usually show cytoplasmic and more heterogeneous staining. Therefore, when making a final diagnostic interpretation, CD99 must be considered in a panel with other antibodies.<sup>4-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** Ewing sarcoma, pancreas

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

MIC-2

## Associated Specialties

Pediatric Pathology

Soft Tissue Pathology

## Associated Grids

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Sex Cord Stromal Tumors	303
Skin: Spindle Cell Tissues and Tumors	306, 307
Retroperitoneal Neoplasms	318
Neuroblastoma vs. Other Small Round Cell Tumors	321
Small Blue Round Cell Tumors	322
Soft Tissue Tumors	322, 323

## Reference

1. Rettig WJ, et al. Lab Invest. 1992; 66:133.
2. Fellingner EJ, et al. Amer J Surg Pathol. 1992; 16:746.
3. Ambros IM, et al. Cancer. 1991; 139:317.
4. Khoury JD. Adv Anat Pathol. 2005; 12:212-20.
5. Dabbs DJ. Theranostic and Genomic Applications. 2014; 126.

## Ordering Information

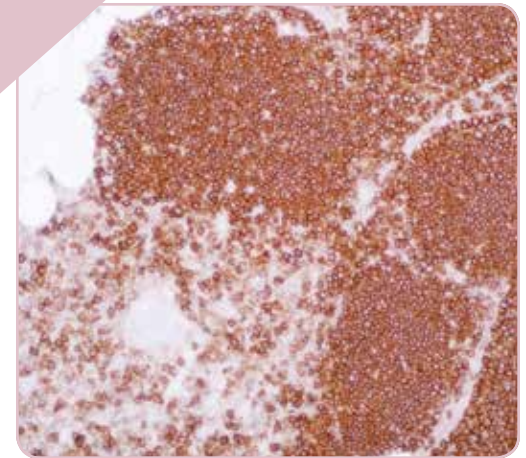
**CD99 (EPR3097Y)**

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
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0.5 mL concentrate	199R-15
1 mL concentrate	199R-16
1 mL predilute	199R-17
7 mL predilute	199R-18

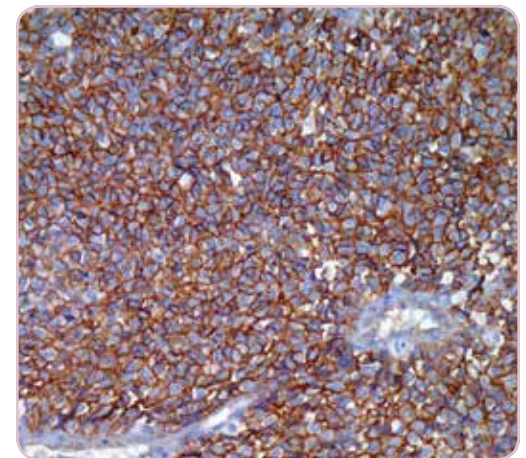
*Please contact your distributor for details on product availability and regulatory status in your country.*



Thymus cortex medulla

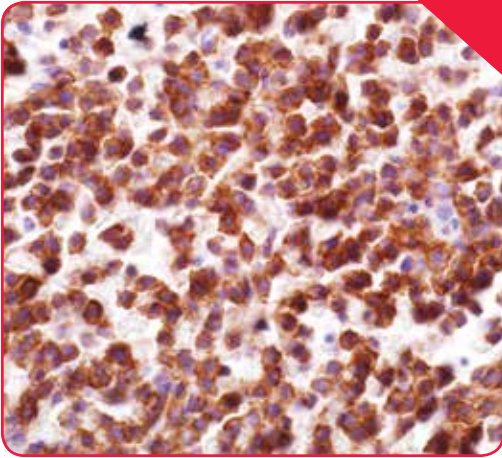


Ewing sarcoma

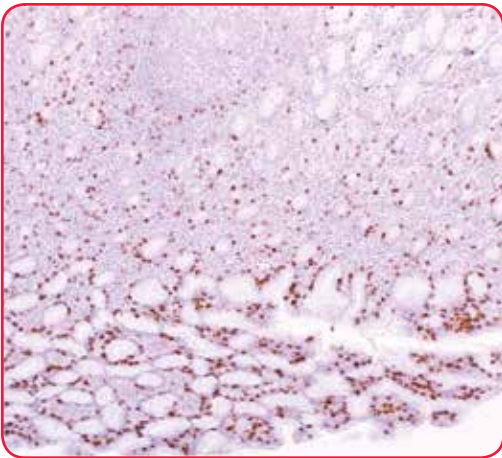


Ewing sarcoma

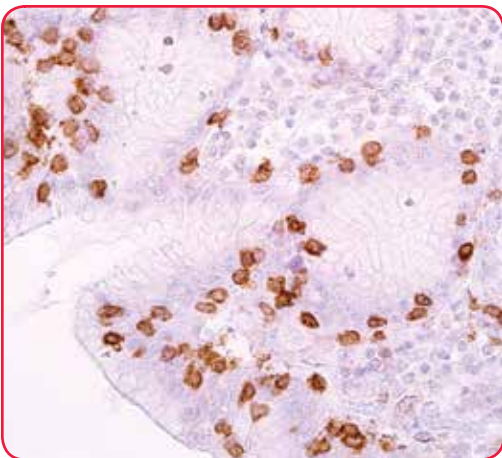
# CD103



Hairy cell leukemia



Gastric mucosa



Gastric mucosa

CD103 is an integrin subunit,  $\alpha E$ , encoded by the ITGAE gene on chromosome 17.<sup>2</sup> CD103 is expressed in almost all cases of hairy cell leukemia (HCL) and absent in the majority of other B-cell neoplasms with an exception to splenic marginal zone lymphoma, in which rare cases express CD103.<sup>1,2</sup> CD103 has been found in mononuclear cells in the interfollicular area of lymph nodes and in intraepithelial cells in the overlying mucosa located primarily toward the basal layer of the tonsil.<sup>2</sup> The high sensitivity of anti-CD103 for HCL makes this marker valuable when distinguishing from other B-cell neoplasms.

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic, membranous  
**Control** hairy cell leukemia, colon  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Dong HY, et al. Immunophenotypic analysis of CD103+ B-lymphoproliferative disorders: hairy cell leukemia and its mimics. *Am J Clin Pathol.* 2009; 131:586-95.
2. Morgan EA, et al. Immunohistochemical detection of hairy cell leukemia in paraffin sections using a highly effective CD103 rabbit monoclonal antibody. *Am J Clin Pathol.* 2013; 139:220-30.

## Ordering Information

**CD103 (EP206)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	437R-14
0.5 mL concentrate	437R-15
1 mL concentrate	437R-16
1 mL predilute	437R-17
7 mL predilute	437R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# CD117, c-kit

CD117, c-kit is a tyrosine kinase receptor important for development and survival of many cell types.<sup>1</sup> CD117 is found on interstitial cells of Cajal, germ cells, bone marrow cells, melanocytes, mast cells, and breast epithelial cells.<sup>1</sup> CD117 is useful for the identification of germ cell tumors as it is positive in seminoma and negative in embryonal carcinoma.<sup>2</sup> The morphologic distinction of clear cell renal carcinoma (RCC) and chromophobe RCC can be challenging; CD117 is typically negative in clear cell RCC and positive in chromophobe RCC.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** gastrointestinal stromal tumor, seminoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Various Germ Cell Tumor Components	301
Breast Carcinoma	302
Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors	305
GIST Mutation vs. Wild Type	307
Germ Cell Tumors	309
Kidney: Epithelial Neoplasms	309
Kidney Neoplasms	310
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Mastocytosis	315
Thoracic Solitary Fibrous Tumor vs. Potential Mimics	320
Kidney, Urothelial, and Soft Tissue Neoplasms	321
Solitary Fibrous Tumor vs. Other Soft Tissue Tumors	323

## Reference

1. Lammie A, et al. J Histochem Cytochem. 1994; 42:1417-25.
2. Leroy X, et al. J Histochem Cytochem. 2002; 50:283-5.
3. Ahmed EA and Youssif ME. J Egypt Natl Canc Inst. 2009; 21:121-32.

## Ordering Information

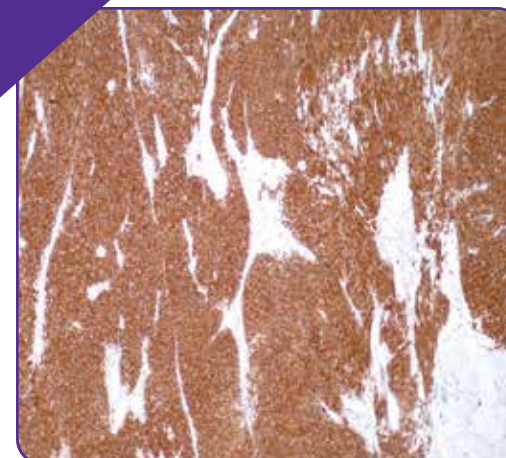
**CD117, c-kit (YR145)**

Rabbit Monoclonal  
Primary Antibody

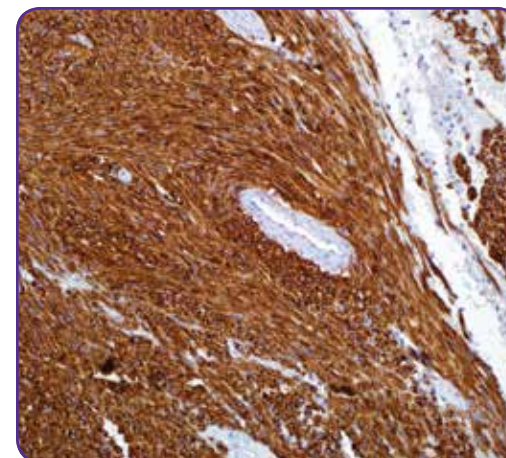


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1 mL concentrate	117R-16
1 mL predilute	117R-17
7 mL predilute	117R-18
25 mL predilute	117R-10

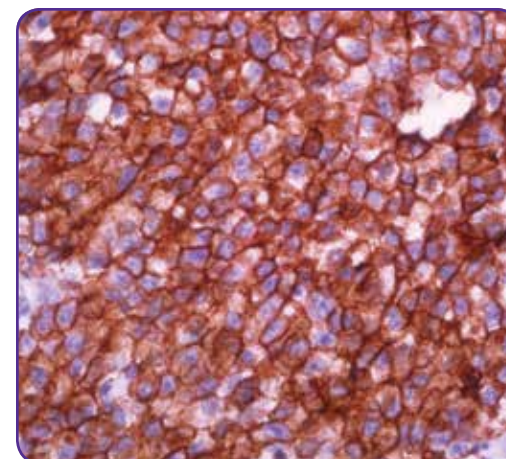
Please contact your distributor for details on product availability and regulatory status in your country.



Gastrointestinal stromal tumor



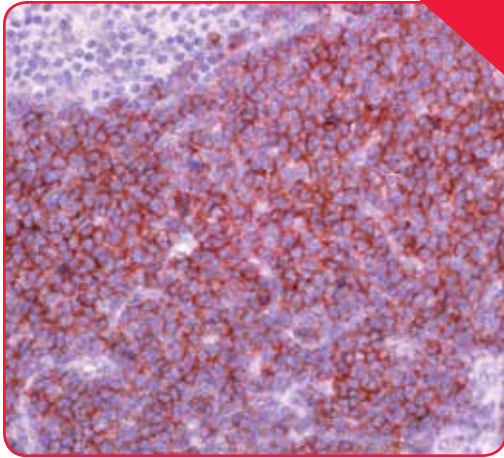
Gastrointestinal stromal tumor



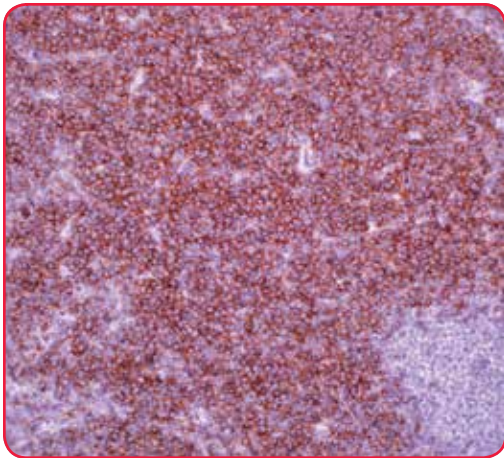
Seminoma



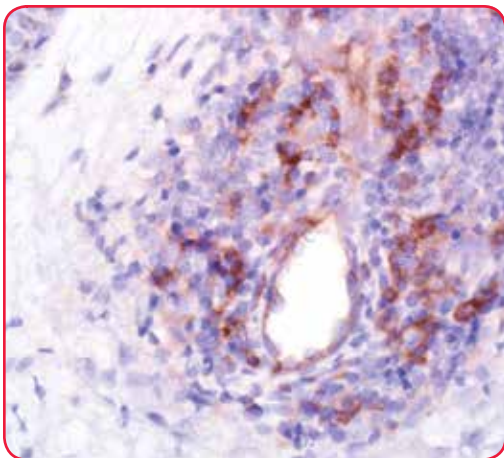
# CD123



Blastic plasmacytoid dendritic cell neoplasm



Blastic plasmacytoid dendritic cell neoplasm



Plasmacytoid dendrocytes

Blastic plasmacytoid dendritic cell neoplasm (BPDCN), previously known as CD4+/CD56+ hematodermic neoplasm or blastic NK-cell lymphoma, is a malignant neoplasm composed of immature hematopoietic precursors of plasmacytoid dendritic cells.<sup>1</sup> The most frequent manifestation is a skin lesion, bone marrow involvement, and regional lymphadenopathy.<sup>1</sup> Myeloid leukemia cutis (LC), myeloid sarcoma, and large aggressive B-cell lymphomas should be differentiated from BPDCN. Recently, it has been reported that these entities can be distinguished by using immunohistochemistry (IHC) in paraffin-embedded tissue sections.<sup>2</sup> CD123 is able to distinguish BPDCN from diffuse large B-cell lymphoma, follicular lymphoma, marginal zone lymphoma, hairy cell leukemia, and small lymphocytic lymphoma.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** blastic plasmacytoid dendritic cell neoplasm

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312

## Reference

1. Facchetti F, et al. WHO classification of tumours of haematopoietic and lymphoid tissues. 4th ed. Lyon, France: IARC Press. 2008:145-7.
2. Cronin DMP, et al. Immunophenotypic analysis of myeloperoxidase-negative leukemia cutis and blastic plasmacytoid dendritic cell neoplasm. Am J Clin Pathol. 2012; 137:367-76.

## Ordering Information

### CD123 (6H6)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	198M-14
0.5 mL concentrate	198M-15
1 mL concentrate	198M-16
1 mL predilute	198M-17
7 mL predilute	198M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CD138/syndecan-1

CD138, Syndecan-1, is expressed in the late stages of B-cell differentiation with progression towards plasma cells.<sup>1,2</sup> It can be used to differentiate lymphoplasmacytic lymphoma from marginal zone lymphoma.<sup>1</sup> ALK+ large B-cell lymphoma (LBCL) usually strongly expresses CD138 whereas lineage-associated markers such as anti-CD20 and anti-CD79a do not stain ALK+LBCL.<sup>3,7</sup> Anti-CD138 is immunoreactive with HHV8-associated primary effusion lymphoma even though the lymphoma cells lack the expression of B-cell markers.<sup>5</sup> Anti-CD138 is a good marker to identify and enumerate plasma cells, benign, reactive, or malignant, in bone marrow biopsy specimens.<sup>4,6</sup> CD138 is also expressed in epithelial cells.<sup>6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- B-A38: IgG<sub>1</sub>
- EP201: IgG

## Synonyms and Abbreviations

Syndecan-1

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Mature B-cell Neoplasms with Reduced CD20 Expression	316
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316

## Reference

1. Chilosì M, et al. Mod Pathol. 1999; 12:1101-6.
2. Sebestyén A, et al. Br J Haematol. 1999; 104:412-9.
3. Delsol G, et al. WHO Press, Geneva, Switzerland. 254.
4. Bayer-Garner IB, et al. Mod Pathol. 2001; 14:1052-8.
5. Said J, et al. WHO Press, Geneva, Switzerland. 261.
6. O'Connell FP, et al. Am J Clin Pathol. 2004; 121:254-63.
7. Colomo L, et al. Am J Surg Pathol. 2004; 28:736-47.

## Ordering Information

**CD138 (EP201)**  
Rabbit Monoclonal  
Primary Antibody

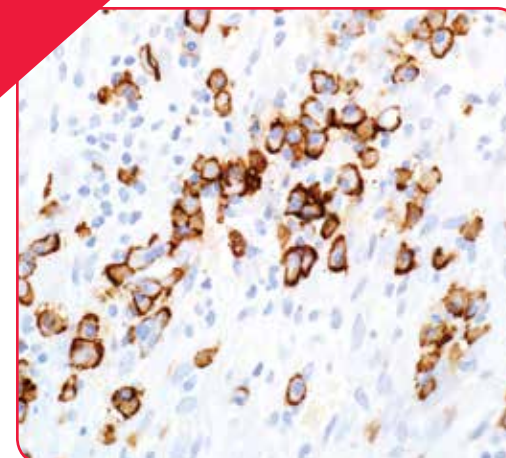
CELL MARQUE  
**RabMab**  
Technology from Abcam

Volume	Part No.
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0.5 mL concentrate	138R-25
1 mL concentrate	138R-26
1 mL predilute	138R-27
7 mL predilute	138R-28

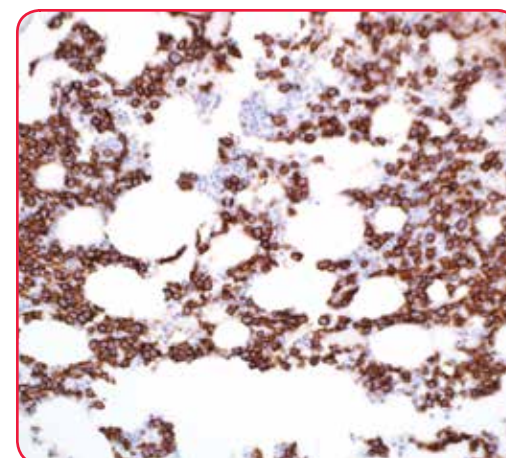
**CD138/syndecan-1 (B-A38)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	138M-14
0.5 mL concentrate	138M-15
1 mL concentrate	138M-16
1 mL predilute	138M-17
7 mL predilute	138M-18
25 mL predilute	138M-10

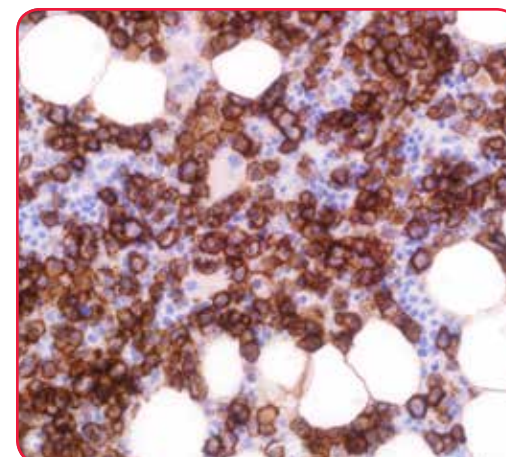
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Plasma cells

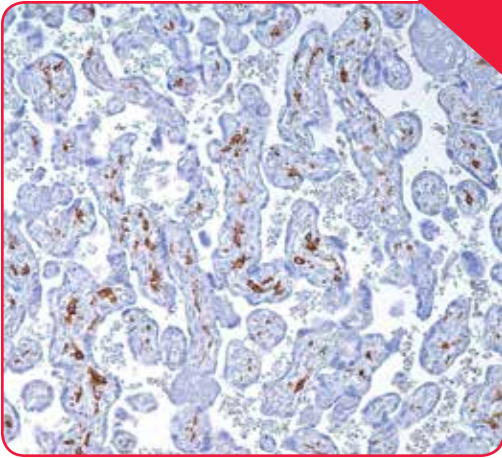


Plasma cell myeloma

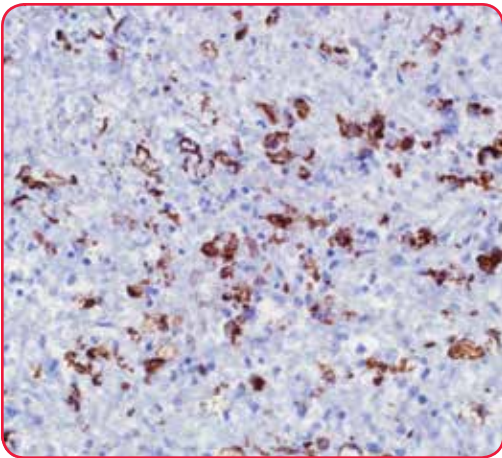


Plasma cell myeloma

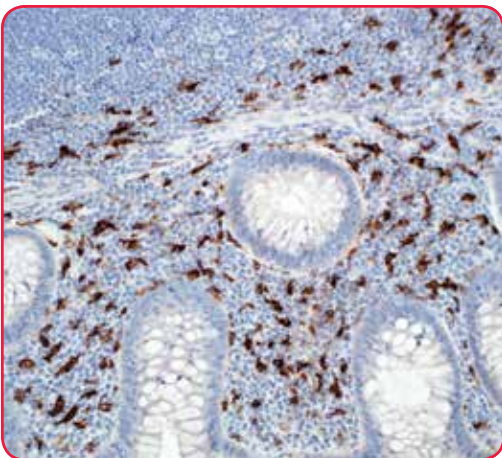
# CD163



Placenta



Macrophages



Colon mucosa

CD163, also known as scavenger receptor cysteine-rich type 1 protein M130,<sup>1</sup> is an acute phase-regulated and signal-inducing transmembrane protein,<sup>2</sup> found exclusively on cells of monocytic origin.<sup>1</sup> CD163 plays a critical role in macrophage clearance and endocytosis of hemoglobin/haptoglobin complexes.<sup>2</sup> Therefore, CD163 contributes to the anti-inflammatory response and protects tissues from oxidative and inflammatory hemoglobin.<sup>3</sup> Anti-CD163 labels cells of monocytic-macrophage lineage, with expression in bone marrow<sup>3</sup> and histiocytic neoplasms.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic, membranous  
**Control** inflamed tissue  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

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Histiocytic and Dendritic Cell Neoplasms	313
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## Reference

1. Buechler C, et al. Regulation of scavenger receptor CD163 expression in human monocytes and macrophages by pro- and anti-inflammatory stimuli. *J Leukoc Biol.* 2000; 67:97-103.
2. Kristiansen M, et al. Identification of the haemoglobin scavenger receptor. *Nature.* 2001; 409:198-201.
3. Etzerodt A, et al. CD163 and inflammation: biological, diagnostic, and therapeutic aspects. *Antioxid Redox Signal.* 2013; 18:2352-63.
4. Backe E, et al. Ber-MAC3: new monoclonal antibody that defines human monocyte/macrophage differentiation antigen. *J Clin Pathol.* 1991; 44:936-45.

## Ordering Information

**CD163 (MRQ-26)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	163M-14
0.5 mL concentrate	163M-15
1 mL concentrate	163M-16
1 mL predilute	163M-17
7 mL predilute	163M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CDX-2

CDX-2 is a caudal-related homeobox transcription factor whose expression in the adult is normally present in the gastrointestinal (GI) epithelium.<sup>1</sup> It is implicated in the development and maintenance of the intestinal mucosa.<sup>2</sup> This protein is expressed immunohistochemically in the nuclei of normal GI epithelium.<sup>1</sup> CDX-2 protein expression has been seen in GI carcinomas. Anti-CDX-2 has been useful to establish GI origin of metastatic adenocarcinomas and carcinoids<sup>2,3</sup> and is especially useful to distinguish metastatic colorectal adenocarcinoma from lung adenocarcinoma.<sup>1,4,5,6,7</sup> However, mucinous carcinomas of the ovary also stain positively with this antibody, which limits the usefulness of this marker in the distinction of metastatic colorectal adenocarcinoma versus mucinous carcinoma of the ovary.<sup>8</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Associated Grids

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Colon vs. Prostate Adenocarcinoma	294
Differential Diagnosis of Metastatic Adenocarcinomas	295
Neuroendocrine Neoplasms	298
Neuroendocrine Tumors from Different Anatomical Locations	299
Ampullary Carcinomas	307
Pancreatic Epithelial Tissues and Tumors	308

## Reference

1. Mazziotta RM, et al. Appl Immunohistochem Mol Morphol. 2005; 13:55-60.
2. Erickson LA, et al. Endocr Pathol. 2004; 15:247-52.
3. Saqi A, et al. Am J Clin Pathol. 2005; 123:394-404.
4. Saad RS, et al. Am J Clin Pathol. 2004; 122:421-7.
5. Kaimaktchiev V, et al. Mod Pathol. 2004; 17:1392-9.
6. Werling RW, et al. Am J Surg Pathol. 2003; 27:303-10.
7. Groisman GM, et al. Int J Gynecol Pathol. 2004; 231:52-7.
8. Moskaluk CA, et al. Mod Pathol. 2003; 16:913-9.

## Ordering Information

**CDX-2 (EPR2764Y)**

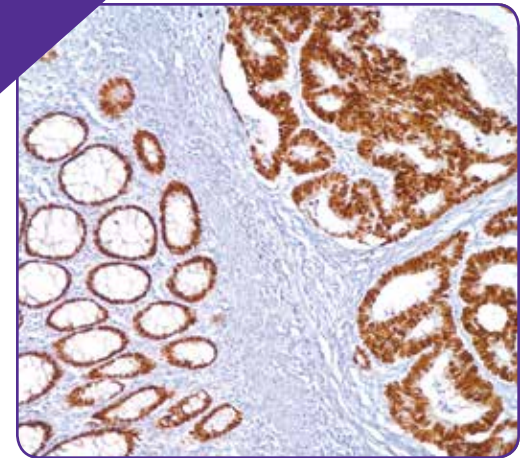
Rabbit Monoclonal

Primary Antibody

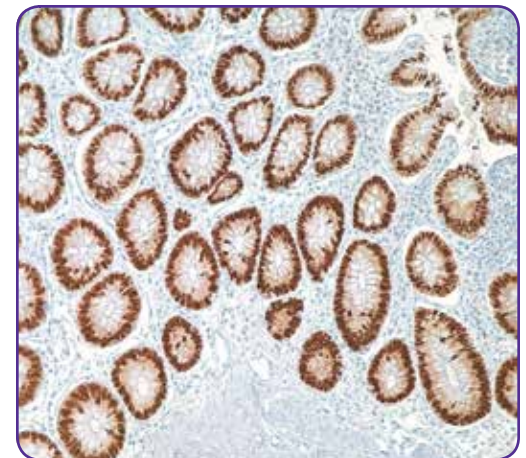


Volume	Part No.
0.1 mL concentrate	235R-14
0.5 mL concentrate	235R-15
1 mL concentrate	235R-16
1 mL predilute	235R-17
7 mL predilute	235R-18
25 mL predilute	235R-10

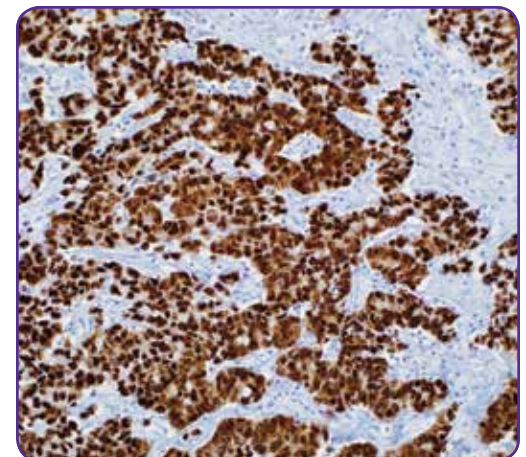
*Please contact your distributor for details on product availability and regulatory status in your country.*



Colon adenocarcinoma

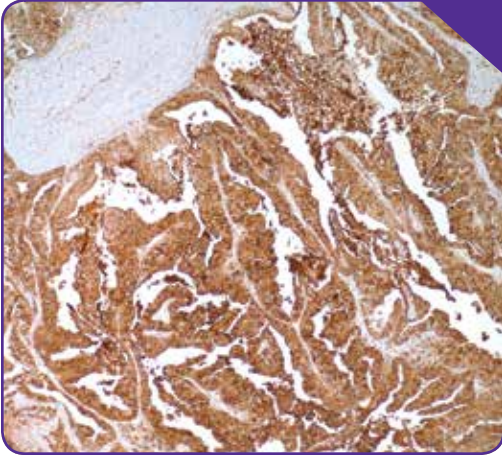


Colon

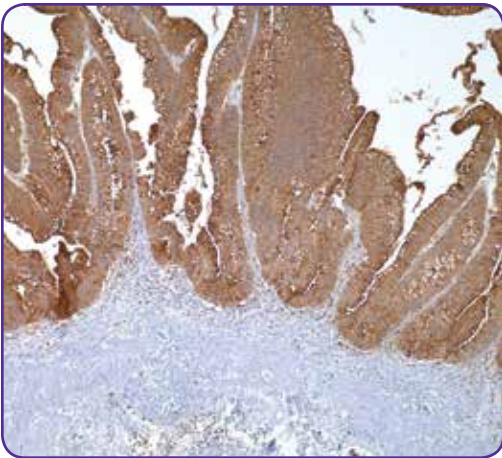


Liver, metastatic colon carcinoma

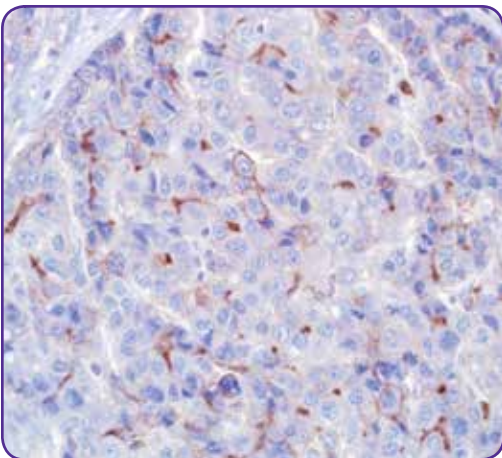
# CEA



Colorectal carcinoma



Colon



Hepatocellular carcinoma with canalicular structures highlighted

Anti-CEA is employed essentially as a tool to assist in the distinction between adenocarcinoma and epithelioid malignant mesotheliomas,<sup>1</sup> along with other markers such as those against calretinin, CK 5 & 6, CD15, HBME-1, MOC-31, and Ber-EP4.<sup>1</sup> Another suggested use of anti-CEA is to immunophenotype various metastatic adenocarcinomas as a means of identifying their origin within a panel of different markers.<sup>1</sup> Anti-CEA positivity is seen in adenocarcinomas from the lung, colon, stomach, esophagus, pancreas, gallbladder, urachus, salivary gland, ovary, and endocervix.<sup>2,3</sup> Polyclonal anti-CEA is useful in staining hepatocellular carcinoma in a canalicular pattern.<sup>2,4</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic  
**Control** colon adenocarcinoma, colon mucosa  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** CEA31: IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology  
 Cytopathology  
 Pulmonary Pathology

## Associated Grids

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Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310
Epithelioid Mesothelioma vs. Carcinoma	319
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Ordering Information

### CEA (CEA31) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	236M-94
0.5 mL concentrate	236M-95
1 mL concentrate	236M-96
1 mL predilute	236M-97
7 mL predilute	236M-98

### CEA Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	236A-14
0.5 mL concentrate	236A-15
1 mL concentrate	236A-16
1 mL predilute	236A-17
7 mL predilute	236A-18

Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

- Shield PW, et al. Immunocytochemical staining of cytologic specimens. How helpful is it? *Am J Clin Pathol.* 1996; 105:157-62.
- Sheahan K, et al. Differential reactivities of carcinoembryonic antigen (CEA) and CEA-related monoclonal and polyclonal antibodies in common epithelial malignancies. *Am J Clin Pathol.* 1990; 94:157-64.
- Alkushi A, et al. Immunoprofile of cervical and endometrial adenocarcinomas using a tissue microarray. *Virchows Arch.* 2003; 442:271-7.
- Morrison C, et al. A comparison of CD10 to pCEA, MOC-31, and hepatocyte for the distinction of malignant tumors in the liver. *Mod Pathol.* 2002; 15:1279-87.

# Chromogranin A

Immunohistochemical methods have localized chromogranin in a wide variety of endocrine tissues including the pituitary, pancreas, thyroid, and parathyroid.<sup>1-3</sup> Neuroendocrine cells exhibit a fine granular immunoreactivity to chromogranin.<sup>1-3</sup> It is generally accepted that the co-expression of certain keratins and chromogranin mean neuroendocrine lineage. The presence of strong chromogranin staining and absence of keratin staining should raise the possibility of paraganglioma. The co-expression of chromogranin and NSE is typical of neuroendocrine neoplasms.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pancreas

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Retroperitoneal Neoplasms	318

## Reference

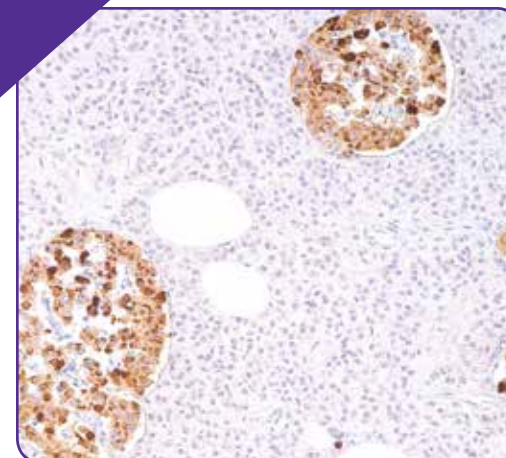
1. Fischer-Colbrie R, et al. Immunological studies on the distribution of chromogranin A and B in endocrine and nervous tissues. *Neuroscience*. 1985; 16:547-55.
2. Hearn SA. Electron microscopic localization of chromogranin A in osmium-fixed neuroendocrine cells with a protein A-gold technique. *J Histochem Cytochem*. 1987; 35:795-801.
3. Wilson BS, et al. Detection of chromogranin in neuroendocrine cells with a monoclonal antibody. *Am J Pathol*. 1984; 115:458-68.

## Ordering Information

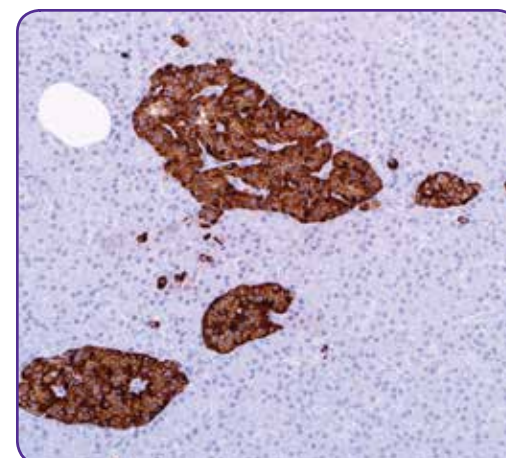
### Chromogranin A (LK2H10) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	238M-94
0.5 mL concentrate	238M-95
1 mL concentrate	238M-96
1 mL predilute	238M-97
7 mL predilute	238M-98
25 mL predilute	238M-90

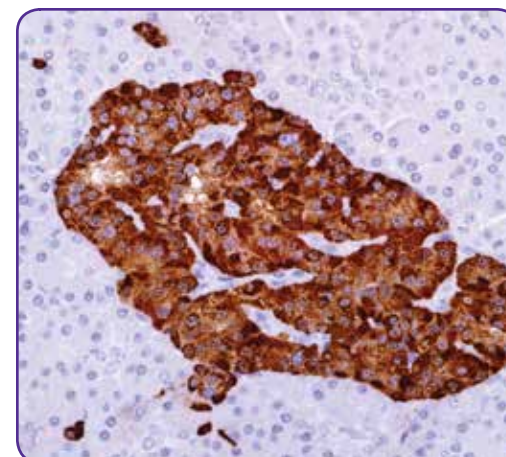
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreatic islet cells

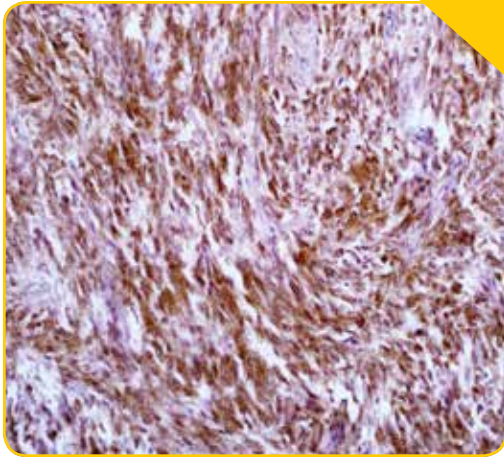


Pancreatic islet cells

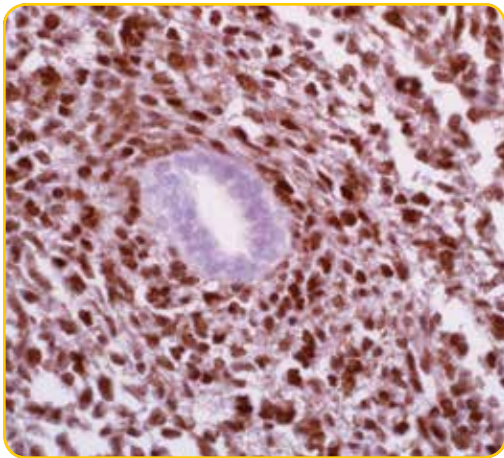


Pancreatic islet cells

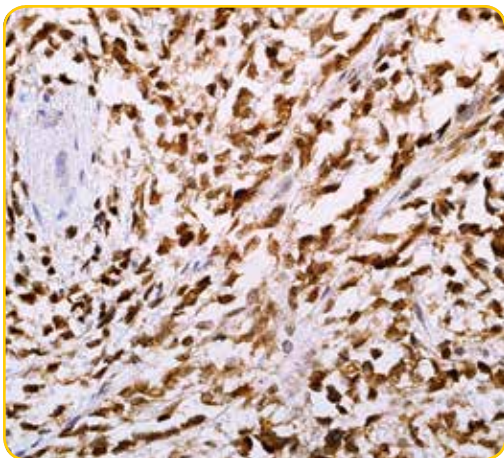
# CITED1



Wilms tumor



Wilms tumor



Wilms tumor

CITED1 is a transcriptional cofactor expressed in the metanephric mesenchyme (MM) of the embryonic kidney and is down-regulated as these cells undergo epithelial differentiation.<sup>1-4</sup> It is thought that CITED1 may play a role in maintaining MM cells in an undifferentiated state.<sup>3</sup> Wilms tumors (WT) are thought to arise from abnormal postnatal retention and dysregulated differentiation of nephrogenic progenitor cells that originate as a condensed MM within embryonic kidneys.<sup>1</sup> CITED1 expression has been shown to persist in blastemal cell populations of human WT.<sup>1,2</sup> In the developing embryonic kidney, CITED1 expression is seen in the cytoplasmic compartment. In WT, expression of CITED1 is detected in the nuclear compartment of tumor cells.<sup>1-4</sup> It has been suggested that persistent expression of CITED1 in the MM could play a role in WT initiation and pathogenesis.<sup>1</sup> CITED1 has been detected in 86.8% of WT cases.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** Wilms tumor

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>/k

## Associated Specialties

Pediatric Pathology

## Associated Grids

Grid	Page No.
Kidney Neoplasms	310

## Reference

1. Lovvorn III H, et al. CITED1 Expression in Wilms Tumor and Embryonic Kidney. *Neoplasia*. 2007; 9:589-600.
2. Murphy A, et al. SIX2 and CITED1, Markers of Nephronic Progenitor Self-Renewal, Remain Active in Primitive Elements of Wilms Tumor. *Journal of Pediatric Surgery*. 2012; 47:1239-1249.
3. Boyle S, et al. Cited1 and Cited2 Are Differentially Expressed in the Developing Kidney but are not Required for Nephrogenesis. *Developmental Dynamics*. 2007; 236:2321-2330.
4. Sehic D, et al. Evaluation of CITED1, SIX1, and CD56 Protein Expression for Identification of Blastemal Elements in Wilms Tumor. *American Journal of Clinical Pathology*. 2014; 141:828-833.

## Ordering Information

### CITED1 (5H6)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	424M-14
0.5 mL concentrate	424M-15
1 mL concentrate	424M-16
1 mL predilute	424M-17
7 mL predilute	424M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Claudin 1

Claudins are a family of over twenty proteins which are components of tight junctions. Tight junctions are specialized regions of cell-to-cell contact made up of a network of strands to act as a molecular 'gasket' for preventing the leakage of ions, water, etc., between cells.<sup>1</sup> Claudin 1 has been shown to distinguish epithelial neoplasms from lymphomas, making it a useful marker for nearly all carcinomas.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** neurofibroma, colon carcinoma

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Spindle Cell Lesions	300
Meningeal Solitary Fibrous Tumor (SFT)	318

## Reference

1. Folpe AL, et al. Expression of claudin-1, a recently described tight junction-associated protein, distinguishes soft tissue perineurioma from potential mimics. *Am J Surg Pathol.* 2002; 26:1620-6.
2. Soini Y. Expression of claudins 1, 2, 3, 4, 5, and 7 in various types of tumors. *Histopathology.* 2005; 47:551-60.

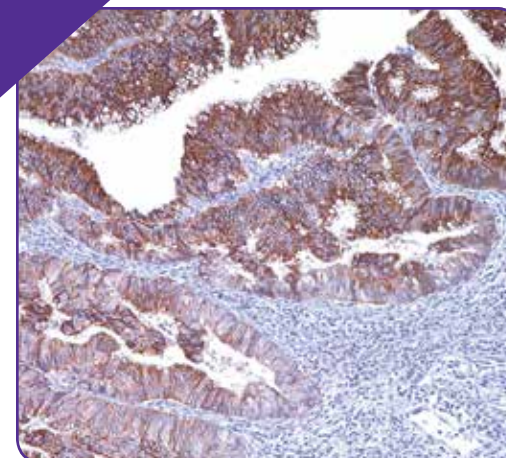
## Ordering Information

### Claudin 1

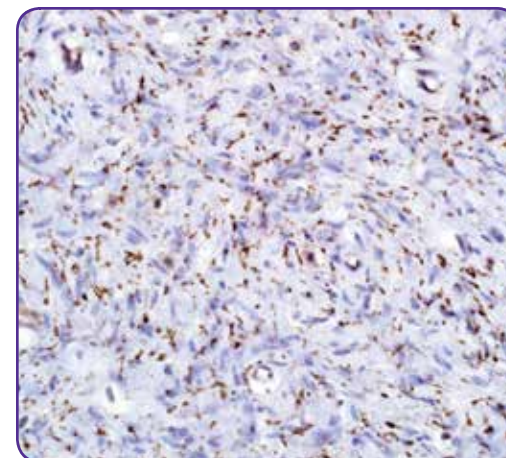
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	359A-14
0.5 mL concentrate	359A-15
1 mL concentrate	359A-16
1 mL predilute	359A-17
7 mL predilute	359A-18

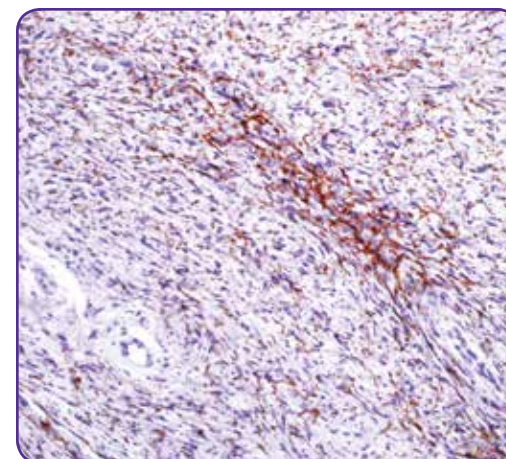
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Colon adenocarcinoma



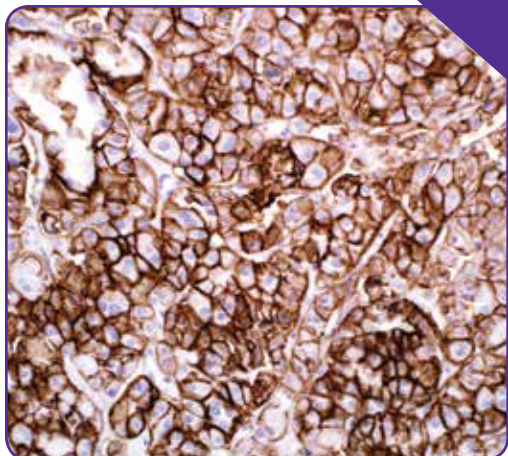
Neurofibroma



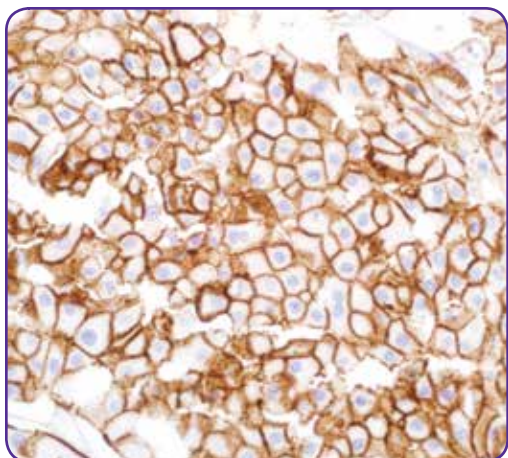
Skin



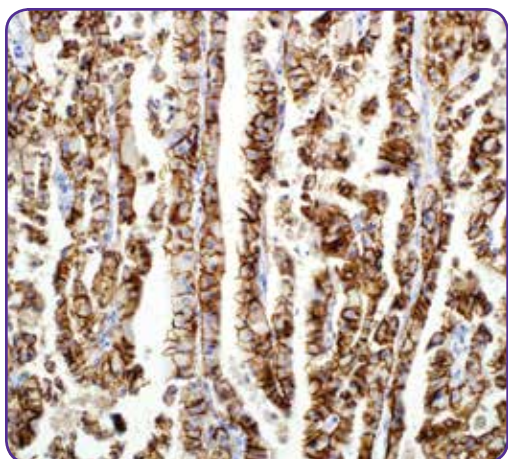
# Claudin 7



Chromophobe renal cell carcinoma



Renal cell carcinoma



Papillary renal cell carcinoma

Claudin 7 is a transmembrane protein involved in the formation of tight junctions between epithelial cells.<sup>1</sup> The Claudin family of proteins are involved in critical roles of cellular polarity, signal transductions, and have been implicated in the pathogenesis of various human neoplasms including chromophobe renal cell carcinoma. The identification between chromophobe renal cell carcinoma and oncocytoma is difficult by light microscopy, and yet important as chromophobe renal cell carcinoma is malignant, whereas oncocytoma is benign.<sup>2</sup> Anti-claudin 7 reactivity is seen in most chromophobe renal cell carcinomas, while it is rarely seen in oncocytomas, and only seen in a minority of clear cell renal cell carcinomas.<sup>1,3</sup> Therefore, anti-claudin 7 could be a useful immunohistochemical marker for the distinction and identification of chromophobe renal cell carcinoma.

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** chromophobe renal cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Kidney Neoplasms	310

## Reference

1. Li L, et al. Expression of Claudin-7 in Benign Kidney and Kidney Tumors. *International Journal of Clinical and Experimental Pathology*. 2008; 1:57-64.
2. Hornsby CD, et al. Claudin-7 Immunohistochemistry in Renal Tumors: A Candidate Marker for Chromophobe Renal Cell Carcinoma Identified by Gene Expression Profiling. *Archives of Pathology and Laboratory Medicine*. 2007; 10:1541-6.
3. Choi YD, et al. Claudin-7 is Highly Expressed In Chromophobe Renal Cell Carcinoma and Renal Oncocytoma. *Journal of Korean Medical Science*. 2007; 2:305-10.
4. Osunkoya AO, et al. Claudin-7 and Claudin-8: Immunohistochemical Markers for the Differential Diagnosis of Chromophobe Renal Cell Carcinoma and Renal Oncocytoma. *Human Pathology*. 2009; 2:206-10.

## Ordering Information

**Claudin 7 (5D10F3)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	418M-14
0.5 mL concentrate	418M-15
1 mL concentrate	418M-16
1 mL predilute	418M-17
7 mL predilute	418M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# CMV

Human cytomegalovirus (CMV) is a  $\beta$ -herpesvirus (human herpesvirus 5) that causes widespread persistent infection. CMV continues to be an important opportunistic pathogen in immunocompromised patients with 30% of transplant recipients experiencing CMV disease. The range of organ involvement in post-transplant CMV disease is wide; hepatitis occurs in 40% of liver transplant recipients<sup>1</sup>, and pneumonitis is more frequently seen in heart and heart-lung transplant patients.<sup>2</sup> Other organs that are commonly affected are the gastrointestinal tract and the peripheral and central nervous systems. Histologic diagnosis of CMV in fixed tissues usually rests on identifying characteristic cytopathic effects including intranuclear inclusions, cytoplasmic inclusions, or both, especially in the endothelial cells. However, histologic examination lacks sensitivity, and in some cases atypical cytopathic features can be confused with reactive or degenerative changes.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** CMV infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 8B1.2, 1G5.2 & 2D4.2: IgG<sub>2a</sub>
- DDG9/CCH2: IgG<sub>2a</sub>/k, IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Cytopathology

## Reference

1. Bronsther O, et al. The occurrence of cytomegalovirus hepatitis in liver transplant patients. *J Med Virol.* 1988; 24:423-34.
2. Drummer JS, et al. Morbidity of cytomegalovirus infection in recipients of heart or heart-lung transplant who received cyclosporine. *J Infect Dis.* 1985; 152:1182-91.
3. Anwar F, et al. Are there cytopathic features associated with cytomegalovirus infection predictive of resistance to antiviral therapy? *Ann Diag Pathol.* 1999; 3:19-22.
4. Kandiel A, et al. Cytomegalovirus colitis complicating inflammatory bowel disease. *Am J Gastroenterol.* 2006; 101:2857-65.
5. Kambham N, et al. Cytomegalovirus infection in steroid-refractory ulcerative colitis: a case-control study. *Am J Surg Pathol.* 2004; 28:365-73.

## Ordering Information

### CMV (8B1.2, 1G5.2 & 2D4.2)

Mouse Monoclonal Antibody

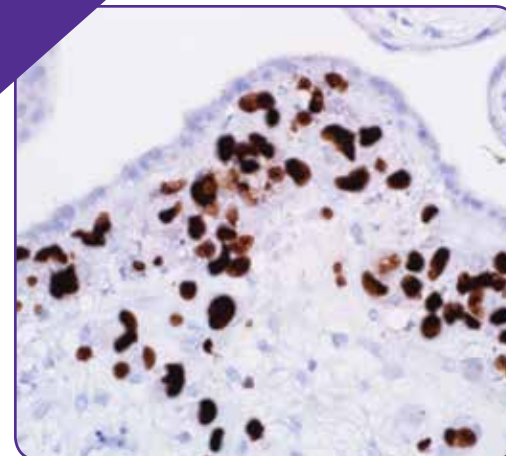
Volume	Part No.
0.1 mL concentrate	213M-24
0.5 mL concentrate	213M-25
1 mL concentrate	213M-26
1 mL predilute	213M-27
7 mL predilute	213M-28

### CMV (DDG9/CCH2)

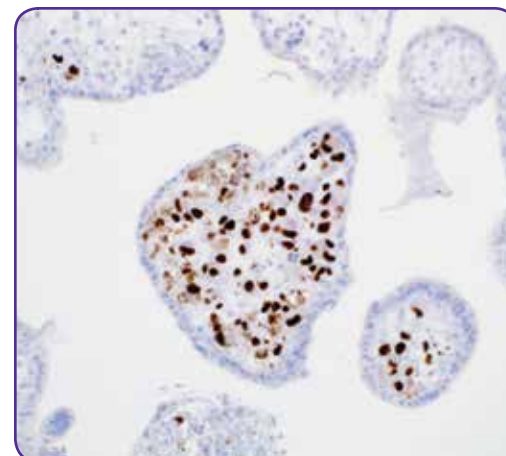
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	213M-14
0.5 mL concentrate	213M-15
1 mL concentrate	213M-16
1 mL predilute	213M-17
7 mL predilute	213M-18

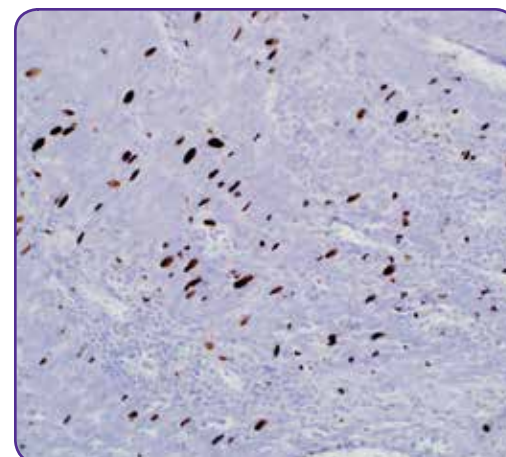
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Placenta

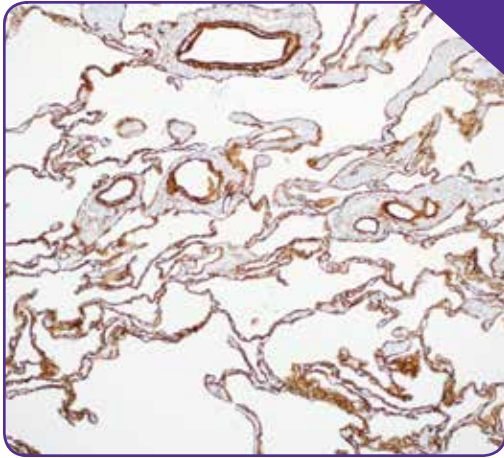


Placenta

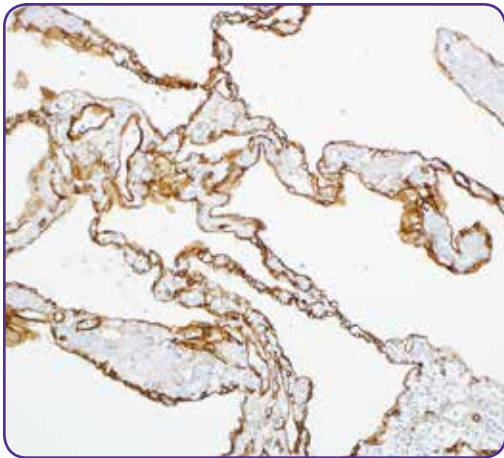


Colon wall

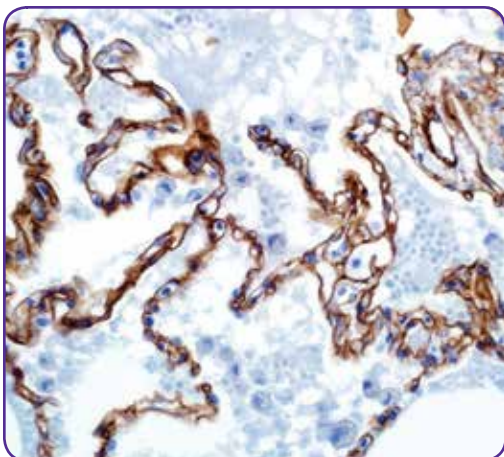
# Collagen Type IV



Lung



Lung



Lung alveolar wall

Collagen Type IV is a major component of the basement membrane and plays an important role in cell adhesion, migration, differentiation and growth.<sup>1-3</sup> In normal tissue, collagen type IV labels the epithelial basal lamina.<sup>1,2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** intercellular

**Control** lung, muscle

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Spindle Cell Melanoma vs. Epithelioid	
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Skin: Spindle Cell Tissues and Tumors	
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## Reference

1. Odermatt BF, et al. Monoclonal antibodies to human type IV collagen: useful reagents to demonstrate the heterotrimeric nature of the molecule. Proc Natl Acad Sci U S A. 1984; 81:7343-7.
2. Laurie GW, et al. Localization of type IV collagen, laminin, heparan sulfate proteoglycan, and fibronectin to the basal lamina of basement membranes. J Cell Biol. 1982; 95:340-4.
3. Abreu-Velez AM, et al. Collagen IV in Normal Skin and in Pathological Processes. N Am J Med Sci. 2012; 4:1-8.

## Ordering Information

### Collagen Type IV (CIV22) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	239M-14
0.5 mL concentrate	239M-15
1 mL concentrate	239M-16
1 mL predilute	239M-17
7 mL predilute	239M-18

Please contact your distributor for details on product availability and regulatory status in your country.

# COX-2

Cyclooxygenase 2 (COX-2) is an essential enzyme involved not only in the mediation of inflammation but also carcinogenesis.<sup>1</sup> Increased expression of COX-2 has been shown in carcinomas of many organ systems including stomach, colorectum, breast and lung.<sup>1,2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** colon adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310

## Reference

1. Stoehlmacker J. Cyclooxygenase-2 inhibitors in colorectal cancer. *Semin Oncol.* 2003; 30:10-6.
2. Sano H, et al. Expression of cyclooxygenase-1 and -2 in human colorectal cancer. *Cancer Res.* 1995; 55:3785-9.

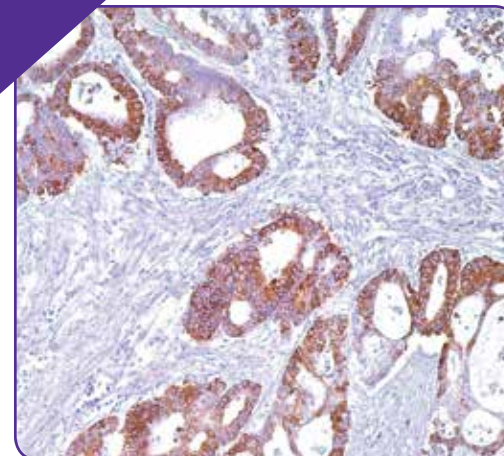
## Ordering Information

### COX-2 (SP21)

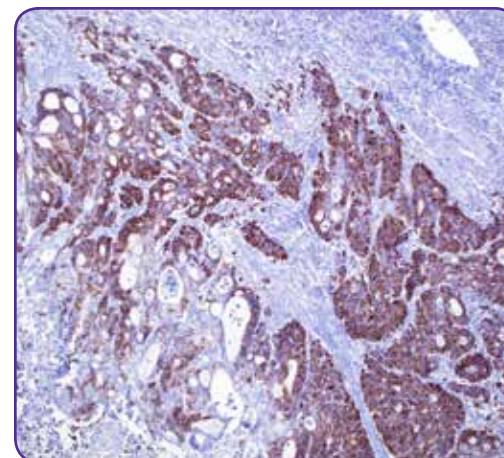
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	240R-14
0.5 mL concentrate	240R-15
1 mL concentrate	240R-16
1 mL predilute	240R-17
7 mL predilute	240R-18

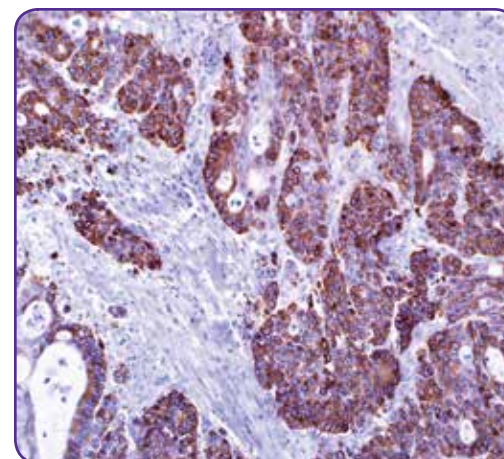
*Please contact your distributor for details on product availability and regulatory status in your country.*



Colorectal carcinoma

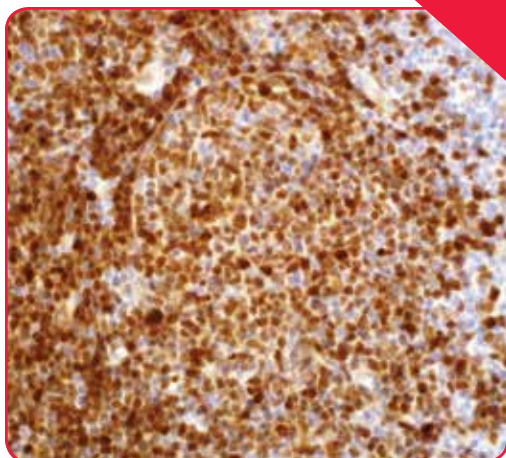


Colorectal carcinoma

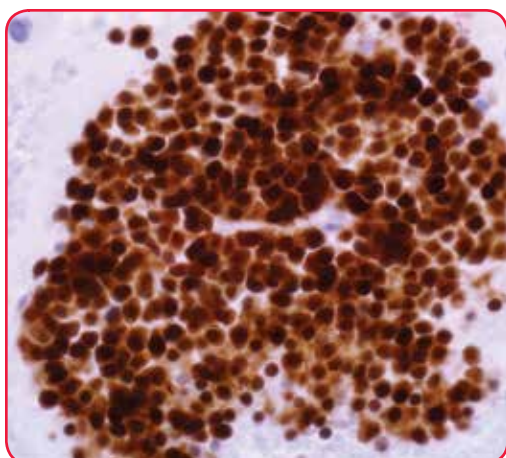


Colorectal carcinoma

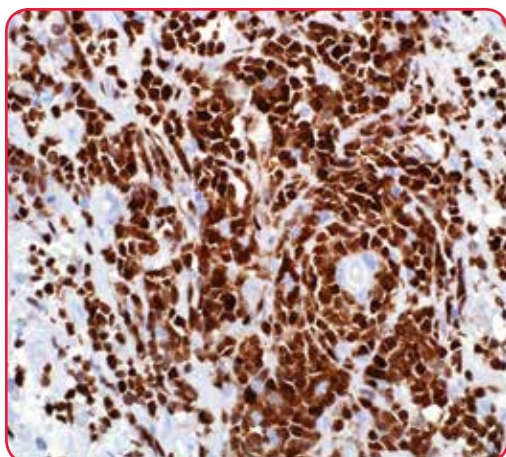
# Cyclin D1



Mantle cell lymphoma



Bone marrow, mantle cell lymphoma



Mantle cell lymphoma

Cyclin D1, one of the key cell cycle regulators, is a putative proto-oncogene overexpressed in a wide variety of human neoplasms. Cyclins are proteins that govern transitions through distinct phases of the cell cycle by regulating the activity of the cyclin-dependent kinases.<sup>1</sup> In mid-to-late G1 phase of the cell cycle, cyclin D1 shows a maximum expression following growth factor stimulation. Anti-cyclin D1 has been successfully employed and is a promising tool for further studies in both cell cycle biology and cancer associated abnormalities.<sup>1-3</sup> This antibody is useful for separating mantle cell lymphomas (cyclin D1 positive) from chronic lymphocytic leukemia/small lymphocytic lymphoma and follicular lymphomas (cyclin D1 negative).<sup>4-7</sup> Hairy cell leukemia and plasma cell myeloma can weakly express cyclin D1.<sup>8</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** mantle cell lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP12: IgG
- SP4: IgG

## Synonyms and Abbreviations

BCL1

## Associated Specialties

Hematopathology

## Associated Grids

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Mature B-cell Neoplasms	315
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Bartkova J, et al. Cancer Research. 1995; 55:949-956.
2. Bartkova J, et al. Oncogene. 1995; 10:775-778.
3. Bartkova J, et al. J Pathol. 1994; 172:237-245.
4. Hankin RC, et al. Arch Pathol Lab Med. 1999; 123:1182-8.
5. Yatabe Y, et al. Blood. 2000; 95:2253-61.
6. Kodet R, et al. Virchows Arch. 2003; 442:538-47.
7. Hui P, et al. Leuk Lymphoma. 2003; 44:1385-94.
8. Swerdlow SH, et al. WHO Press. 2008; 189, 205.

## Ordering Information

### Cyclin D1 (EP12)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	241R-44
0.5 mL concentrate	241R-45
1 mL concentrate	241R-46
1 mL predilute	241R-47
7 mL predilute	241R-48

### Cyclin D1 (SP4)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	241R-14
0.5 mL concentrate	241R-15
1 mL concentrate	241R-16
1 mL predilute	241R-17
7 mL predilute	241R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Cytokeratin (34betaE12)

Anti-cytokeratin, 34betaE12 is an antibody to high molecular weight cytokeratin that reacts with all squamous and ductal epithelium and stains carcinomas. This antibody recognizes cytokeratins 1,5,10, and 14 that are found in complex epithelia. Anti-cytokeratin, 34betaE12 shows no reactivity with hepatocytes, pancreatic acinar cells, proximal renal tubules, or endometrial glands; there has been no reactivity with cells derived from simple epithelia. Mesenchymal tumors, lymphomas, melanomas, and neural tumors are unreactive with this antibody with some exceptions. Anti-cytokeratin, 34betaE12 does label myoepithelial cells and has been shown to be useful in distinguishing prostatic adenocarcinoma from hyperplasia of the prostate. This antibody has also been useful in separating benign from malignant intraductal breast proliferations.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Breast Lesion	302
Prostate Lesions	310
Prostate: Malignant vs. Benign	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310

## Reference

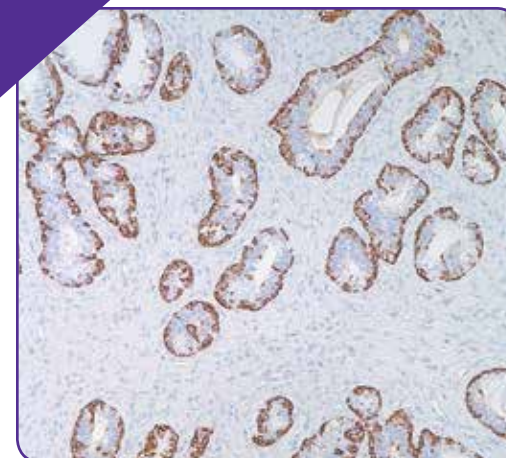
1. Gown AM, et al. Am J Pathol. 1984; 114:309.
2. O'Malley FP, et al. Virch Arch A. 1990; 417:191-6.
3. Amin MB. Arch Pathol Lab Med. 1994; 118:260-264.
4. Wojno KJ, et al. Am J Surg Pathol. 1995; 19:251-60.
5. Moinfar F, et al. Am J Surg Pathol. 1999; 23:1048-58.
6. Yang XJ, et al. Am J Surg Pathol. 1999; 23:147-52.

## Ordering Information

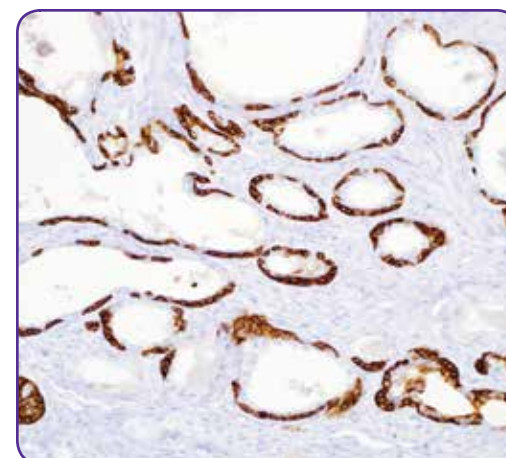
### Cytokeratin (34betaE12) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	334M-84
0.5 mL concentrate	334M-85
1 mL concentrate	334M-86
1 mL predilute	334M-87
7 mL predilute	334M-88
25 mL predilute	334M-80

*Please contact your distributor for details on product availability and regulatory status in your country.*



Prostate

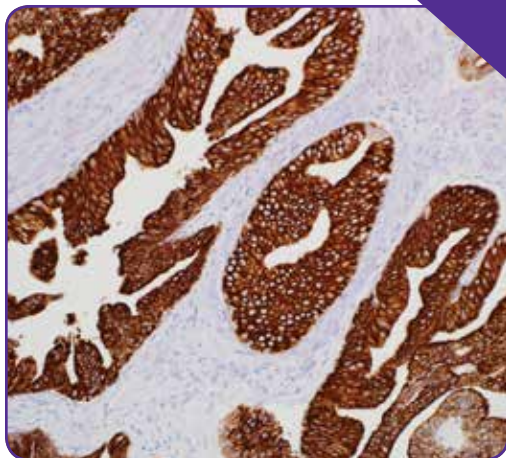


Prostate

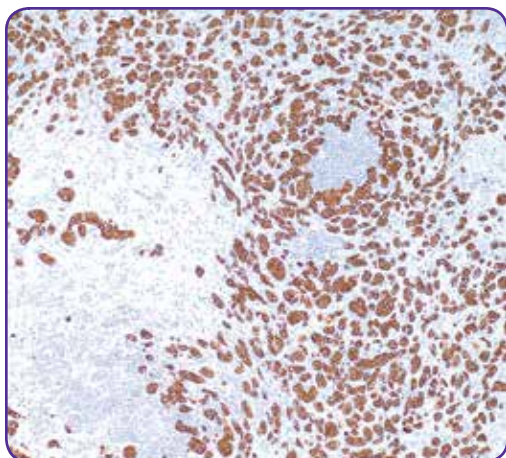


Benign prostate acini

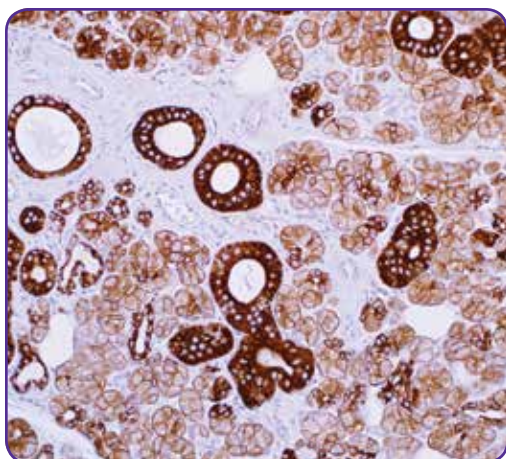
# Cytokeratin (35betaH11)



Prostate



Breast invasive ductal carcinoma



Salivary gland

Cytokeratin 8, a member of the Type II family of cytokeratins, is typically expressed in simple epithelium. Cytokeratin 8, often dimerized with cytokeratin 18, (labeled by 35betaH11) in the cytoplasm of simple epithelial cells allows for the formation of an intermediate filament cytoskeletal framework. This structure plays a role in the maintenance of cellular structural integrity and also functions in promoting signal transduction and cellular differentiation processes.<sup>1</sup> Additionally, the presence of cytokeratin 8 has been detected in neoplastic epithelia, including glandular epithelium that can be found in prostate carcinoma.<sup>2</sup> Positive immunoreactivity with anti-cytokeratin 8 is a useful indicator for the identification of normal and neoplastic epithelial tissues.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM/k

## Synonyms and Abbreviations

Cytokeratin 8

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Epithelioid Cell Neoplasms	296
Cervix Neoplasia	302

## Reference

1. Moll R, et al. The human keratins: biology and pathology. *Histochem Cell Biol.* 2008; 129:705-33.
2. Ljung G, et al. Characterization of residual tumor cells following radical radiation therapy for prostatic adenocarcinoma; immunohistochemical expression of prostate-specific antigen, prostatic acid phosphatase, and cytokeratin 8. *Prostate.* 1997; 31:91-7.
3. Murata T, et al. The diagnostic use of low molecular weight keratin expression in sebaceous carcinoma. *Pathol Res Pract.* 1993; 189:888-93.

## Ordering Information

### Cytokeratin (35betaH11) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	335M-94
0.5 mL concentrate	335M-95
1 mL concentrate	335M-96
1 mL predilute	335M-97
7 mL predilute	335M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Cytokeratin (CAM 5.2)

Anti-CAM 5.2 is a mouse monoclonal antibody that was generated by using the human colorectal carcinoma cell line HT24. Anti-CAM 5.2 is not technically a pan-keratin antibody because its reactivity has been restricted mainly to keratin 8, and also to keratin 7 at a lower level.<sup>1</sup> However, since the few keratins are widely expressed in formalin-fixed, paraffin-embedded tissues, especially in simple and glandular epithelia, this antibody can be successfully used as a reliable marker for neoplasms of epithelial differentiation. Anti-CAM 5.2 reacts with the majority of epithelial tumors, including lung, liver, pancreas, GI tract, breast, genitourinary system, female reproductive organs and some endocrine organs.<sup>2</sup> Adrenal cortical carcinomas frequently do not react with anti-CAM 5.2.<sup>3</sup> Sebaceous carcinoma, squamous cell carcinoma, and basal cell carcinoma may show an overlapping morphology. Anti-CAM 5.2 is useful to discriminate among them. Literature indicates no reactivity by anti-CAM 5.2 for squamous cell carcinoma while sebaceous carcinoma and basal cell carcinoma show 73% and 44% immunoreactivity respectively.<sup>4</sup> Similar to other broad-spectrum keratin antibodies, such as the AE1/AE3 antibody cocktail, anti-CAM 5.2 may stain astrocytic tumors, but the positivity reported for this tumor cross-reactivity is lower than with anti-AE1/AE3.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** appendix, hepatocellular carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>/k

## Associated Specialties

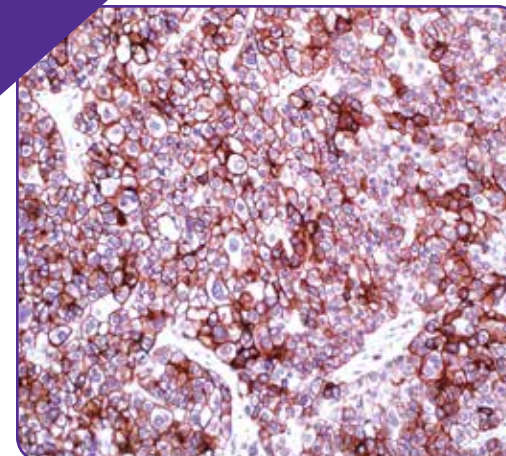
Anatomic Pathology

## Associated Grids

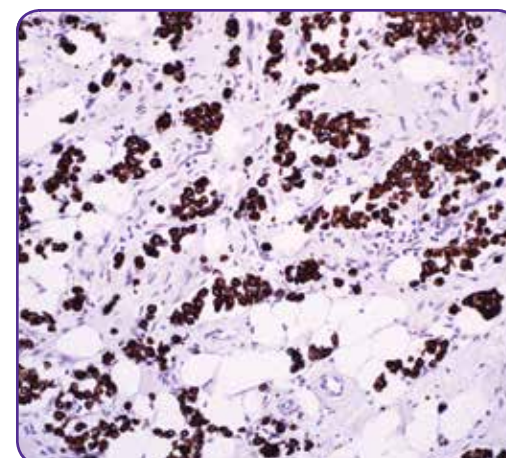
Grid	Page No.
Carcinomas and Sarcomas with Epithelioid Morphology (Features)	293
Skin Neoplasms	306

## Reference

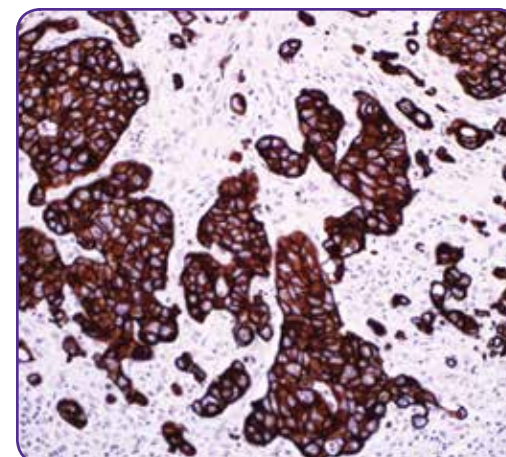
1. Wang S-C, et al. Cytokeratin 8/18 monoclonal antibody was dissimilar to anti-cytokeratin CAM 5.2. *Cancer Chemother Pharmacol.* 2011; 67:243-244.
2. Ordóñez NG. Broad-spectrum immunohistochemical epithelial markers: a review. *Hum Pathol.* 2013; 44:1195-215.
3. Pan CC, et al. Differential immunoprofiles of hepatocellular carcinoma, renal cell carcinoma, and adrenocortical carcinoma: a systemic immunohistochemical survey using tissue array technique. *Appl Immunohistochem Mol Morphol.* 2005; 13:347-52.
4. Sinard JH. Immunohistochemical distinction of ocular sebaceous carcinoma from basal cell and squamous cell carcinoma. *Arch Ophthalmol.* 1999; 117:776-83.
5. Cosgrove MM, et al. Keratin intermediate filament expression in astrocytic neoplasms: analysis by immunocytochemistry, western blot, and northern hybridization. *Mod Pathol.* 1993; 6:342-7.



Hepatocellular carcinoma



Breast carcinoma



Colorectal carcinoma

## Ordering Information

### Cytokeratin (CAM 5.2)

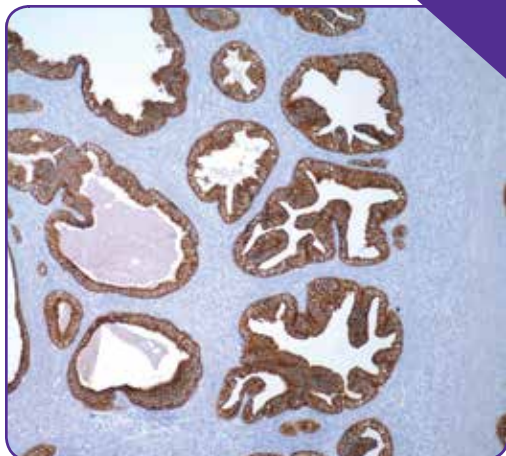
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	452M-94
0.5 mL concentrate	452M-95
1 mL concentrate	452M-96
1 mL predilute	452M-97
7 mL predilute	452M-98
25 mL predilute	452M-90

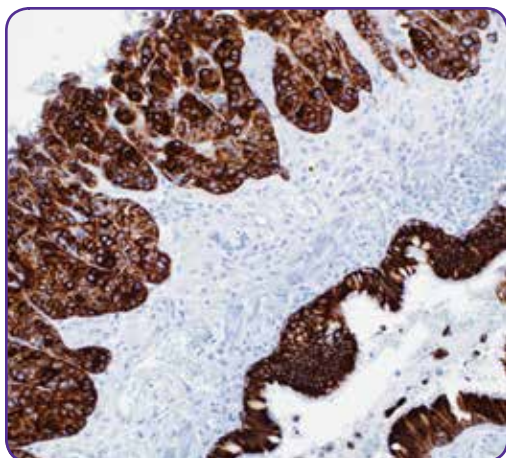
*Please contact your distributor for details on product availability and regulatory status in your country.*



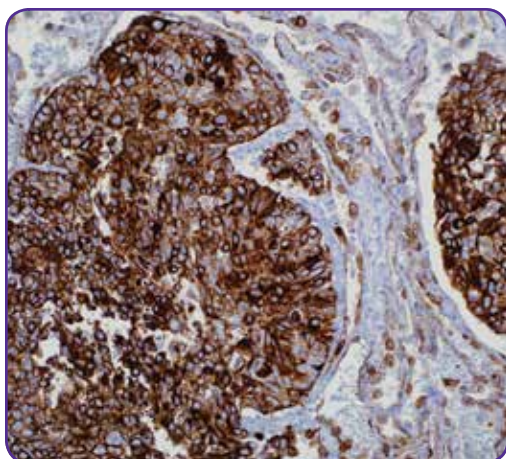
# Cytokeratin (OSCAR)



Prostate



Lung squamous cell carcinoma



Lung squamous cell carcinoma

Cytokeratin (OSCAR) is a wide-spectrum cytokeratin.<sup>1</sup> This antibody stains cytokeratins present in normal and abnormal human tissues and has shown high sensitivity in the recognition of epithelial cells, making it a useful marker for identifying several types of carcinoma.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Placental Trophoblastic Proliferations	303

## Reference

1. Bahrami A, et al. Aberrant expression of epithelial and neuroendocrine markers in alveolar rhabdomyosarcoma: a potentially serious diagnostic pitfall. *Mod Pathol.* 2008; 21:795-806.
2. Galera P, et al. Diagnosis of metaplastic breast carcinoma: keratin OSCAR versus other cytokeratins. *Appl Immunohistochem Mol Morphol.* 2016; 24:622-6.

## Ordering Information

**Cytokeratin (OSCAR)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	300M-14
0.5 mL concentrate	300M-15
1 mL concentrate	300M-16
1 mL predilute	300M-17
7 mL predilute	300M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Cytokeratin 5

Cytokeratin 5 (CK 5) is an intermediate filament protein of 58-kD molecular weight within the cytokeratin family. It is a type II (basic) cytokeratin. Antibodies to this protein identify basal cells of squamous and glandular epithelia, myoepithelia, and mesothelium.<sup>1</sup> Anti-CK 5 has been reported useful in the differential diagnosis of metastatic carcinoma in the pleura versus epithelioid mesothelioma.<sup>2</sup> Epithelioid mesotheliomas are strongly positive in almost all cases, but a minority of pulmonary adenocarcinomas will show focal immunoreactivity.<sup>2</sup> Almost all squamous cell carcinomas, half of transitional carcinomas, and many undifferentiated large cell carcinomas immunostain with anti-CK 5.<sup>3</sup> Anti-CK 5, along with anti-p63, affords a high sensitivity and specificity for squamous differentiation. Myoepithelial cells of the breast,<sup>4,5</sup> glandular epithelia, and basal cells of the prostate are labeled with anti-CK 5.<sup>6</sup> This antibody, along with anti-CK 14, has found application in identifying basal-like breast carcinoma.<sup>5,7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** mesothelioma, prostate

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Breast Carcinoma	302
Skin Neoplasms	306
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Reference

1. Dabbs DJ. Diagnostic Immunohistochemistry. 4th Edition. Elsevier Saunders, Philadelphia, PA. 2014. p. 212.
2. Ordonez NG. What are the current best immunohistochemical markers for the diagnosis of epithelioid mesothelioma? A review and update. Human Pathology. 2007; 38:1-16.
3. Kargi A, et al. The diagnostic value of TTF-1, CK 5/6, and p63 immunostaining in classification of lung carcinomas. Appl Immunohistochem Mol Morphol. 2007; 15:415-420.
4. Clarke CL, et al. Cytokeratin 5/6 in normal human breast: lack of evidence for a stem cell phenotype. J Pathol. 2004; 204:147-52.
5. Dabbs DJ, et al. Basal phenotype of ductal carcinoma in situ: recognition and immunohistologic profile. Mod Pathol. 2006; 19:1506-11.
6. Netto GJ, et al. Diagnostic immunohistochemistry, therapeutic and genomic applications. 3rd Edition. David J Dabbs Saunders Elsevier p.595-6.
7. Livasy CA, et al. Identification of a basal-like subtype of breast ductal carcinoma in situ. Hum Pathol. 2007; 38:197-204.

## Ordering Information

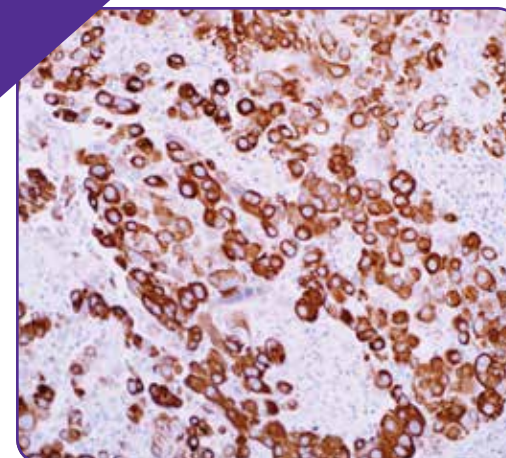
### Cytokeratin 5 (EP1601Y)

Rabbit Monoclonal  
Primary Antibody

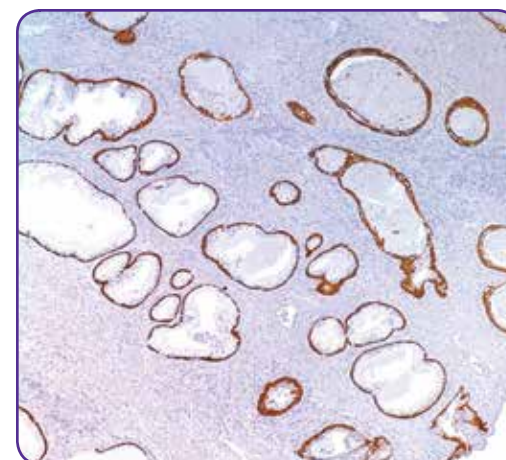


Volume	Part No.
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0.5 mL concentrate	305R-15
1 mL concentrate	305R-16
1 mL predilute	305R-17
7 mL predilute	305R-18

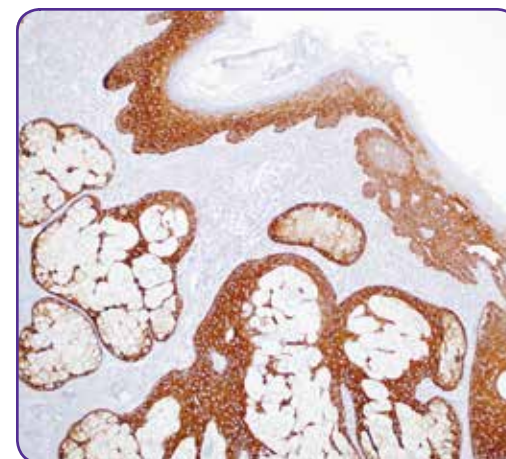
Please contact your distributor for details on product availability and regulatory status in your country.



Mesothelioma

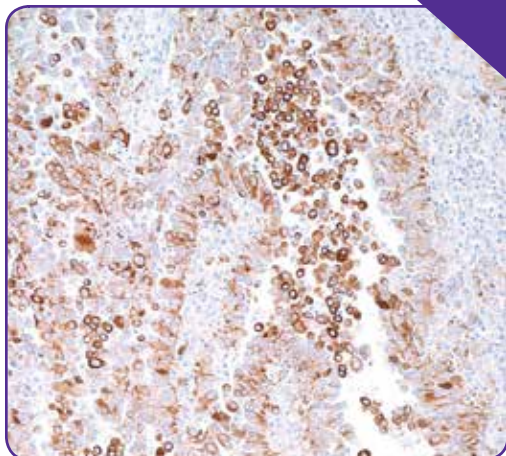


Prostate

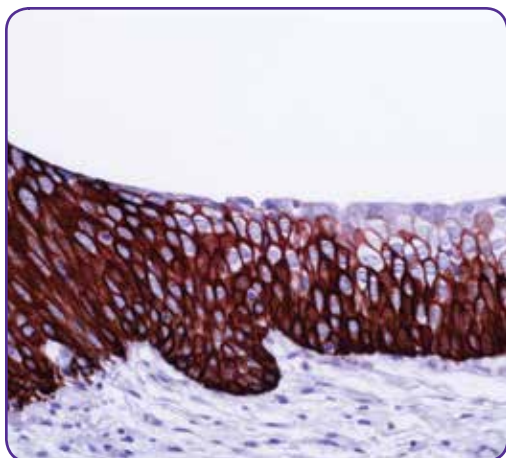


Skin, basal epidermis and sebaceous glands

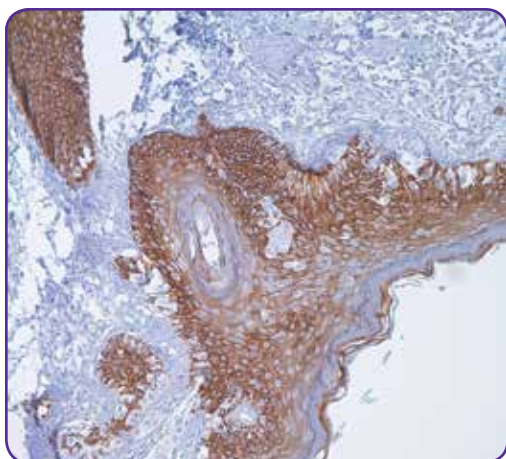
# Cytokeratin 5 & 6



Mesothelioma



Renal pelvis



Skin

Twenty identified cytokeratins make up a complex family of intermediate filaments.<sup>1</sup> Cytokeratin 5 (58-kD) & cytokeratin 6 (56-kD) are type II high molecular weight keratins that are expressed in a broad range of normal tissues including breast, prostate, mesothelium, skin and esophagus.<sup>1-3</sup> Anti-Cytokeratin 5 & 6 is a useful immunohistochemical marker in the identification of mesothelioma and lung squamous cell carcinoma.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** mesothelioma

**Stability** up to 36 mos. at 2-8°C

**Isotype** D5:IgG<sub>1</sub> & 16B4:IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

Cytopathology

Genitourinary (GU) Pathology

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Thymus	301
Non-Invasive Breast Lesions vs. Invasive Ductal Carcinoma	303
Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors	305
Bladder Urothelium: Dysplasia vs. Reactive Changes	308
Prostate: Malignant vs. Benign	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310
Epithelioid Mesothelioma vs. Carcinoma	319
Lung Adenocarcinoma vs. Mesothelioma	319
Lung Squamous Cell Carcinoma vs. Adenocarcinoma	320
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Ordering Information

### Cytokeratin 5 & 6 (D5 & 16B4) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	356M-14
0.5 mL concentrate	356M-15
1 mL concentrate	356M-16
1 mL predilute	356M-17
7 mL predilute	356M-18
25 mL predilute	356M-10

Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

- Ordóñez NG1. Value of cytokeratin 5/6 immunostaining in distinguishing epithelial mesothelioma of the pleura from lung adenocarcinoma. *Am J Surg Pathol.* 1998; 22:1215-1221.
- Takahashi K, et al. Cloning and characterization of multiple human genes and cDNAs encoding highly related type II keratin 6 isoforms. *J Biol Chem.* 1995; 270:18581-92.
- Lersch R, et al. Isolation, sequence, and expression of a human keratin K5 gene: transcriptional regulation of keratins and insights into pairwise control. *Mol Cell Biol.* 1989; 9:3685-97.

# Cytokeratin 5 & 6 + TTF-1

Anti-cytokeratin 5 & 6 is a marker for epithelioid mesotheliomas. Anti-cytokeratin 5 & 6 stains the cytoplasm of such cells. Anti-TTF-1 stains the nuclei in the case of lung adenocarcinomas and is negative in nearly all mesotheliomas. The nuclear vs. cytoplasmic staining pattern of this cocktail can be useful in distinguishing between mesothelioma and adenocarcinoma of the lung.<sup>1-7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic (cytokeratin 5 & 6), nuclear (TTF-1)

**Control** mesothelioma, lung adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub> & IgG<sub>1</sub> + IgG<sub>1</sub>

## Synonyms and Abbreviations

Lung Cocktail

## Associated Specialties

Pulmonary Pathology

## Reference

1. Ordóñez NG. Value of cytokeratin 5/6 immunostaining in distinguishing epithelial mesothelioma of the pleura from lung adenocarcinoma. *Am J Surg Pathol.* 1998; 22:1215-21.
2. Ordóñez NG. Role of immunohistochemistry in distinguishing epithelial peritoneal mesotheliomas from peritoneal and ovarian serous carcinomas. *Am J Surg Pathol.* 1998; 22:1203-14.
3. Cury PM, et al. Value of the mesothelium-associated antibodies thrombomodulin, cytokeratin 5/6, calretinin, and CD44H in distinguishing epithelioid pleural mesothelioma from adenocarcinoma metastatic to the pleura. *Mod Pathol.* 2000; 13:107-12.
4. Jang KY, et al. Utility of thyroid transcription factor-1 and cytokeratin 7 and 20 immunostaining in the identification of origin in malignant effusions. *Anal Quant Cytol Histol.* 2001; 23:400-4.
5. Srodon M, et al. Immunohistochemical staining for thyroid transcription factor-1: a helpful aid in discerning primary site of tumor origin in patients with brain metastases. *Hum Pathol.* 2002; 33:642-5.
6. Abutaily AS, et al. Immunohistochemistry in the distinction between malignant mesothelioma and pulmonary adenocarcinoma: a critical evaluation of new antibodies. *J Clin Pathol.* 2002; 55:662-8.
7. Bejarano PA, et al. Incidence and significance of cytoplasmic thyroid transcription factor-1 immunoreactivity. *Arch Pathol Lab Med.* 2003; 127:193-5.

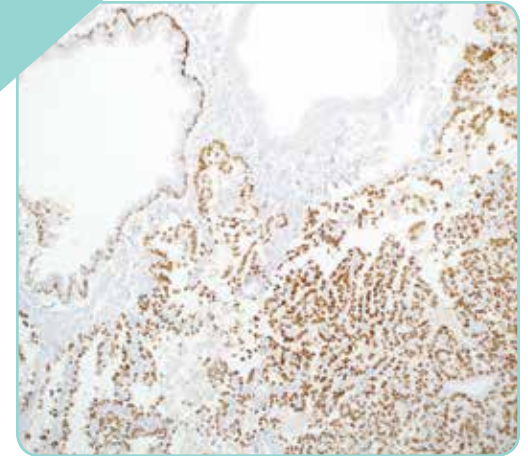
## Ordering Information

**Cytokeratin 5 & 6 (D5/16B4) + TTF-1 (8G7G3/1)**

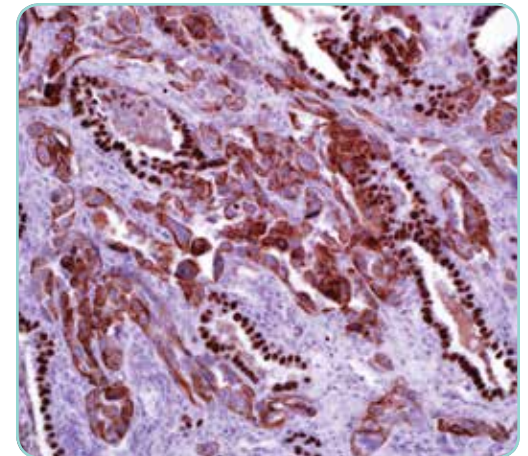
Mouse Monoclonal Antibody

Volume	Part No.
1 mL predilute	902H-07
7 mL predilute	902H-08

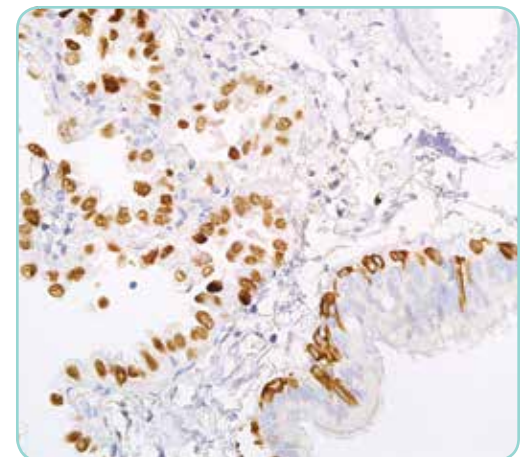
*Please contact your distributor for details on product availability and regulatory status in your country.*



Lung adenocarcinoma

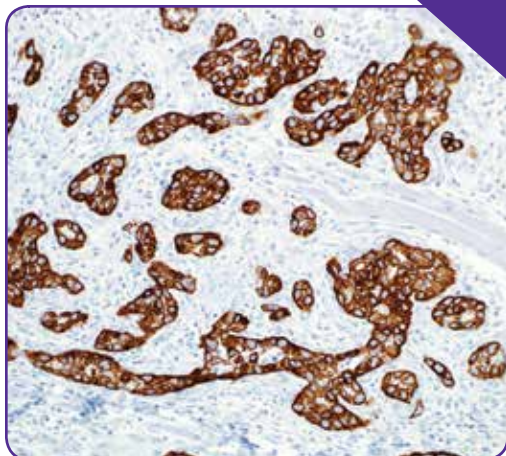


Lung squamous cell carcinoma

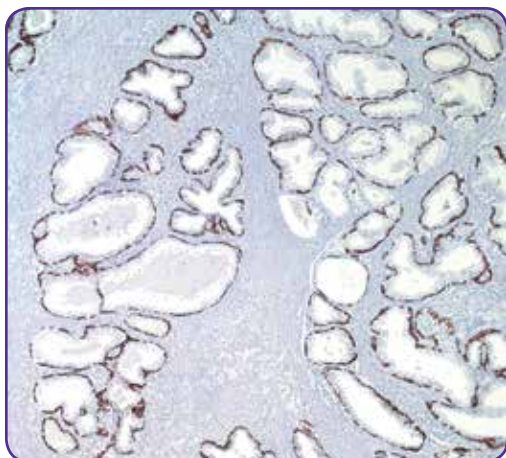


Lung adenocarcinoma

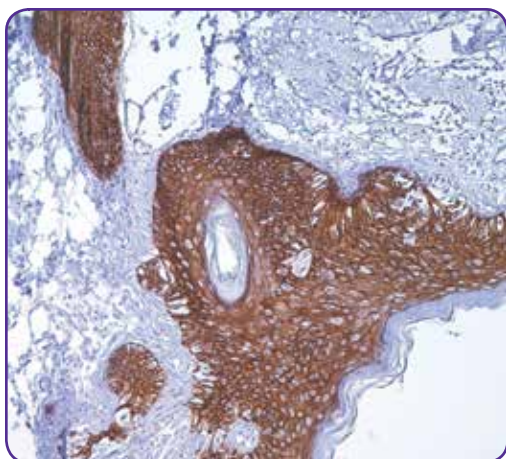
# Cytokeratin 5 + Cytokeratin 14



Lung squamous cell carcinoma



Prostate



Skin

Cytokeratin 5 is an intermediate filament protein of 58-kD amongst the cytokeratin family. It is a type II (basic) cytokeratin. Antibodies to this protein identify basal cells of squamous and glandular epithelia, myoepithelia, and mesothelium.<sup>1</sup> Cytokeratin 14 is a 50-kD polypeptide found in basal cells of squamous epithelia, some glandular epithelia, myoepithelium, and mesothelial cells.<sup>1</sup> Anti-cytokeratin 5 has been useful in the differential diagnosis of metastatic carcinoma in the pleura versus epithelial mesothelioma.<sup>2</sup> Anti-cytokeratin 14 has been demonstrated to be useful in differentiating squamous cell carcinomas from other epithelial tumors.<sup>3,4,6</sup> Anti-cytokeratin 5, along with anti-cytokeratin 14, has been found to have an application in identifying the basal-like phenotype of breast carcinoma.<sup>5,7-9</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic  
**Control** esophagus, squamous cell carcinoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG + IgG<sub>3</sub>

## Synonyms and Abbreviations

Basaloid Cocktail

## Associated Specialties

Anatomic Pathology  
 Genitourinary (GU) Pathology  
 Pulmonary Pathology

## Associated Grids

Grid	Page No.
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Cutaneous Epithelial Neoplasms	304

## Reference

1. Dabbs DJ. Diagnostic immunohistochemistry. 4th Edition. Philadelphia, PA: Elsevier Saunders, 2014. Print. p.212.
2. Comin CE, et al. h-caldesmon, calretinin, estrogen receptor, and Ber-EP4: a useful combination of immunohistochemical markers for differentiating epithelioid peritoneal mesothelioma from serous papillary carcinoma of the ovary. *Am J Surg Pathol.* 2007; 31:1139-48.
3. Reis-Filho JS, et al. Novel and classic myoepithelial/stem cell markers in metaplastic carcinomas of the breast. *Appl Immunohistochem Mol Morphol.* 2003; 11:1-8.
4. Chu PG, et al. Cytokeratin 14 immunoreactivity distinguishes oncocyctic tumour from its renal mimics: an immunohistochemical study of 63 cases. *Histopathology.* 2001; 39:455-62.
5. Dabbs DJ, et al. Basal phenotype of ductal carcinoma in situ: recognition and immunohistologic profile. *Mod Pathol.* 2006; 19:1506-11.

For the complete list of references see the product IFU.

## Ordering Information

**Cytokeratin 5  
 (EP1601Y) +  
 Cytokeratin 14  
 (LL002)**



Mouse and Rabbit Monoclonal Antibody

Volume	Part No.
1 mL predilute	905H-07
7 mL predilute	905H-08

Please contact your distributor for details on product availability and regulatory status in your country.

# Cytokeratin 7

Anti-cytokeratin 7 reacts with the protein that is found in most ductal, glandular, transitional, and biliary duct epithelial cells. Cytokeratin 7 (CK 7) labeling can help distinguish between lung,<sup>1</sup> breast carcinomas, and urothelial carcinomas that typically stain positive, and colon and prostate carcinomas that typically lack CK 7 expression.<sup>2-7</sup> CK 7 is a common marker of primary lung adenocarcinomas (almost all cases) with a lower specificity since it is also observed in other primary lung carcinomas and non-pulmonary carcinomas.<sup>1</sup> Anti-CK 7 has also been useful in the differential diagnosis of ovarian neoplasms.<sup>8</sup> This antibody does not recognize intermediate filament proteins.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** salivary gland, lung adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

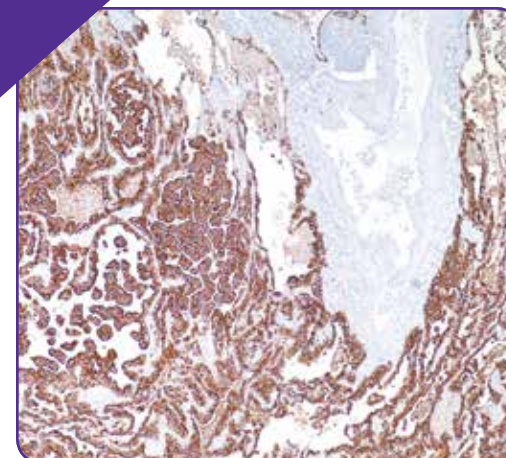
## Associated Grids

Grid	Page No.
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Micropapillary Carcinomas	297
Breast Carcinoma	302
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Skin Neoplasms	306
Liver: Primary and Metastatic Epithelial Neoplasms	308
Pancreatic Epithelial Tissues and Tumors	308
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Kidney Neoplasms	310
Prostate Lesions	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310

## Reference

1. Jerome MV, et al. *Histopathology*. 2004; 45:125-34.
2. Murray SK, et al. *Am J Surg Pathol*. 2004; 28:1154-62.
3. Chu P, et al. *Mod Pathol*. 2000; 13:962-72.
4. Logani S, et al. *Am J Surg Pathol*. 2003; 27:1434-41.
5. Ramalingam P, et al. *Ann Diagn Pathol*. 2003; 7:112-9.

For the complete list of references see the product IFU.



Lung adenocarcinoma

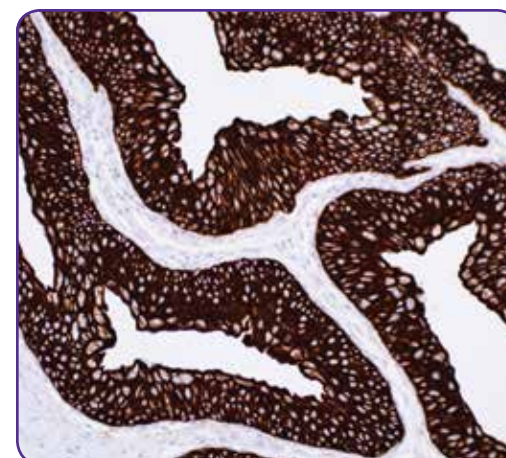
## Ordering Information

### Cytokeratin 7 (OV-TL 12/30)

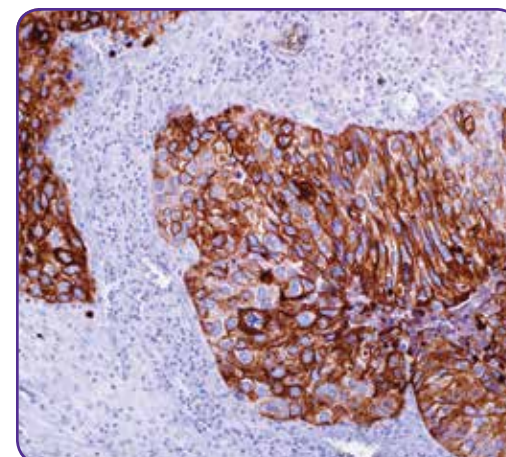
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	307M-94
0.5 mL concentrate	307M-95
1 mL concentrate	307M-96
1 mL predilute	307M-97
7 mL predilute	307M-98
25 mL predilute	307M-90

Please contact your distributor for details on product availability and regulatory status in your country.

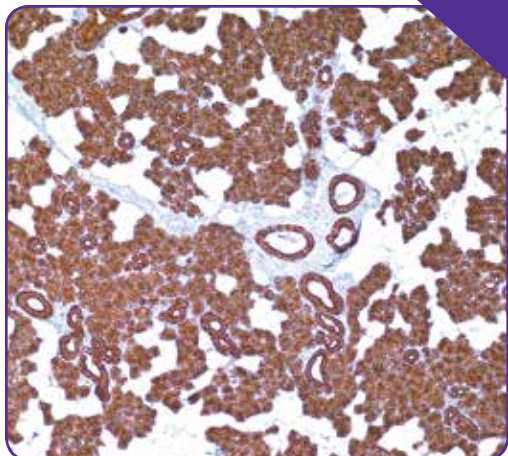


Urothelium

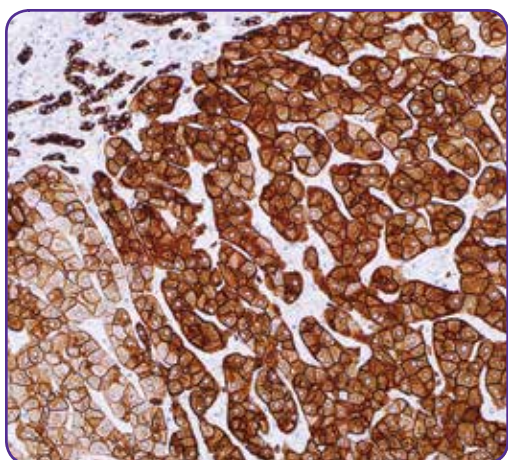


Urothelial carcinoma

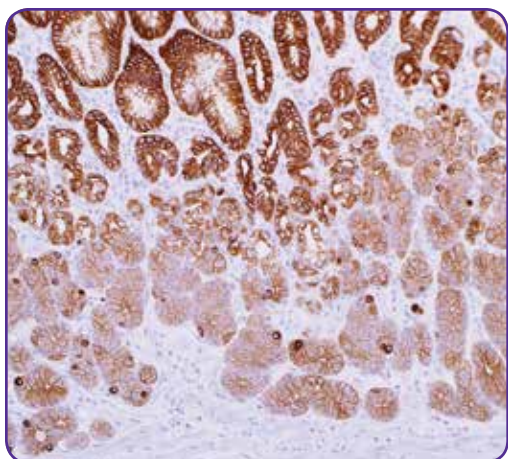
# Cytokeratin 8 & 18



Salivary gland



Cirrhotic liver



Stomach

Cytokeratins 8 & 18 (CK 8 & 18) are expressed in most simple epithelia (e.g. thyroid, breast, gastrointestinal tract, and respiratory tract). Anti-CK 8 & 18 have been reported to stain most adenocarcinomas and squamous cell carcinomas, but not some well-differentiated squamous cell carcinomas.<sup>1-3</sup> CK 8 & 18 have been reported to be useful markers for identifying Paget cells,<sup>4</sup> colorectal carcinoma metastases,<sup>5</sup> and gastric cancer micrometastases.<sup>6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate, pancreas

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Neuroendocrine Tumors from Different Anatomical Locations	299
Sex Cord Stromal Tumors	303
Skin: Basal vs. Squamous Cell Carcinoma	306
Skin: Spindle Cell Tissues and Tumors	306, 307
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324

## Reference

1. Angus B, et al. NCL-5D3: a new monoclonal antibody recognizing low molecular weight cytokeratins effective for immunohistochemistry using fixed paraffin-embedded tissue. *J Pathol.* 1987; 155:377-84.
2. Corson, JM. Keratin protein immunohistochemistry in surgical pathology practice. *Pathol Annu.* 1986; 21:47-81.
3. Moll R, et al. The human keratins: biology and pathology. *Histochem Cell Biol.* 2008; 129:705-33.
4. Liegl B, et al. Mammary and extramammary Paget's disease: an immunohistochemical study of 83 cases. *Histopathology.* 2007; 50:439-47.

For the complete list of references see the product IFU.

## Ordering Information

### Cytokeratin 8 & 18 (B22.1 & B23.1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	818M-94
0.5 mL concentrate	818M-95
1 mL concentrate	818M-96
1 mL predilute	818M-97
7 mL predilute	818M-98
25 mL predilute	818M-90

Please contact your distributor for details on product availability and regulatory status in your country.

# Cytokeratin 10

Cytokeratin 10 (CK 10) belongs to type I and acidic keratin family.<sup>1</sup> It is a low molecular weight keratin that is usually expressed in suprabasal keratinocytes and can also be seen in suprabasal cells of non-cornifying, stratified epithelium.<sup>1</sup> In addition, CK 10 is reported to be a typical component of cells of eccrine sweat gland ducts and sebaceous cells.<sup>2</sup> Anti-CK 10 is helpful in the identification of well differentiated squamous cell carcinoma derived from skin or from internal organs.<sup>2,3</sup> However, CK 10 was found to be sparse in poorly differentiated squamous cell carcinoma, even though it has been reported that focal CK 10 expression has been found in 50% of cases of oral and pharyngeal squamous cell carcinoma.<sup>3</sup> Anti-CK 10 has demonstrated utility in the differentiation of extra-mammary Paget's disease (negative) from basal cell carcinoma and squamous cell carcinoma (positive).<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** squamous cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

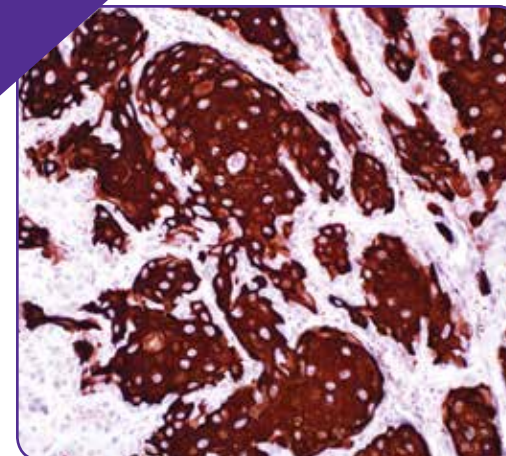
Anatomic Pathology

## Associated Grids

Grid	Page No.
Skin Neoplasms	306

## Reference

1. Moll R, et al. The human keratins: biology and pathology. *Histochem Cell Biol.* 2008; 129:705-733.
2. Kurokawa I, et al. Expression of keratins in cutaneous epithelial tumors and related disorders-distribution and clinical significance. *Experimental Dermatol.* 2011; 20:217-228.
3. Moll R, et al. Cytokeratins as marker of differentiation in the diagnosis of epithelial tumors. *Subcell Biochem.* 1998; 31:205-262.



Skin, squamous cell carcinoma

## Ordering Information

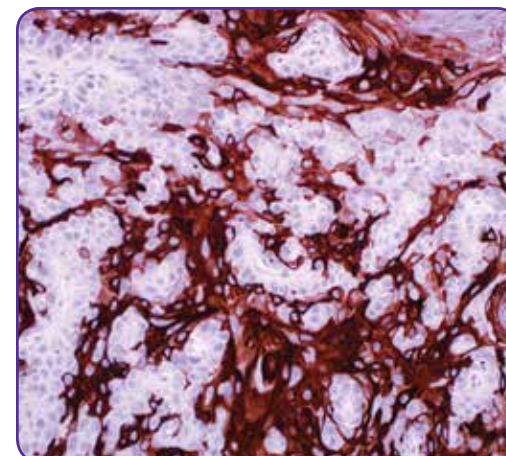
### Cytokeratin 10 (EP97)

Rabbit Monoclonal  
Primary Antibody

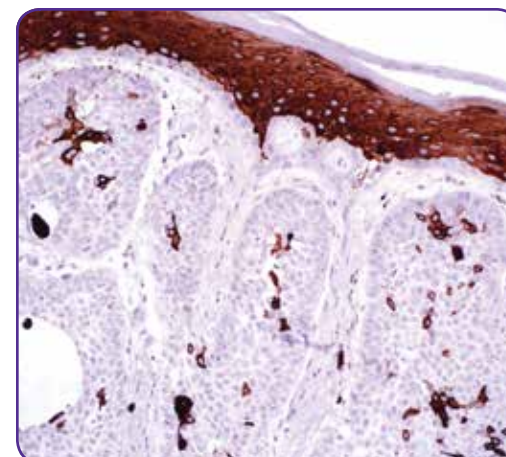


Volume	Part No.
0.1 mL concentrate	410R-14
0.5 mL concentrate	410R-15
1 mL concentrate	410R-16
1 mL predilute	410R-17
7 mL predilute	410R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*



Skin lesion



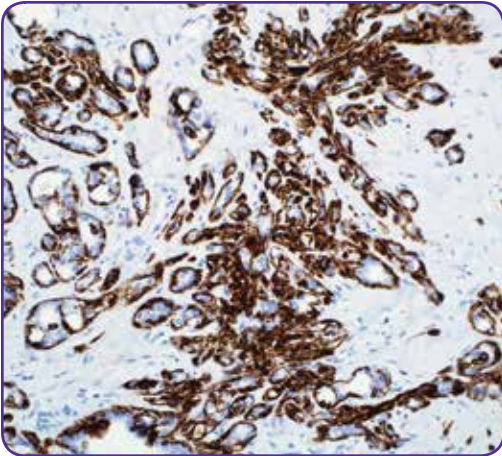
Skin lesion



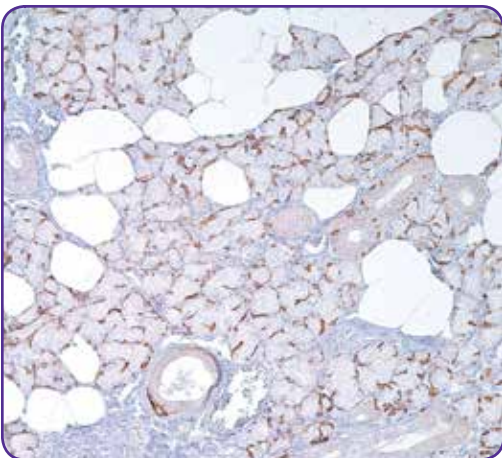
# Cytokeratin 14



Lung squamous cell carcinoma



Sclerosing adenosis



Salivary gland

Cytokeratin 14 is a member of the type I family of cytokeratins and is generally expressed in the basal cell layer of squamous epithelium. The cytokeratin 14 protein forms a heterotetramer with homodimers of cytokeratin 5 to contribute to the structural integrity of the intracellular cytoskeletal network.<sup>1</sup> Anti-cytokeratin 14 has immunohistochemical utility as an aid in distinguishing squamous cell carcinomas from other tumors of epithelial origin.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** squamous cell carcinoma, prostate, skin

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- LL002: IgG<sub>3</sub>
- SP53: IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Thymus	301
Skin Neoplasms	306
Prostate: Malignant vs. Benign	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310

## Reference

1. Moll R, et al. The human keratins: biology and pathology. *Histochem Cell Biol.* 2008; 129:705-33.
2. Chu PG, et al. Cytokeratin 14 expression in epithelial neoplasms: a survey of 435 cases with emphasis on its value in differentiating squamous cell carcinomas from other epithelial tumours. *Histopathology.* 2001; 39:9-16.

## Ordering Information

### Cytokeratin 14 (LL002)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	314M-14
0.5 mL concentrate	314M-15
1 mL concentrate	314M-16
1 mL predilute	314M-17
7 mL predilute	314M-18

### Cytokeratin 14 (SP53)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	314R-14
0.5 mL concentrate	314R-15
1 mL concentrate	314R-16
1 mL predilute	314R-17
7 mL predilute	314R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Cytokeratin 17

Cytokeratin 17 is a 46-kD intermediate filament protein found in basal cells of complex epithelia, such as bronchial epithelial cells, nail beds, sebaceous glands, and is involved in the formation and maintenance of various skin appendages such as hair follicles. Anti-cytokeratin 17 is a useful immunohistochemical reagent for identifying basal cell differentiation and squamous cell neoplasms.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** cervix immature metaplasia, breast

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP98: IgG
- Ks 17.E3: IgG<sub>2b</sub>

## Associated Specialties

Anatomic Pathology


## Associated Grids

Grid	Page No.
Cervix	302
Cervix Neoplasia	302
Skin Neoplasms	306
Ampullary Carcinomas	307

## Reference

1. Regauer S, et al. CK17 and p16 expression patterns distinguish (atypical) immature squamous metaplasia from high-grade cervical intraepithelial neoplasia (CIN III). *Histopathology*. 2007; 50:629-35.
2. Chu PG, et al. Immunohistochemical staining in the diagnosis of pancreatobiliary and ampulla of Vater adenocarcinoma: application of CDX2, CK17, MUC1, and MUC2. *Am J Surg Pathol*. 2005; 29:359-67.
3. Cohen-Kerem R, et al. Cytokeratin-17 as a potential marker for squamous cell carcinoma of the larynx. *Ann Otol Rhinol Laryngol*. 2004; 113:821-7.
4. Martens JE, et al. Cytokeratin 17 and p63 are markers of the HPV target cell, the cervical stem cell. *Anticancer Res*. 2004; 24:771-5.

## Ordering Information

**Cytokeratin 17 (EP98)**  CELL MARQUE  
Rabbit Monoclonal  
Primary Antibody  RabMAB  
Technology from Abcam

Volume	Part No.
0.1 mL concentrate	317R-14
0.5 mL concentrate	317R-15
1 mL concentrate	317R-16
1 mL predilute	317R-17
7 mL predilute	317R-18

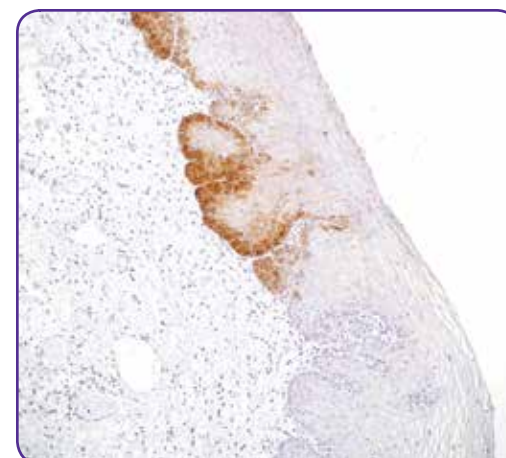
**Cytokeratin 17 (Ks 17.E3)**  
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	317M-15
1 mL concentrate	317M-16
1 mL predilute	317M-17
7 mL predilute	317M-18

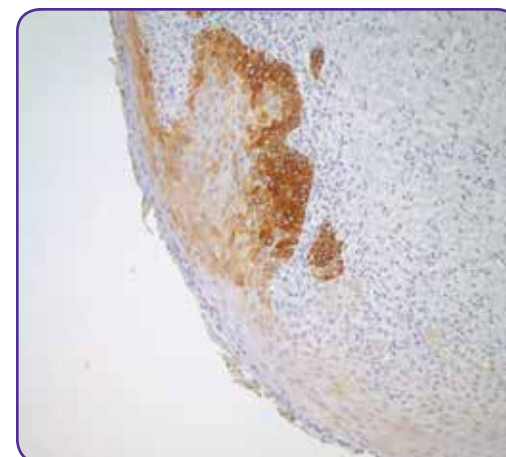
*Please contact your distributor for details on product availability and regulatory status in your country.*



Cervical intraepithelial neoplasia III

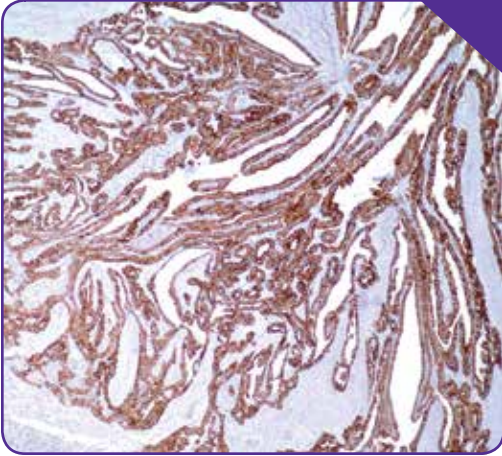


Benign cervical epithelium

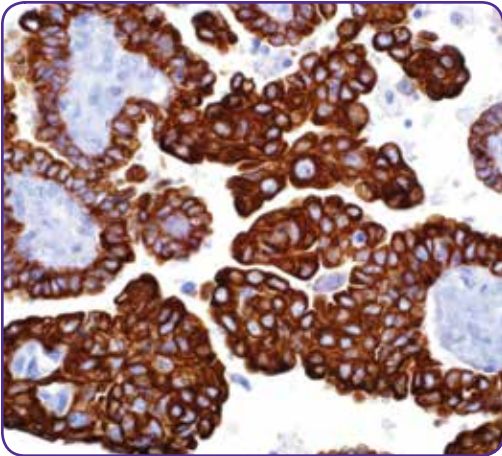


Uterine cervix

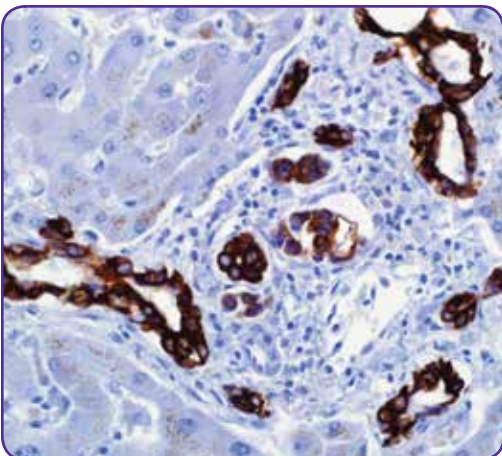
# Cytokeratin 19



Thyroid papillary carcinoma



Thyroid papillary carcinoma



Liver

Anti-cytokeratin 19 reacts with epithelia and epithelial malignancies including carcinomas of the colon, stomach, pancreas, biliary tract, liver, and breast.<sup>1</sup> Anti-cytokeratin 19 is very useful in differentiation of hepatocellular carcinoma from intrahepatic cholangiocarcinoma, especially in a combination of cytokeratin 7, CAM 5.2, Ber-EP4/MOC-31, Hep Par-1 and TTF-1.<sup>1</sup> Another useful application is the identification of thyroid papillary carcinoma.<sup>2-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** bladder, colon, colon carcinoma, thyroid carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- A53-B/A2.26: IgG<sub>2a</sub>/Lambda
- EP72: IgG

## Associated Specialties

Anatomic Pathology

Cytopathology

Head and Neck Pathology

## Associated Grids

Grid	Page No.
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Cutaneous Neoplasms	304
Skin Neoplasms	306
Liver: Primary and Metastatic Epithelial Neoplasms	308
Pancreatic Epithelial Tissues and Tumors	308

## Reference

1. Jain R, et al. The use of Cytokeratin 19 (CK19) immunohistochemistry in lesions of the pancreas, gastrointestinal tract, and liver. *Appl Immunohistochem Mol Morphol.* 2010; 18:9-15.
2. Rosai J. Immunohistochemical markers of thyroid tumors: significance and diagnostic applications. *Tumori.* 2003; 89:517-9.
3. de Matos LL, et al. Expression of CK-19, galectin-3 and HBME-1 in the differentiation of thyroid lesions: systematic review and diagnostic meta-analysis. *Diagn Pathol.* 2012; 7:97.

## Ordering Information

### Cytokeratin 19 (A53-B/A2.26) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	319M-14
0.5 mL concentrate	319M-15
1 mL concentrate	319M-16
1 mL predilute	319M-17
7 mL predilute	319M-18

### Cytokeratin 19 (EP72) Rabbit Monoclonal Primary Antibody

**RabMAb**  
Technology from Abcam

Volume	Part No.
0.1 mL concentrate	319R-24
0.5 mL concentrate	319R-25
1 mL concentrate	319R-26
1 mL predilute	319R-27
7 mL predilute	319R-28

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Cytokeratin 20

Cytokeratin 20 is a 46-kD intermediate filament protein which reacts primarily with gastric and intestinal epithelium, urothelium, and Merkel cells.<sup>1-4</sup> Anti-cytokeratin 20 is useful in the identification of specific types of these epithelial cells under normal hyperplastic and neoplastic conditions.<sup>3</sup> Cytokeratin 20 has been detected in adenocarcinomas of the colon, stomach and biliary tract.<sup>5-7</sup> Merkel cell carcinomas have shown reactivity. In contrast, adenocarcinomas from breast and lung, non-mucinous carcinomas from ovary are generally non-reactive.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** colon carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
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Colon vs. Prostate Adenocarcinoma	294
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Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310

## Ordering Information

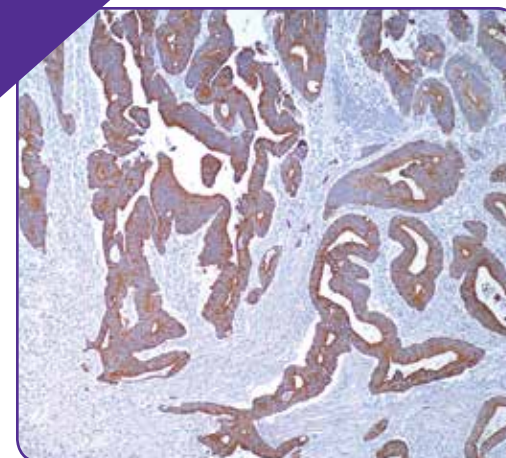
### Cytokeratin 20 (Ks20.8) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	320M-14
0.5 mL concentrate	320M-15
1 mL concentrate	320M-16
1 mL predilute	320M-17
7 mL predilute	320M-18
25 mL predilute	320M-10

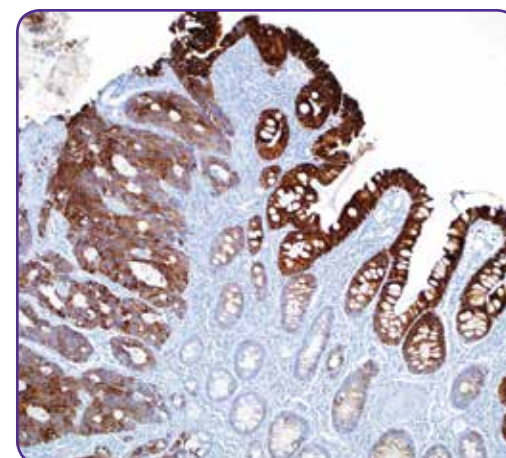
Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

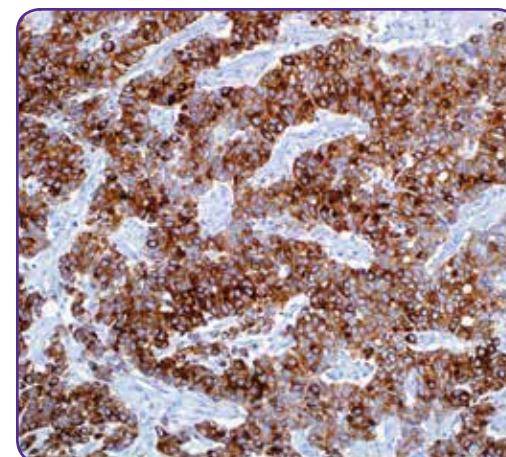
- Moll R, et al. Identification of protein IT of the intestinal cytoskeleton as a novel type 1 cytokeratin with unusual properties and expression patterns. *J Cell Biol.* 1990; 111:567-80.
- Moll R, et al. The catalog of human cytokeratins: patterns of expression in normal epithelia, tumors and cultured cells. *Cell.* 1982; 31:11-24.
- Han AC and Duszak R Jr. Coexpression of cytokeratins 7 and 20 confirms urothelial carcinoma presenting as an intrarenal tumor. *Cancer.* 1999; 86:2327-30.
- Moll R, et al. Cytokeratin 20 in human carcinomas: a new histodiagnostic marker detected by monoclonal antibodies. *AJP.* 1992; 140:427-47.
- Tot T. Adenocarcinomas metastatic to the liver: the value of cytokeratins 20 and 7 in search for unknown primary tumors. *Cancer.* 1999; 85:171-7.
- Lau SK, et al. Comparative immunohistochemical profile of hepatocellular carcinoma, cholangiocarcinoma, and metastatic adenocarcinoma. *Hum Pathol.* 2002; 33:1175-81.
- Rullier A, et al. Cytokeratin 7 and 20 expression in cholangiocarcinomas varies along the biliary tract but still differs from that in colorectal carcinoma metastasis. *Am J Surg Pathol.* 2000; 24:870-6.



Colorectal adenocarcinoma

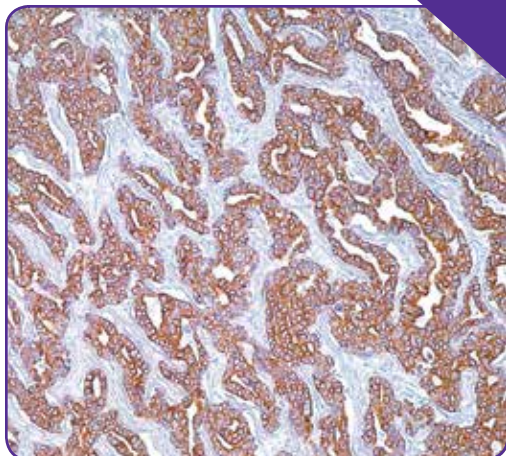


Colonic mucosa, high-grade dysplasia

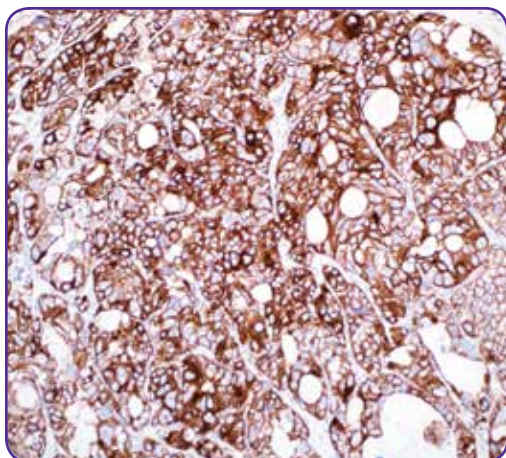


Metastatic colorectal carcinoma

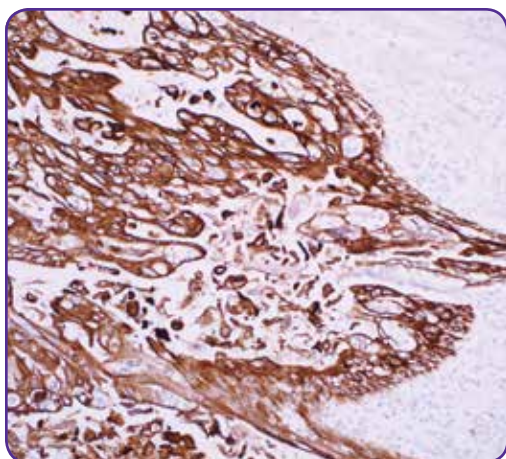
# Cytokeratin Cocktail



Colorectal carcinoma



Prostate carcinoma



Esophageal squamous cell carcinoma

Anti-cytokeratin cocktail (AE1 & AE3) is the broad-spectrum keratin antibody cocktail.<sup>1-3</sup> It is composed of mouse monoclonal antibody AE1 that recognizes the acidic type I keratins 10, 14, 15, 16, 19, and AE3 that reacts with the basic type II keratins 1, 2, 3, 4, 5, 6, 7, and 8. Both clones were generated using epidermal keratin as immunogen.<sup>1-3</sup> This antibody detects carcinomas of different organ origin, but is most frequently negative in hepatocellular carcinoma, chromophobe RCC, adrenal cortical carcinoma, some clear cell RCC, and renal oncocytoma.<sup>1,2</sup> This antibody cocktail can cross-react with other intermediate filaments, such as glial fibrillary acidic protein, giving a false-positive staining in glial tumors.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic  
**Control** breast, lung, colon, skin  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>1</sub>/k & IgG<sub>2</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Neuroendocrine Neoplasms	298
Neuroendocrine Tumors from Different Anatomical Locations	299
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Sex Cord Stromal Tumors	303
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Skin: Basal vs. Squamous Cell Carcinoma	306
Skin: DFSP vs. DF-FH	306
Skin: Spindle Cell Tissues and Tumors	306, 307
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Soft Tissue Tumors	322, 323
SFT vs. Other Soft Tissue Tumors	323

## Ordering Information

### Cytokeratin Cocktail (AE1 & AE3)

#### Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	313M-14
0.5 mL concentrate	313M-15
1 mL concentrate	313M-16
1 mL predilute	313M-17
7 mL predilute	313M-18
25 mL predilute	313M-10

Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

- Battifora H. Clinical applications of the immunohistochemistry of filamentous proteins. *Am J Surg Pathol.* 1988; 12:24.
- Cooper D, et al. Classification of human epithelia and their neoplasms using monoclonal antibodies to keratins: strategies, applications, and limitations. *Lab Invest.* 1985; 52:243-56.
- Gown AM, et al. Monoclonal antibodies to human intermediate filament proteins. III. Analysis of tumors. *AM J Clin Pathol.* 1985; 84:413.
- Kriho UK, et al. Keratin expression in astrocytomas: An immunofluorescent and biochemical reassessment. *Virehows Arch.* 1997; 431:139-47.

# Cytokeratin, HMW

Anti-cytokeratin, high molecular weight (AE3) is capable of recognizing all basic keratins; therefore, it is a broadly reactive antibody staining most epithelia and their neoplasms. Members of the acidic and basic subfamilies are found together in pairs. Since each epithelium contains at least one acidic and one basic keratin, this antibody is used to observe the distribution of keratin-containing cells in normal epithelia and to identify neoplasms derived from such epithelium.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate, salivary gland, bladder

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

Cytokeratin AE3

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
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## Reference

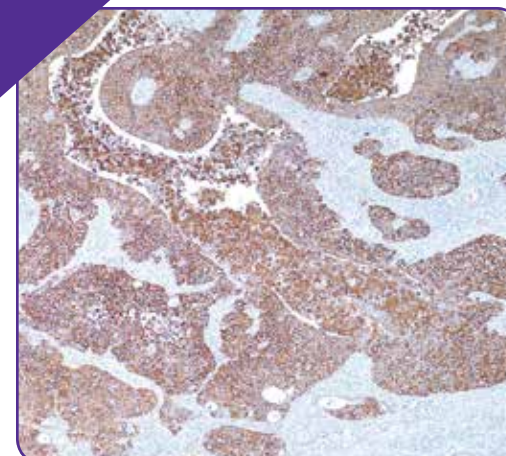
1. Tyler CR. Immunoperoxidase techniques: practical and theoretical aspects. Arch Pathol Lab Med. 1978; 102:113-21.
2. Weiss RA, et al. Monoclonal antibody analysis of keratin expression in epidermal diseases: a 48- and 56-kDton keratin as molecular markers for hyperproliferative keratinocytes. J Cell Biol. 1984; 98:1397-406.
3. Lopez-Beltrán A, et al. Lymphoepithelioma-like carcinoma of the urinary bladder: a clinicopathologic study of 13 cases. Virchows Arch. 2001; 438:552-7.
4. Nelson WG, et al. The 50- and 58-kDton keratin classes as molecular markers for stratified squamous epithelia: cell culture studies. J Cell Biol. 1983; 97:244-51.
5. Sun TT, et al. Monoclonal antibody studies of mammalian epithelial keratins: a review. Ann N Y Acad Sci. 1985; 455:307-29.

## Ordering Information

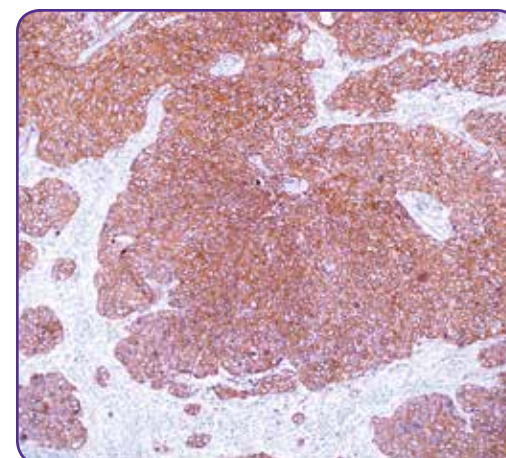
### Cytokeratin, HMW (AE3) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	303M-14
0.5 mL concentrate	303M-15
1 mL concentrate	303M-16
1 mL predilute	303M-17
7 mL predilute	303M-18

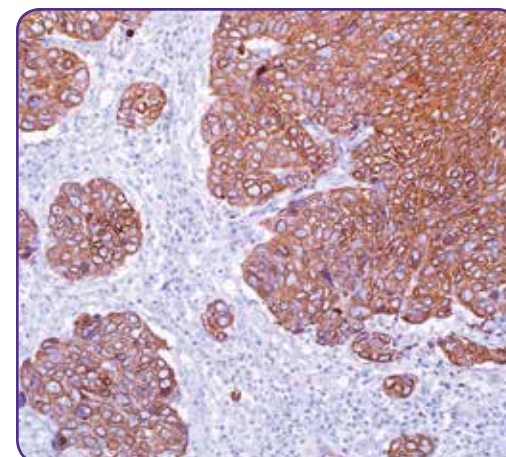
*Please contact your distributor for details on product availability and regulatory status in your country.*



Squamous cell carcinoma

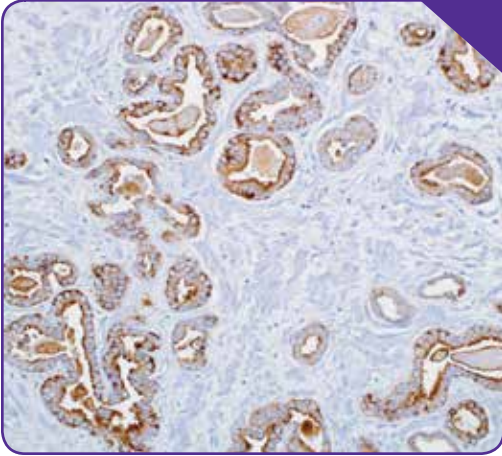


Squamous cell carcinoma

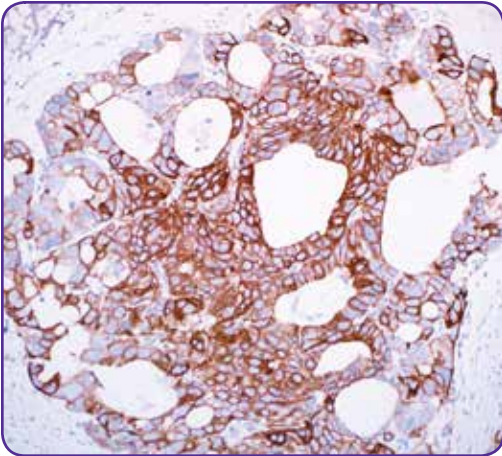


Squamous cell carcinoma

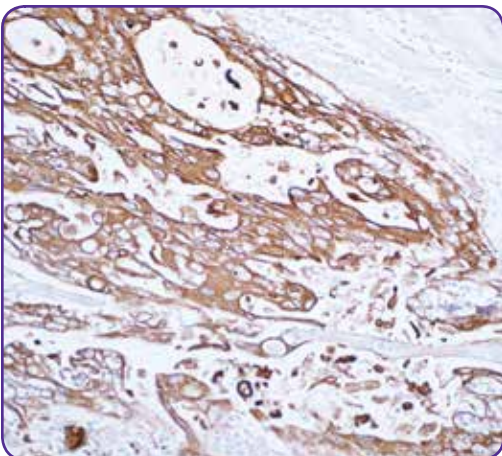
# Cytokeratin, LMW



Prostate



Prostate



Esophageal squamous cell carcinoma

Anti-cytokeratin, low molecular weight (AE1) antibody labels acidic keratins K10, K14, K15, K16, and K19. Anti-cytokeratin (AE1) reactivity is seen in most normal and neoplastic cells of epithelial origin. Anti-cytokeratin (AE1) is a useful immunohistochemical reagent for distinguishing between poorly differentiated carcinomas and non-epithelial neoplasms.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate, salivary gland

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

Cytokeratin AE1

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Skin: Pagetoid Tumors	306

## Reference

1. Tyler CR. Immunoperoxidase techniques: practical and theoretical aspects. Arch Pathol Lab Med. 1978; 102:113-21.
2. Weiss RA, et al. Monoclonal antibody analysis of keratin expression in epidermal diseases: a 48- and 56-kD keratin as molecular markers for hyperproliferative keratinocytes. J Cell Biol. 1984; 98:1397-406.
3. Swanson PE, et al. Heffalumps, jaguars, and cheshire cats. A commentary on cytokeratins and soft tissue sarcomas. Am J Clin Pathol. 1991; 95:S2-7.
4. Eusebi V, et al. Keratin-positive epithelioid angiosarcoma of thyroid. A report of four cases. Am J Clin Pathol. 1990; 14:737-47.
5. Dabbs DJ. Diagnostic Immunohistochemistry. Churchill Livingstone. 2002; 166-74.
6. Lopez-Beltran A, et al. Lymphoepithelioma-like carcinoma of the urinary bladder: a clinicopathologic study of 13 cases. Virchows Arch. 2001; 438:552-7.
7. Kitazawa R, et al. In situ demonstration of parathyroid hormone-related protein mRNA in sclerosing hepatic carcinoma. Virchows Arch. 1999; 435:137-42.
8. Judkins AR, et al. Sensitivity and specificity of antibodies on necrotic tumor tissue. Am J Clin Pathol. 1998; 110:641-6.
9. Demetris AJ, et al. Ductular reaction after submassive necrosis in humans. Special emphasis on analysis of ductular hepatocytes. Am J Pathol. 1996; 149:439-48.

## Ordering Information

### Cytokeratin, LMW (AE1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	301M-14
0.5 mL concentrate	301M-15
1 mL concentrate	301M-16
1 mL predilute	301M-17
7 mL predilute	301M-18

Please contact your distributor for details on product availability and regulatory status in your country.

# Desmin

Anti-desmin detects a protein that is expressed by cells of normal smooth, skeletal, and cardiac muscles. It has been suggested that desmin is primarily located at or near the periphery of Z lines in striated muscle fibrils.<sup>1</sup> In smooth muscle, desmin interconnects cytoplasmic dense bodies with membrane bound dense plaques. Anti-desmin reacts with leiomyomas, leiomyosarcoma, rhabdomyomas, rhabdomyosarcoma, and perivascular cells of glomus tumors of the skin.<sup>1-4</sup> This antibody is used to demonstrate the myogenic components/derivation of tumors.<sup>2,3</sup> Desmin can also be present in myofibroblasts and be focally positive in desmoid fibromatosis.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** skeletal muscle

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- D33: IgG
- EP15: IgG<sub>1</sub>/k

## Associated Specialties

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Epithelioid Cell Neoplasms	296
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
PEComa	299
Spindle Cell Tumors	300
Spindle Cell Lesions	300
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Skin: Dermatofibrosarcoma Protuberans (DFSP) vs. Dermatofibroma Fibrous Histiocytoma (DF-FH)	306
Neuroblastoma vs. Other Small Round Cell Tumors	321
Soft Tissue Neoplasms	322
Soft Tissue Tumors	322, 323
Solitary Fibrous Tumor vs. Other Soft Tissue Tumors	323

## Reference

1. Kouloumenta A, et al. Journal of Biological Chemistry. 2007; 282:35211-21.
2. Altmannberger M, et al. Am J Pathol. 1985; 118:85-95.
3. Debus E, et al. EMBO J. 1983; 2:2305-12.
4. Yamaguchi U, et al. Virchows Arch. 2004; 2:142-50.

## Ordering Information

### Desmin (D33)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	243M-14
0.5 mL concentrate	243M-15
1 mL concentrate	243M-16
1 mL predilute	243M-17
7 mL predilute	243M-18

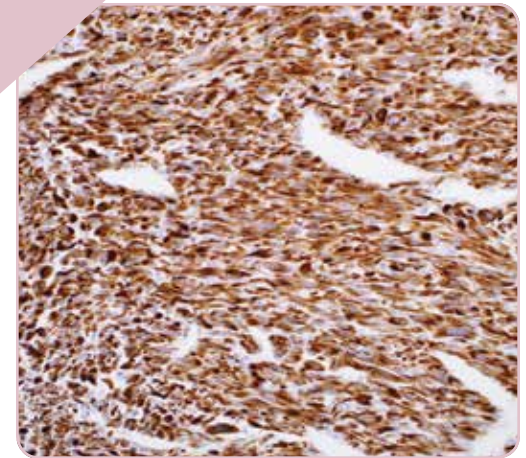
### Desmin (EP15)

Rabbit Monoclonal Primary Antibody

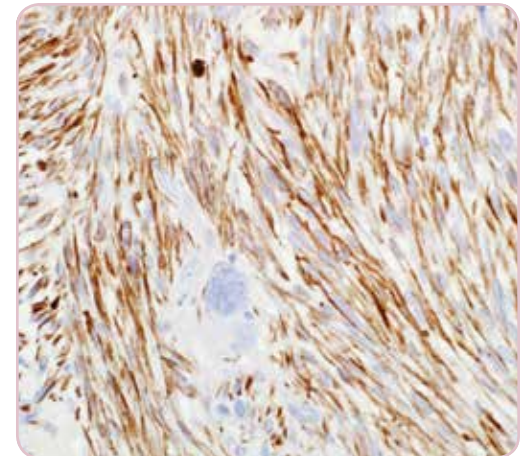


Volume	Part No.
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0.5 mL concentrate	243R-15
1 mL concentrate	243R-16
1 mL predilute	243R-17
7 mL predilute	243R-18

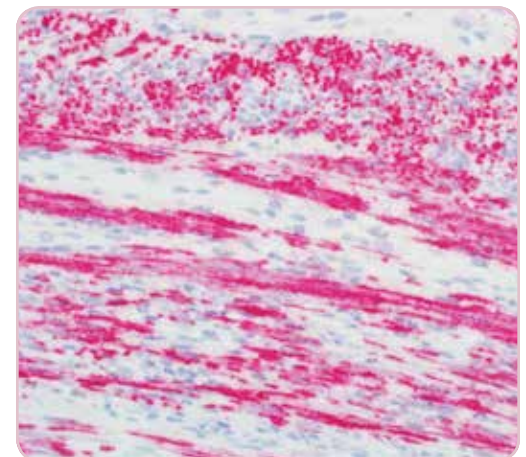
Please contact your distributor for details on product availability and regulatory status in your country.



Rhabdomyosarcoma



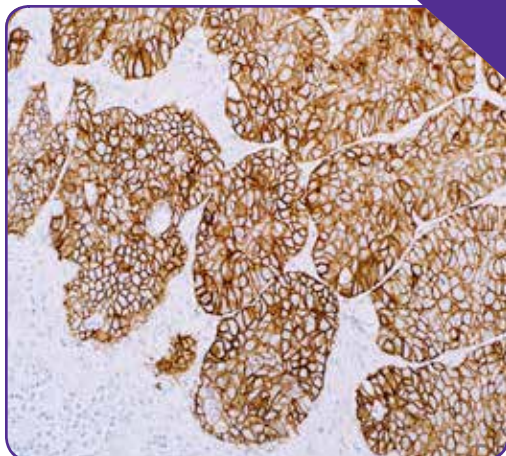
Leiomyosarcoma



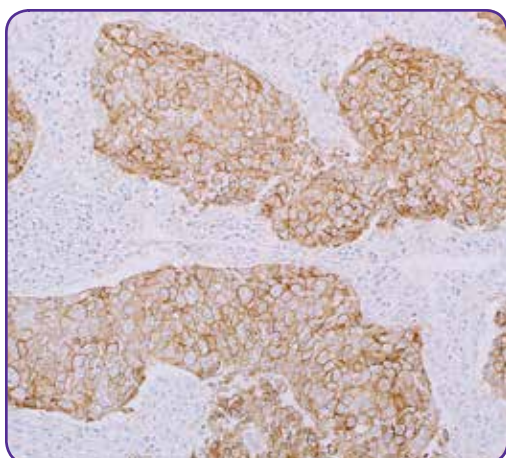
Smooth muscle



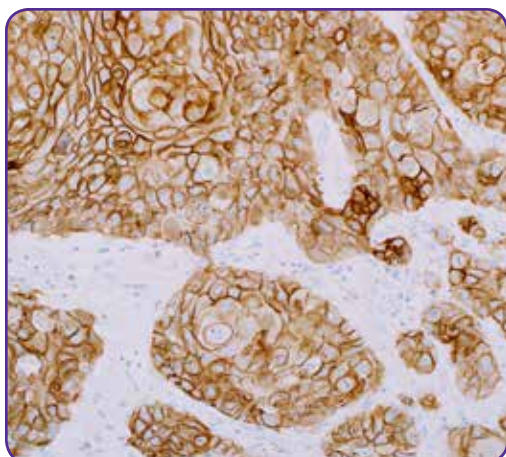
# Desmoglein 3



Lung squamous cell carcinoma



Lung squamous cell carcinoma



Bladder squamous cell carcinoma

Desmosomes are cell-to-cell adhesion complexes that provide mechanical integrity to keratinocytes by linking to keratin intermediate filaments.<sup>1,2</sup> Desmosomes are made up of two major transmembrane proteins known as desmoglein (DSG) and desmocollin.<sup>1</sup> Three DSG subfamily members have been identified: DSG1, DSG2, and DSG3.<sup>2</sup> DSG3 makes up the calcium binding transmembrane glycoprotein component of desmosomes in vertebrate epithelial cells.<sup>2</sup> DSG3 is found in both the basal and suprabasal layers of the stratified epithelia. DSG3 has been found to be expressed in squamous carcinomas of the lung, bladder, skin, and urinary system among others.<sup>1,2</sup> DSG3 is a highly specific marker for labeling squamous differentiation and can be used to help identify a squamous component in carcinomas.<sup>1</sup> DSG3 is a reliable marker for differentiating lung squamous cell carcinoma from lung adenocarcinoma.<sup>1,2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** lung squamous cell carcinoma, skin squamous cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

DSG3

## Associated Specialties

Anatomic Pathology



## Associated Grids

Grid	Page No.
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310
Lung Squamous Cell Carcinoma vs. Adenocarcinoma	320

## Reference

1. Huang W, et al. Novel markers of squamous differentiation in the urinary bladder. *Hum Pathol.* 2013; 44:1989-97.
2. Tacha D, et al. A 6-antibody panel for the classification of lung adenocarcinoma versus squamous cell carcinoma. *Appl Immunohistochem Mol Morphol.* 2012; 20:201-7.

## Ordering Information

**Desmoglein 3 (EP306)**  **Rabbit Monoclonal Primary Antibody** 

Volume	Part No.
0.1 mL concentrate	436R-14
0.5 mL concentrate	436R-15
1 mL concentrate	436R-16
1 mL predilute	436R-17
7 mL predilute	436R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# DOG1

DOG1 is a calcium-dependent chloride channel protein that is encoded by a gene called TMEM16A (TMEM16 FLJ10261, ANO1, ORAOV2, and AOS2) located on chromosome 11q13.<sup>1</sup> DOG1 has many significant functions such as regulation of the cholinergic activity of gastrointestinal smooth muscle<sup>2,3</sup> and regulation of both the survival and proliferation of cells.<sup>4</sup> Anti-DOG1 has been shown to be useful in the identification of gastrointestinal stromal tumors (GIST).<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** GIST

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Epithelioid Cell Neoplasms	296
Spindle Cell Tumors	300
GIST Mutation vs. Wild Type	307
Soft Tissue Tumors	322, 323
Solitary Fibrous Tumor vs. Other Soft Tissue Tumors	323

## Reference

1. Kang HG, et al. DOG1 and PKC- $\theta$  are useful in the diagnosis of KIT-negative gastrointestinal stromal tumors. *Mod Pathol.* 2011; 24:866-77.
2. Rizzo FM, et al. Parallels of DOG1 expression with recurrence risk in gastrointestinal stromal tumors bearing KIT or PDGFRA mutations. *BMC Cancer.* 2016; 16:87
3. Katoh M, et al. FLJ10261 gene, located within the CCND1- EMS1 locus on human chromosome 1q13, encodes the eight transmembrane protein homologous to C12orf3, C11orf25 and L34272 gene products. *Int J Oncol.* 2003; 22:1375-81.
4. Stanich JE, et al. Ano1 as a regulator of proliferation. *Am J Physiol Gastrointest Liver Physiol.* 2011; 1044-51.
5. Guler B, et al. Histopathological features of gastrointestinal stromal tumors and the contribution of DOG1 expression to the diagnosis. *Balkan Med J.* 2015; 32:388-96.

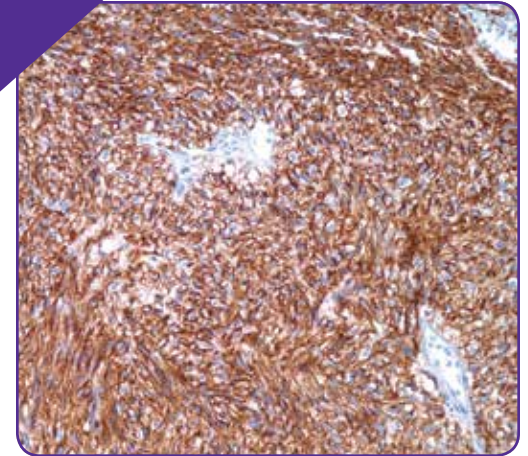
## Ordering Information

### DOG1 (SP31)

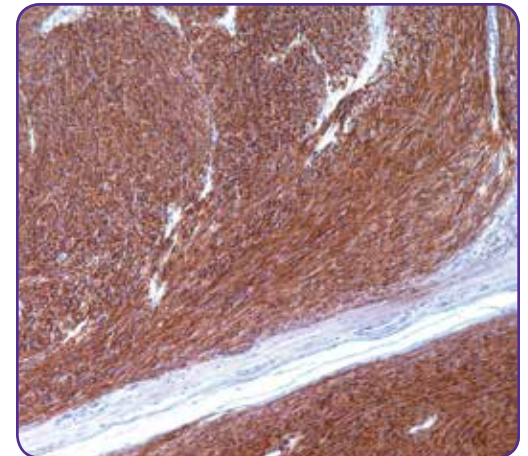
Rabbit Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	244R-15
1 mL concentrate	244R-16
1 mL predilute	244R-17
7 mL predilute	244R-18

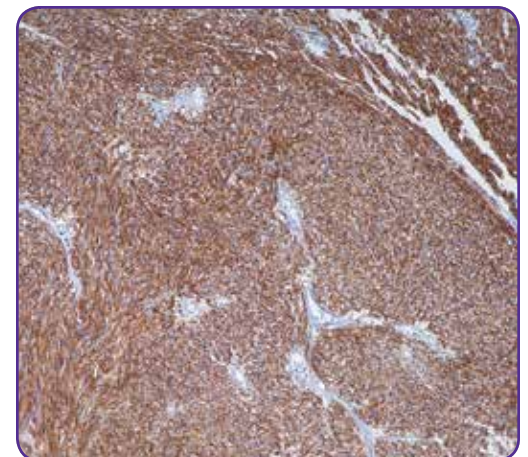
*Please contact your distributor for details on product availability and regulatory status in your country.*



Gastrointestinal stromal tumor

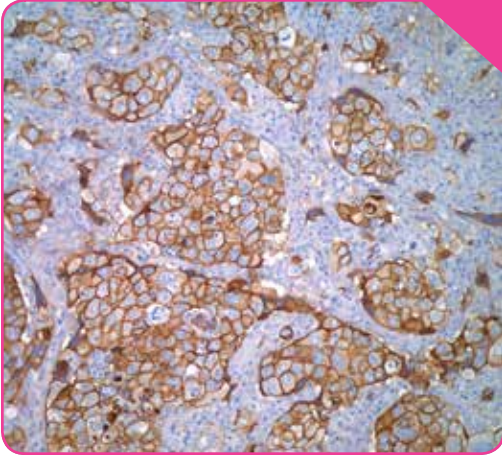


Gastrointestinal stromal tumor

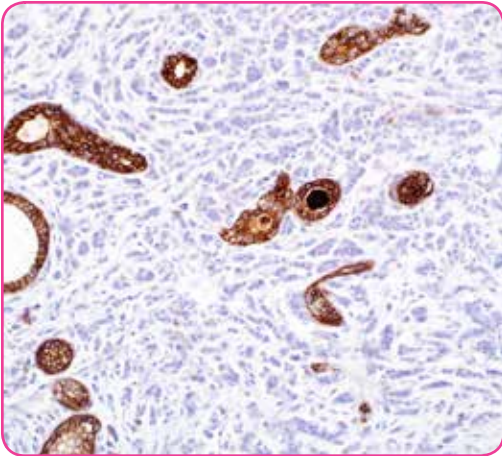


Gastrointestinal stromal tumor

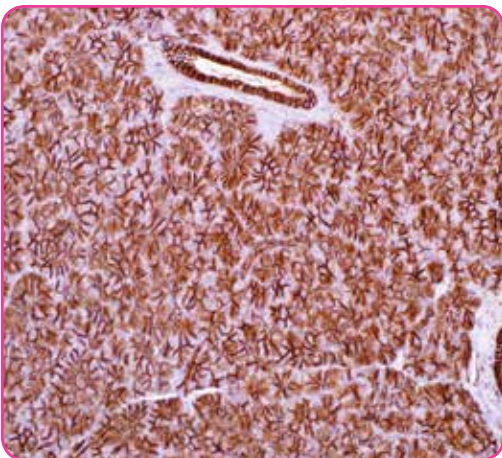
# E-cadherin



Breast, invasive ductal carcinoma



Breast, invasive lobular carcinoma



Liver

E-cadherin is an adhesion protein that is expressed in cells of epithelial lineage. Anti-E-cadherin stains positively in glandular epithelium as well as adenocarcinomas of the lung,<sup>1-3,6</sup> gastrointestinal tract,<sup>4</sup> and ovary.<sup>5</sup> Another application involves the differentiation of ductal (which is membrane staining) vs. lobular cancer of the breast (with loss of membranous staining).<sup>7,8</sup> It has also been shown to be positive in some thyroid carcinomas. A combination of E-cadherin and p120 catenin helps distinguish ductal carcinoma of the breast from lobular carcinoma.<sup>9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** breast

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
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Lung Small Cell Carcinoma vs. Merkel Cell Carcinoma	297
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Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Reference

1. Han AC, et al. Hum Pathol. 1997; 28:641-5.
2. Simsir A, et al. Diagn Cytopathol. 1999; 20:125-30.
3. Lear MP, et al. Histopathology. 1998; 32:209-16.
4. Karayiannakis AG, et al. Hepatogastroenterology. 1998; 45:2437-42.
5. Peralta Soler A, et al. Hum Pathol. 1997; 28:734-9.
6. Abutaily AS, et al. J Clin Pathol. 2002; 55:662-8.
7. Wahed A, et al. Ann Diagn Pathol. 2002; 6:349-51.
8. Acs G, et al. Am J Clin Pathol. 2001; 115:85-98.
9. Dabbs DJ, et al. Am J Surg Pathol. 2007; 31:427-37.

## Ordering Information

**E-cadherin (EP700Y)**

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	246R-14
0.5 mL concentrate	246R-15
1 mL concentrate	246R-16
1 mL predilute	246R-17
7 mL predilute	246R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# EGFR

EGFR is a 170-kD transmembrane glycoprotein encoded by the HER-1 proto-oncogene located at 7p11.2-p12.<sup>1-2</sup> EGFR is widely expressed on the surface of epithelial cells, fibroblasts, gliocytes, keratinocytes, and other cell types.<sup>1</sup> EGFR is overexpressed in many epithelial malignancies including carcinomas of the colorectum, stomach, esophagus, and non-small cell carcinoma of the lung.<sup>1-5</sup> Studies suggest that EGFR expression is not unique to carcinomas and may be present in malignant bone and soft tissue tumors.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP22: IgG
- SP84: IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Carcinomas and Sarcomas with Epithelioid Morphology (Features)	293

## Reference

1. Vranic S, et al. EGFR and HER-2/neu expression in invasive apocrine carcinoma of the breast. *Mod Pathol.* 2010; 23:644-53.
2. Ch'ng S, et al. Epidermal growth factor receptor: a novel biomarker for aggressive head and neck cutaneous squamous cell carcinoma. *Hum Pathol.* 2008; 39:344-9.
3. Van Damme N, et al. Epidermal growth factor receptor and K-RAS status in two cohorts of squamous cell carcinomas. *BMC Cancer.* 2010; 10:189.
4. Tawbi H, et al. Epidermal growth factor receptor expression and mutational analysis in synovial sarcomas and malignant peripheral nerve sheath tumors. *Oncologist.* 2008; 13:459-66.
5. Cascio MJ, et al. Epithelioid sarcoma expresses epidermal growth factor receptor but gene amplification and kinase domain mutations are rare. *Mod Pathol.* 2010; 23:574-80.

## Ordering Information

**EGFR (EP22)**  
Rabbit Monoclonal  
Primary Antibody

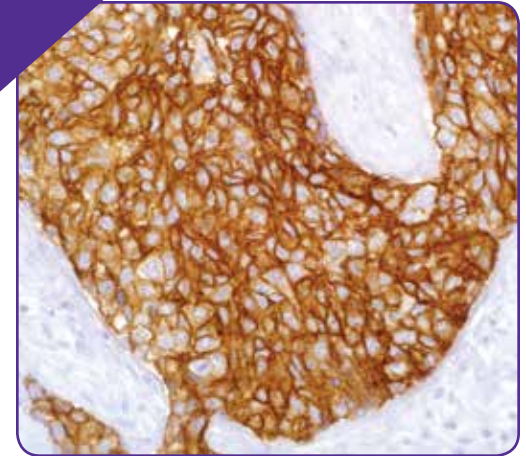
CELL MARQUE  
**RabMAb**  
Technology from Abcam

Volume	Part No.
0.1 mL concentrate	414R-24
0.5 mL concentrate	414R-25
1 mL concentrate	414R-26
1 mL predilute	414R-27
7 mL predilute	414R-28

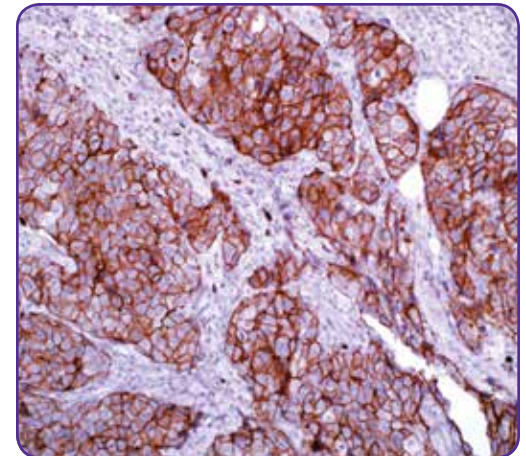
**EGFR (SP84)**  
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	414R-14
0.5 mL concentrate	414R-15
1 mL concentrate	414R-16
1 mL predilute	414R-17
7 mL predilute	414R-18

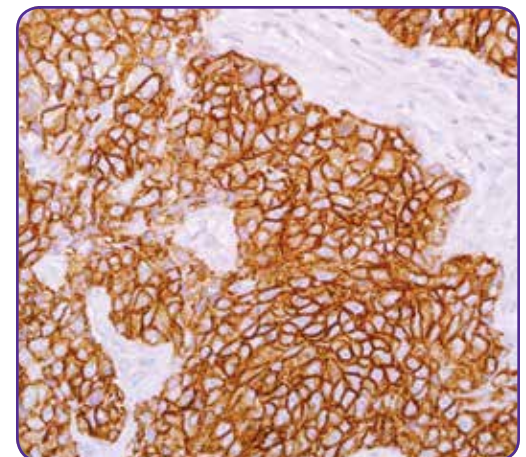
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Breast, invasive ductal carcinoma

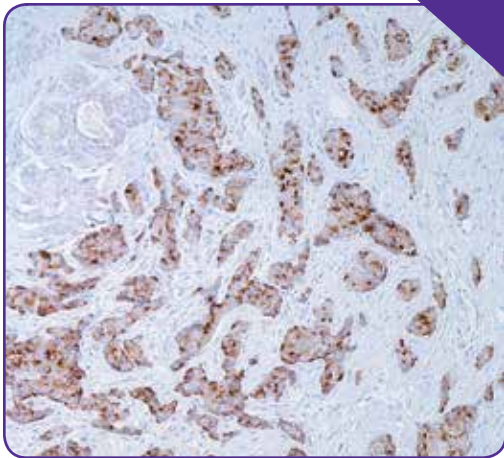


Triple negative breast carcinoma

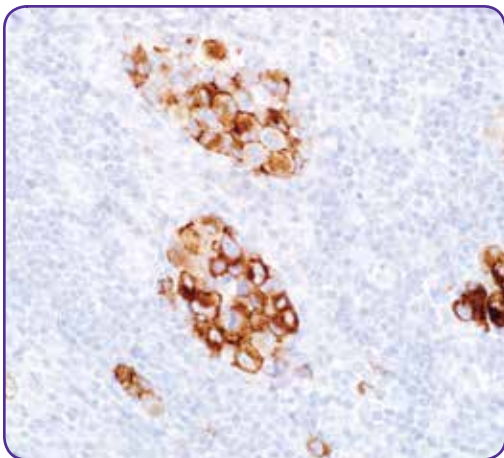


Metastatic breast carcinoma

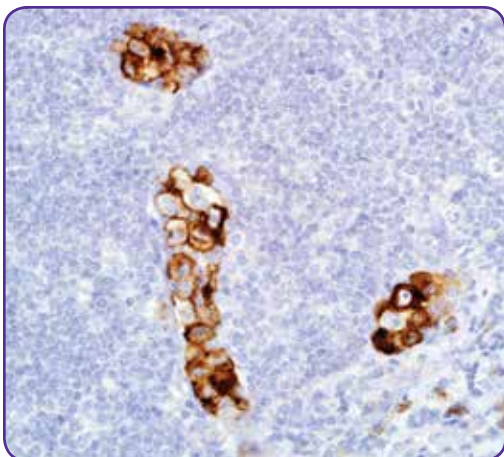
# EMA



Breast, invasive ductal carcinoma



Lymph node, anaplastic large cell lymphoma



Lymph node, anaplastic large cell lymphoma

Anti-EMA is a useful marker for staining many carcinomas. It stains normal and neoplastic cells from various tissues, including mammary gland epithelium, sweat glands and colorectal carcinoma. Hepatocellular carcinoma, adrenal carcinoma and embryonal carcinomas are consistently EMA negative, so keratin positivity with negative EMA favors one of these tumors. EMA is frequently positive in meningioma, which can be useful when distinguishing it from other intracranial neoplasms such as schwannomas.<sup>1-8</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic, membranous  
**Control** breast, breast carcinoma, meningioma, skin  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>2b</sub>/k

## Associated Specialties

Anatomic Pathology  
 Hematopathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Epithelioid Cell Neoplasms	296
Identification of Meningiomas from Histologic Mimics	296
Micropapillary Carcinomas	297
Spindle Cell Tumors	300
Sex Cord Stromal Tumors	303
Skin Adnexal Tumors	305
Skin: Basal vs. Squamous Cell Carcinoma	306
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309
Hodgkin vs. Non-Hodgkin Lymphomas	314
Mature B-cell Neoplasms with Reduced CD20 Expression	316
Brain: CNS Tumors	318
Meningeal Solitary Fibrous Tumor (SFT)	318
Soft Tissue Tumors	322, 323

## Ordering Information

### EMA (E29)

#### Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	247M-94
0.5 mL concentrate	247M-95
1 mL concentrate	247M-96
1 mL predilute	247M-97
7 mL predilute	247M-98
25 mL predilute	247M-90

Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

1. Pinkus GS, et al. Epithelial membrane antigen -a diagnostic discriminant in surgical pathology: immunohistochemical profile in epithelial, mesenchymal, and hematopoietic neoplasms using paraffin sections and monoclonal antibodies. *Hum Pathol.* 1985; 16:929-40.
2. Pinkus GS, et al. Are keratin proteins a better tumor marker than epithelial membrane antigen? A comparative immunohistochemical study of various paraffin-embedded neoplasms using monoclonal and polyclonal antibodies. *Am J Clin Pathol.* 1986; 77:269-77.
3. Dearnaly DP, et al. Increased detection of mammary carcinoma cells in marrow smears using antisera to epithelial membrane antigen. *Br J Cancer.* 1981; 44:85-90.
4. Redding WH, et al. Detection of micrometastases in patients with primary breast cancer. *Lancet.* 1983; 1271-4.
5. Attanoos RL, et al. The use of immunohistochemistry in distinguishing reactive from neoplastic mesothelium. A novel use for desmin and comparative evaluation with epithelial membrane antigen, p53, platelet-derived growth factor-receptor, P-glycoprotein and Bcl-2. *Histopathology.* 2003; 43:231-8.
6. Beer TW, et al. Ber EP4 and epithelial membrane antigen aid distinction of basal cell, squamous cell and basosquamous carcinomas of the skin. *Histopathology.* 2000; 37:218-23.
7. Lee JS, et al. Immunohistochemical panel for distinguishing between carcinoma and reactive mesothelial cells in serous effusions. *Acta Cytol.* 1996; 40:631-6.
8. Fraga M, et al. Bone marrow involvement in anaplastic large cell lymphoma. Immunohistochemical detection of minimal disease and its prognostic significance. *Am J Clin Pathol.* 1995; 103:82-9.

# Ep-CAM/Epithelial Specific Antigen

Epithelial cell adhesion molecule (Ep-CAM) is a transmembrane glycoprotein localized on the membrane of cells in most epithelial tissues.<sup>1</sup> Immunoreactivity with the antibody to Ep-CAM has been seen in the majority of epithelial neoplasms, whereas most non-epithelial neoplasms do not show Ep-CAM expression.<sup>2</sup> Ep-CAM is not expressed in mesothelial cells, hepatocytes, and lymphocytes.<sup>1,2</sup> In conjunction with other markers, Ep-CAM can be used as an aid in determining neoplasms of epithelial origin, such as distinguishing between lung adenocarcinoma and mesothelioma.<sup>2-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** adenocarcinoma, colon adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- Ber-EP4: IgG<sub>1</sub>/k
- MOC-31: IgG<sub>1</sub>/k

## Synonyms and Abbreviations

Ber-EP4  
MOC-31

## Associated Specialties

Anatomic Pathology  
Cytopathology  
Pulmonary Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Thymus	301
Cutaneous Neoplasms	304
Skin: Basal vs. Squamous Cell Carcinoma	306
Kidney Neoplasms	310
Epithelioid Mesothelioma vs. Carcinoma	319
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Ordering Information

### Ep-CAM/Epithelial Specific Antigen (Ber-EP4)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	248M-94
0.5 mL concentrate	248M-95
1 mL concentrate	248M-96
1 mL predilute	248M-97
7 mL predilute	248M-98

### Ep-CAM/Epithelial Specific Antigen (MOC-31)

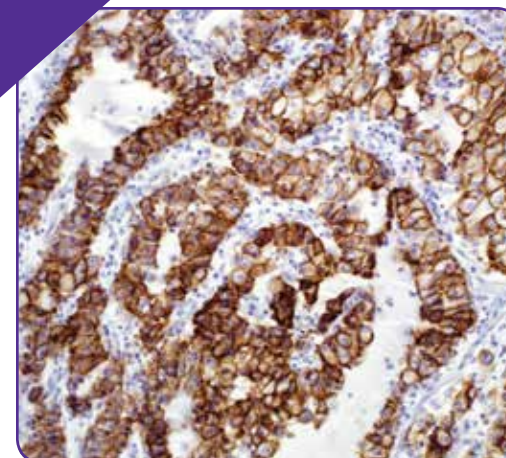
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	248M-14
0.5 mL concentrate	248M-15
1 mL concentrate	248M-16
1 mL predilute	248M-17
7 mL predilute	248M-18
25 mL predilute	248M-10

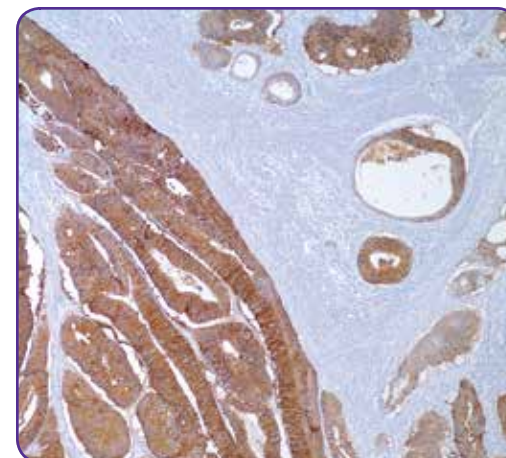
*Please contact your distributor for details on product availability and regulatory status in your country.*

## Reference

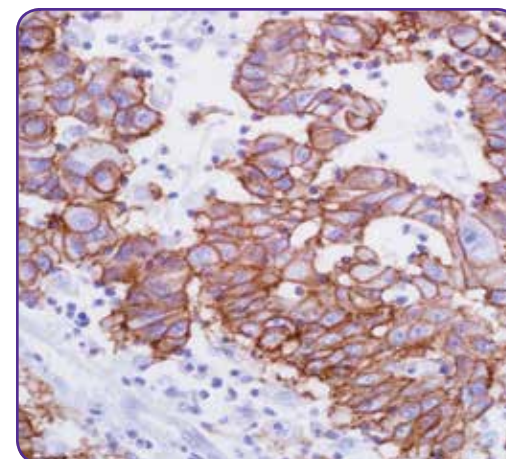
1. Schnell U, et al. EpCAM: structure and function in health and disease. *Biochim Biophys Acta*. 2013; 1828:1989-2001.
2. Latza U, et al. Ber-Ep4: New monoclonal antibody which distinguishes epithelia from mesothelia. *J Clin Pathol*. 1990; 43:213-19.
3. Ordóñez NG. Value of the Ber-Ep4 antibody in differentiating epithelial pleural mesothelioma from adenocarcinoma: the M.D. Anderson experience and a critical review of the literature. *Am J Clin Pathol*. 1998; 109:85-9.
4. Ordóñez NG. The immunohistochemical diagnosis of mesothelioma: a comparative study of epithelioid mesothelioma and lung adenocarcinoma. *Am J Surg Pathol*. 2003; 27:1031-51.



Ber-EP4: Lung adenocarcinoma

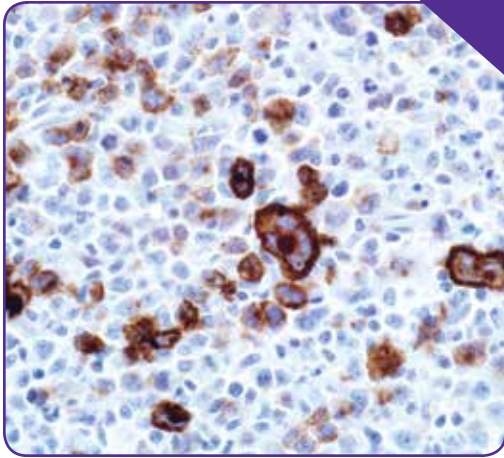


MOC-31: Colon

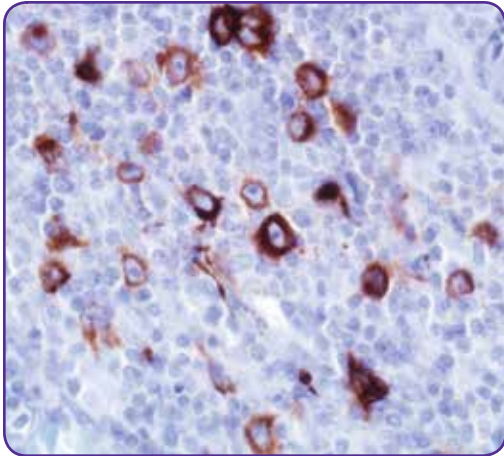


MOC-31: Lung adenocarcinoma

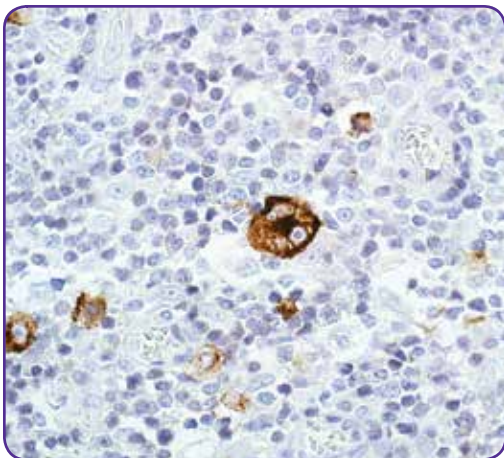
# Epstein-Barr Virus



Hodgkin lymphoma



Hodgkin lymphoma



Hodgkin lymphoma

Anti-Epstein-Barr virus targets the 60-kD latent membrane protein (LMP-1) encoded by the BNLF1 gene of the Epstein-Barr virus. There is reactivity with Reed-Sternberg cells of Hodgkin lymphoma, being more frequent in mixed cellularity and lymphocyte-depleted classic Hodgkin lymphoma lesions. The Epstein-Barr virus is an important cause of infectious mononucleosis and has been associated with oral carcinomas.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** EBV infected tissue, Hodgkin disease

**Stability** up to 36 mos. at 2-8°C

### Isotype

- CS1-4: IgG<sub>1</sub>
- MRQ-47: IgG<sub>1</sub>

## Synonyms and Abbreviations

EBV

## Associated Specialties

Anatomic Pathology

## Reference

1. Murray PG, et al. Immunohistochemical demonstration of the Epstein-Barr virus-encoded latent membrane protein in paraffin sections of Hodgkin disease. *J Pathol.* 1992; 166:1-5.
2. Jarrett RF, et al. Detection of Epstein-Barr virus genomes in Hodgkin disease: relation to age. *J Clin Pathol.* 1991; 44:844-8.
3. Pallesen G, et al. Expression of Epstein-Barr virus latent gene products in tumour cells of Hodgkin disease. *Lancet.* 1991; 337:320-2.
4. Silverberg GS, et al. Principles and Practice of Surgical Pathology and Cytopathology, 3rd edition. 1997.

## Ordering Information

### Epstein-Barr Virus (CS1-4) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	245M-14
0.5 mL concentrate	245M-15
1 mL concentrate	245M-16
1 mL predilute	245M-17
7 mL predilute	245M-18

### Epstein-Barr Virus (MRQ-47) Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	245R-14
0.5 mL concentrate	245R-15
1 mL concentrate	245R-16
1 mL predilute	245R-17
7 mL predilute	245R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# ERG

The transcription factor erythroblastosis virus E26 transforming sequence related gene (ERG) functions as a regulator of key cellular functions to promote endothelial homeostasis.<sup>1</sup> Expression of ERG has been observed in both benign and malignant vascular endothelial tumors, such as hemangiomas and Kaposi sarcomas, respectively.<sup>2,3</sup> Carcinomas of the breast, colon, and urothelium have demonstrated absence of ERG expression, whereas presence of the protein has been confirmed in a subset of prostate carcinoma cases.<sup>4,5</sup> Anti-ERG can be a useful tool for identifying vascular endothelial neoplasms and distinguishing prostate carcinoma from epithelial tumors of non-prostatic origin.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** hemangioma, tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324
Vascular Tumors	324

## Reference

1. Shah AV, et al. Regulation of endothelial homeostasis, vascular development and angiogenesis by the transcription factor ERG. *Vascul Pharmacol.* 2016; 86:3-13.
2. Miettinen M, et al. ERG transcription factor as an immunohistochemical marker for vascular endothelial tumors and prostatic carcinoma. *Am J Surg Pathol.* 2011; 35:432-41.
3. Hornick JL. Novel uses of immunohistochemistry in the diagnosis and classification of soft tissue tumors. *Mod Pathol.* 2014; 27:S47-S63.
4. Yaskiv O, et al. ERG protein expression in human tumors detected with a rabbit monoclonal antibody. *Am J Clin Pathol.* 2012; 138:803-10.
5. Minner S, et al. Marked heterogeneity of ERG expression in large primary prostate cancers. *Mod Pathol.* 2013; 26:106-16.

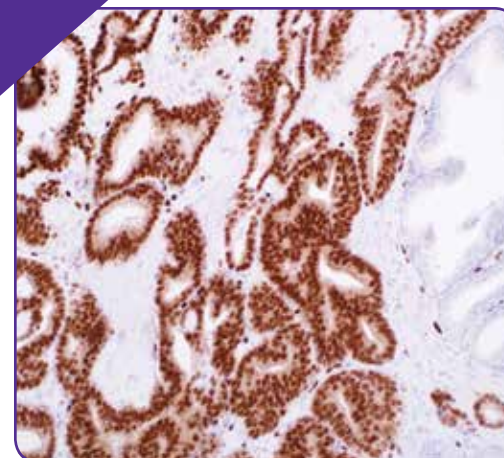
## Ordering Information

**ERG (EP111)**  
Rabbit Monoclonal  
Primary Antibody

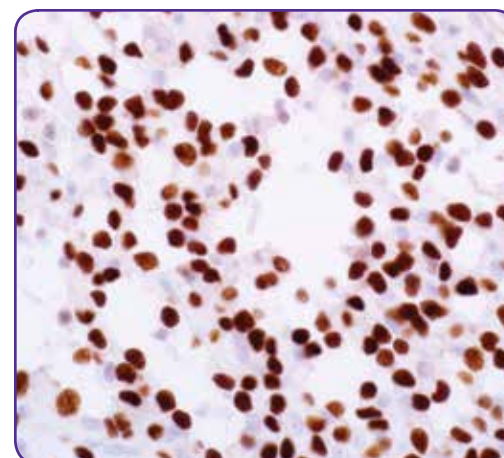


Volume	Part No.
0.1 mL concentrate	434R-14
0.5 mL concentrate	434R-15
1 mL concentrate	434R-16
1 mL predilute	434R-17
7 mL predilute	434R-18
25 mL predilute	434R-10

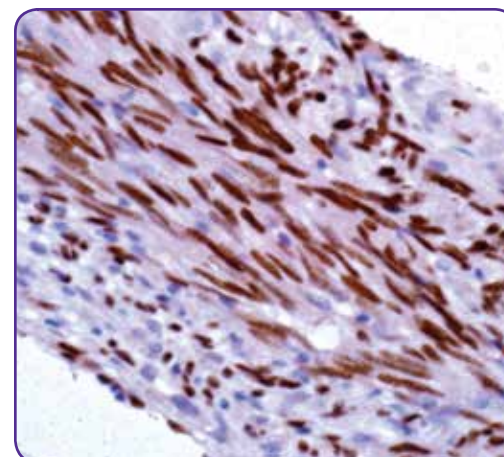
*Please contact your distributor for details on product availability and regulatory status in your country.*



Prostatic acinar carcinoma



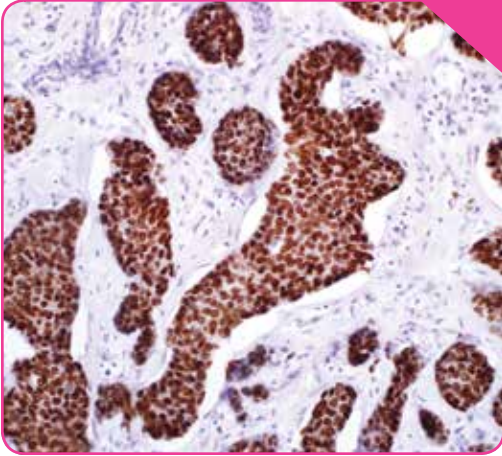
Hepatic hemangioendothelioma



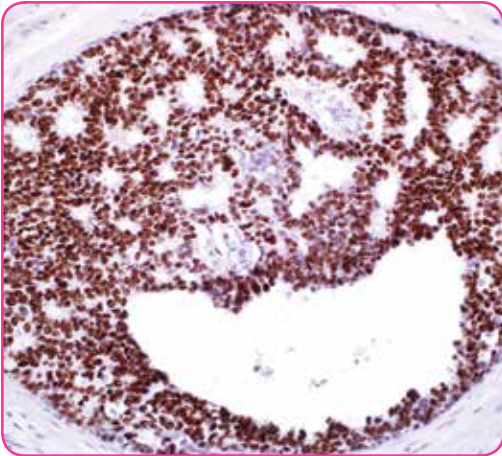
Skin, Kaposi sarcoma



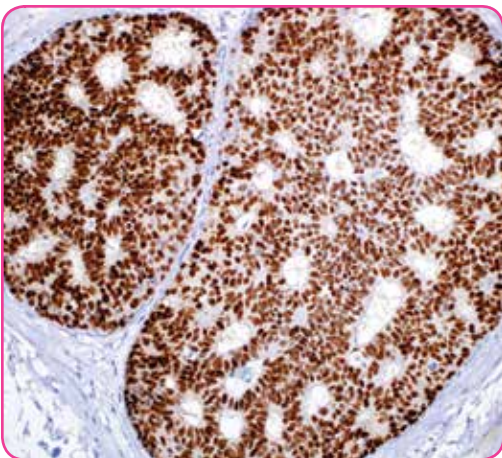
# Estrogen Receptor



Invasive ductal carcinoma



Ductal carcinoma *in situ*



Ductal carcinoma *in situ*

This antibody stains nuclei of breast epithelial cells and breast carcinomas.<sup>1,2</sup> In the case of anti-estrogen receptor, 1% of positively labeled cells within a tumor has been established as the cut-off for tumor positivity.<sup>3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP1: IgG
- SP1: IgG

## Synonyms and Abbreviations

ER

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Micropapillary Carcinomas	297
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Breast Carcinoma	302
Ovarian Carcinomas	303

## Reference

1. Hahnel R, et al. Prognostic value of estrogen receptors in primary breast cancer. *Cancer*. 1979; 44:671-5.
2. Allred DC, et al. Prognostic and predictive factors in breast cancer by immunohistochemical analysis. *Mod Pathol*. 1998; 11:155-68.
3. Harvey JM, et al. Estrogen receptor status by immunohistochemistry is superior to the ligand-binding assay for predicting response to adjuvant endocrine therapy in breast cancer. *J Clin Oncol*. 1999; 17:1474-81.
4. Hammond ME, et al. American society of clinical oncology/college of American pathologists guideline recommendations for immunohistochemical testing of estrogen and progesterone receptors in breast cancer. *J Oncol Pract*. 2010; 6:195-7.

## Ordering Information



### Estrogen Receptor (EP1)

Rabbit Monoclonal Primary Antibody

Volume	Part No.
0.1 mL concentrate	249R-24
0.5 mL concentrate	249R-25
1 mL concentrate	249R-26
1 mL predilute	249R-27
7 mL predilute	249R-28
25 mL predilute	249R-20

### Estrogen Receptor (SP1)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	249R-14
0.5 mL concentrate	249R-15
1 mL concentrate	249R-16
1 mL predilute	249R-17
7 mL predilute	249R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# EZH2

Enhancer of zeste homolog 2 (EZH2) is the catalytic subunit of polycomb repressive complex 2 (PRC2).<sup>1</sup> It generates a methylation epigenetic mark at lysine 27 residue of histone H3 (H3K27me3) in order to silence gene expression.<sup>1</sup> EZH2 target genes are involved in a variety of biological processes such as stem cell pluripotency, cell proliferation, and oncogenic transformation.<sup>1,2</sup> Anti-EZH2 expression has been found in a variety of malignancies including prostate, breast, uterine, gastric, and renal cell cancers in addition to melanoma.<sup>1-4</sup> Anti-EZH2 expression has been reported in non-small cell lung cancers and lymphoma.<sup>1</sup> The EZH2 protein is usually not detected in normal breast ductal epithelium. EZH2 is usually expressed in follicular centers, but not in mantle zones, follicular and interfollicular T cells, plasma cells or NK/T cells. However, its expression can be seen in most B-cell and T-cell lymphomas.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** prostate adenocarcinoma, tonsil, breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292

## Reference

1. Ciarapica R, et al. Enhancer of zeste homolog 2 (EZH2) in pediatric soft tissue sarcomas: first implications. *BMC Med.* 2011; 9:63.
2. Kader L, et al. In aggressive variants of non-Hodgkin lymphomas, Ezh2 is strongly expressed and polycomb repressive complex PRC1.4 dominates over PRC1.2. *Virchows Arch.* 2013; 463:697-711.
3. Varambally S, et al. The polycomb group protein EZH2 is involved in progression of prostate cancer. *Nature.* 2002; 419:624-9.
4. Tan J, et al. EZH2: biology, disease, and structure-based drug discovery. *Acta Pharmacol Sin.* 2014; 35:161-74.

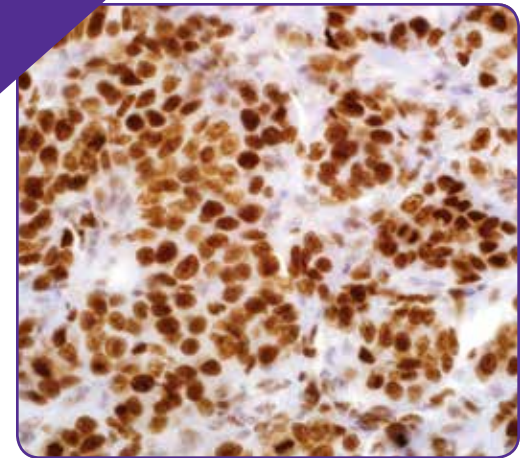
## Ordering Information

### EZH2 (11)

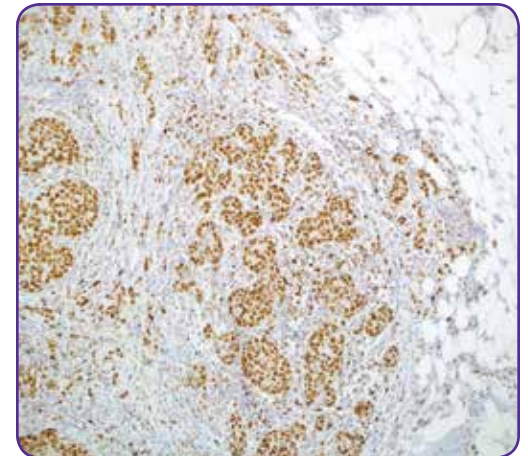
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	415M-14
0.5 mL concentrate	415M-15
1 mL concentrate	415M-16
1 mL predilute	415M-17
7 mL predilute	415M-18

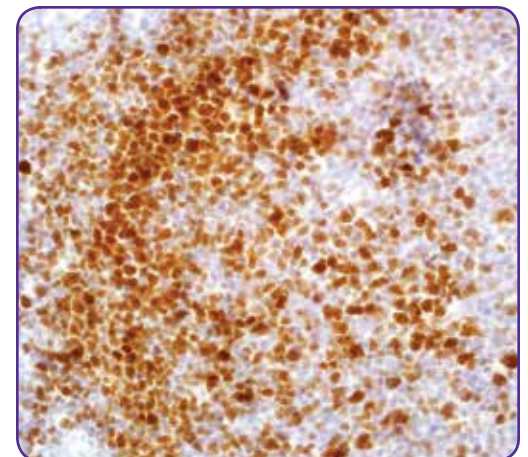
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Breast, invasive ductal carcinoma

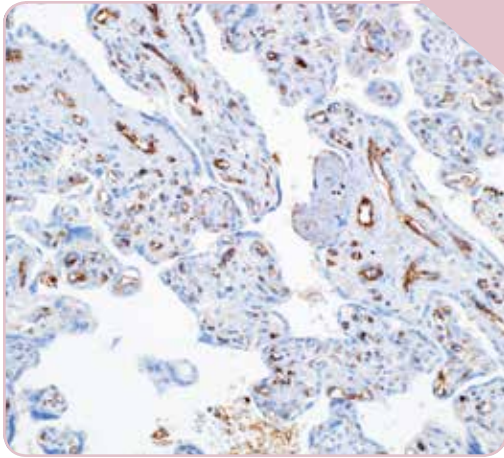


Breast carcinoma

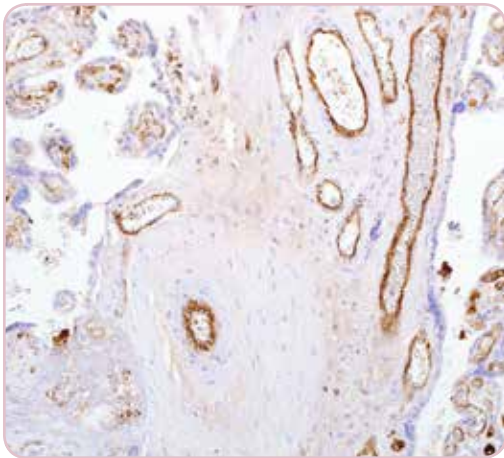


Lymph node

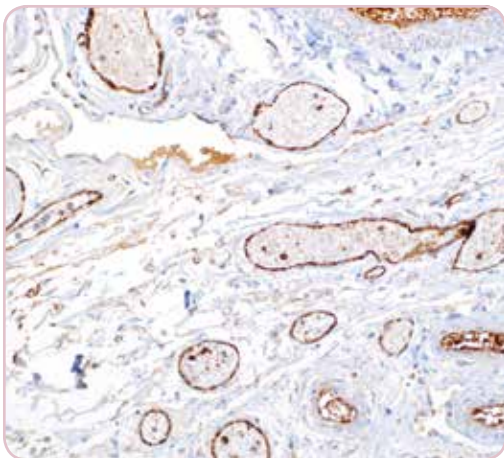
# Factor VIII-R Ag.



Placenta



Placenta



Connective tissue

Factor VIII-Related Antigen or von Willebrand factor is a glycoprotein associated with hemostasis in promoting adhesion of platelets. Anti-factor VIII-related antigen reactivity is seen in endothelial cells, hemangioma, and the majority of tumors of endothelial origin such as Kaposi's sarcoma and angiosarcoma.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** placenta

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

von Willebrand factor

## Associated Specialties

Hematopathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Skin: Spindle Cell Tissues and Tumors	306, 307
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324
Vascular Tumors	324

## Reference

1. Nichols GE, et al. Lobular capillary hemangioma. An immunohistochemical study including steroid hormone receptor status. *Am J Clin Pathol.* 1992; 97:770-5.
2. Falk S, et al. Primary angiosarcoma of the spleen. A clinicopathologic study of 40 cases. *Am J Surg Pathol.* 1993; 17:959-70.
3. Meis-Kindblom JM, et al. Angiosarcoma of soft tissue: a study of 80 cases. *Am J Surg Pathol.* 1998; 22:683-97.
4. Allison KH, et al. Angiosarcoma involving the gastrointestinal tract: a series of primary and metastatic cases. *Am J Surg Pathol.* 2004; 28:298-307.
5. Peyvandi F, et al. Role of von Willebrand factor in the haemostasis. *Blood Transfus.* 2011; 9 Suppl 2:s3-8.

## Ordering Information

### Factor VIII-R Ag.

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	250A-14
0.5 mL concentrate	250A-15
1 mL concentrate	250A-16
1 mL predilute	250A-17
7 mL predilute	250A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Factor XIIIa

Factor XIIIa has been identified in platelets, megakaryocytes, and fibroblast-like mesenchymal or histiocytic cells in the placenta, uterus, and prostate, monocytes and macrophages and dermal dendritic cells. Anti-factor XIIIa has been found to be useful in differentiating between dermatofibroma (almost all cases +), dermatofibrosarcoma protuberans (-/+ ) and desmoplastic malignant melanoma (-).<sup>1-2</sup> Anti-factor XIIIa positivity is also seen in capillary hemangioblastoma, hemangioendothelioma, hemangiopericytoma, xanthogranuloma, xanthoma, hepatocellular carcinoma, glomus tumor, and meningioma.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** dermatofibroma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- AC-1A1: IgG<sub>1</sub>/k
- EP3372: IgG

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Melanotic Lesions	305
Skin: Dermatofibrosarcoma Protuberans (DFSP) vs. Dermatofibroma Fibrous Histiocytoma (DF-FH)	306
Skin: Spindle Cell Tissues and Tumors	306, 307
Histiocytic Lesions	313
Histiocytic Proliferation	319

## Reference

1. Abenzo P, et al. CD34 and factor XIIIa in the differential diagnosis of dermatofibroma and dermatofibrosarcoma protuberans. Am J Dermatopathol. 1993; 15:429-34.
2. Horenstein MG, et al. Indeterminate fibrohistiocytic lesions of the skin: is there a spectrum between dermatofibroma and dermatofibrosarcoma protuberans? Am J Surg Pathol. 2000; 24:996-1003.
3. Kraus MD, et al. "Juvenile" xanthogranuloma: an immunophenotypic study with a reappraisal of histogenesis. Am J Dermatopathol. 2001; 23:104-11.

## Ordering Information

### Factor XIIIa (AC-1A1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	251M-14
0.5 mL concentrate	251M-15
1 mL concentrate	251M-16
1 mL predilute	251M-17
7 mL predilute	251M-18

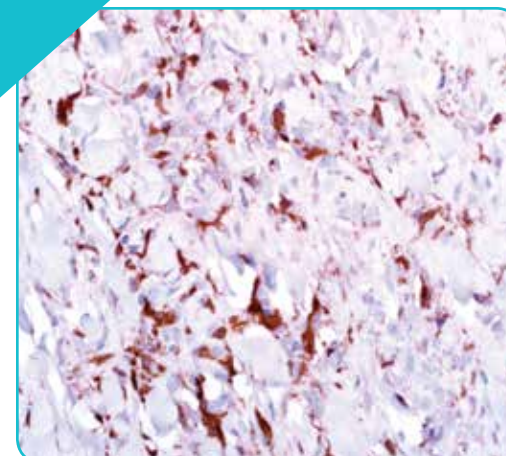
### Factor XIIIa (EP3372)

Rabbit Monoclonal  
Primary Antibody

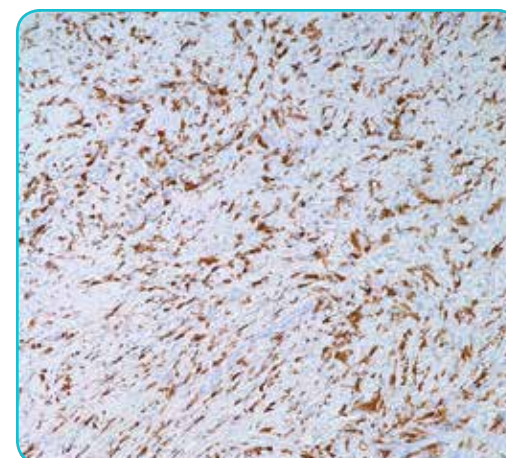
**RabMAb**  
Technology from Abcam

Volume	Part No.
0.1 mL concentrate	251R-14
0.5 mL concentrate	251R-15
1 mL concentrate	251R-16
1 mL predilute	251R-17
7 mL predilute	251R-18

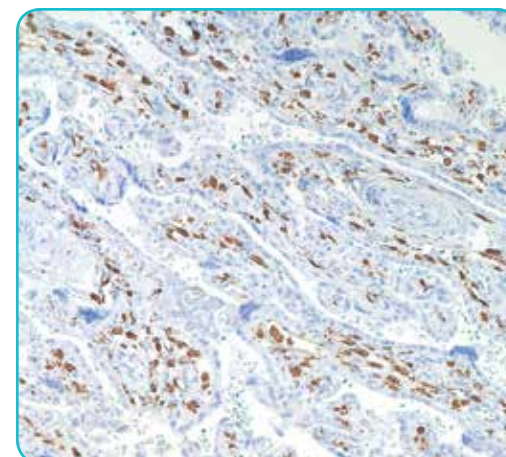
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Dermatofibroma

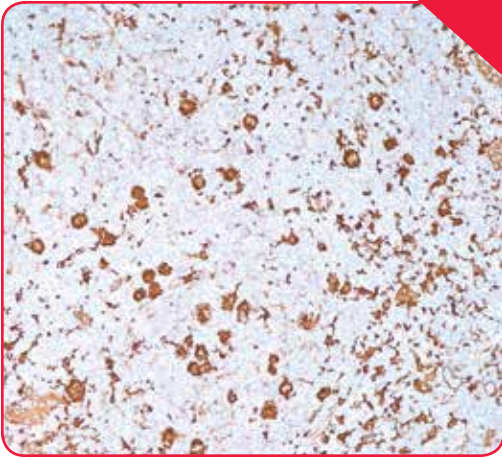


Neurofibroma

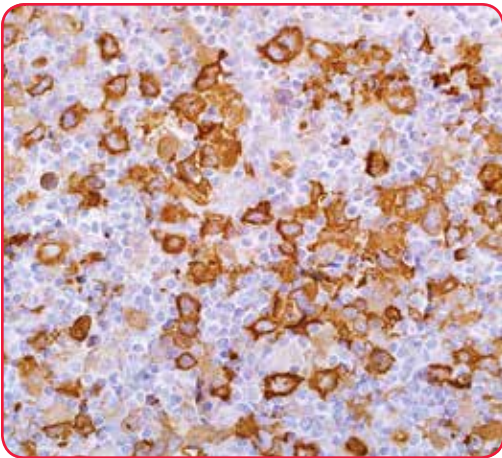


Placenta

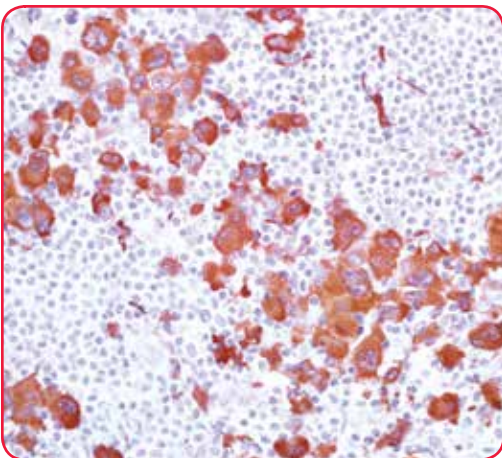
# Fascin



Classic Hodgkin lymphoma



Classic Hodgkin lymphoma



Classic Hodgkin lymphoma

Fascin is a 55-kD actin bundling protein involved in cell migration. Fascin is up-regulated in many human carcinomas and numerous studies have correlated fascin over-expression with increased metastatic potential.<sup>1,2</sup> Fascin is highly sensitive for staining Reed-Sternberg cells making it an excellent marker for classic Hodgkin lymphoma.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** Hodgkin lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Hodgkin vs. Non-Hodgkin Lymphomas	314

## Reference

1. Hashimoto Y, et al. Roles of fascin in human carcinoma motility and signaling: prospects for a novel biomarker? *Int J Biochem Cell Biol.* 2005; 37:1787-804.
2. Tan VY, et al. Association of fascin-1 with mortality, disease progression and metastasis in carcinomas: a systematic review and meta-analysis. *BMC Med.* 2013; 11:52.
3. Pinkus GS, et al. Fascin, a sensitive new marker for Reed-Sternberg cells of Hodgkin's disease. Evidence for a dendritic or B cell derivation? *Am J Pathol.* 1997; 150:543-62.

## Ordering Information

### Fascin (55k-2)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	252M-14
0.5 mL concentrate	252M-15
1 mL concentrate	252M-16
1 mL predilute	252M-17
7 mL predilute	252M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# FLI-1

Friend leukemia integration 1 transcription factor (FLI-1) is a protein encoded by the proto-oncogene FLI-1. The FLI-1 protein is best known for its critical role in the pathogenesis of Ewing sarcoma/peripheral primitive neuroectodermal tumor (ES/pPNET). FLI-1 is normally expressed in endothelial cells and in hematopoietic cells, including T-lymphocytes. The immunohistochemical detection of FLI-1 protein has been shown in studies to be valuable in the discrimination of ES/pPNET from most of its potential mimics. ES/pPNET is a rare primary tumor of the bone/soft tissue that resembles other undifferentiated tumors.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** primitive neuroectodermal tumor

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Pediatric Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Epithelioid Cell Neoplasms	296
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Skin: Spindle Cell Tissues and Tumors	306, 307
Meningeal Solitary Fibrous Tumor (SFT)	318
Small Blue Round Cell Tumors	322
Soft Tissue Tumors	322, 323
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324
Vascular Tumors	324

## Reference

1. Mhawech-Fauceglia P, et al. Diagnostic utility of FLI-1 monoclonal antibody and dual-colour, break-apart probe fluorescence in situ (FISH) analysis in Ewing's sarcoma/primitive neuroectodermal tumour (EWS/PNET). A comparative study with CD99 and FLI-1 polyclonal antibodies. *Histopathology*. 2006; 49:569-75.
2. Kuroda N, et al. Askin tumor with metastasis to the scalp: a histochemical, immunohistochemical and ultrastructural study. *Med Mol Morphol*. 2006; 39:221-5.
3. Ellison DA, et al. Immunohistochemistry of primary malignant neuroepithelial tumors of the kidney: a potential source of confusion? A study of 30 cases from the National Wilms Tumor Study Pathology Center. *Hum Pathol*. 2007; 38:205-11.

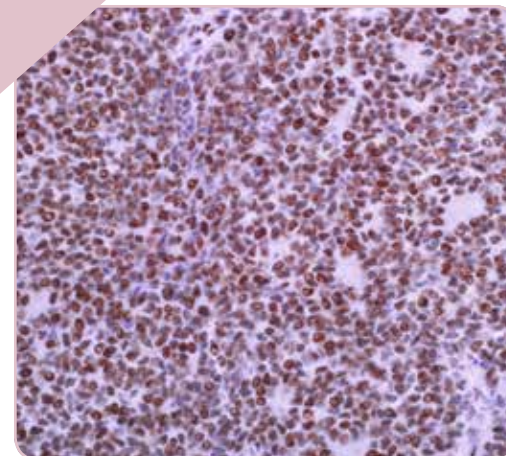
## Ordering Information

### FLI-1 (MRQ-1)

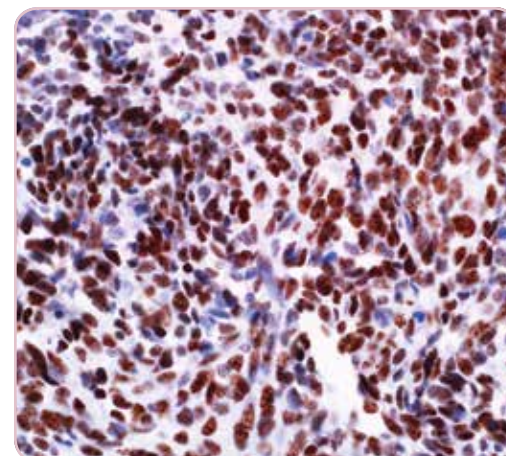
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	254M-15
1 mL concentrate	254M-16
1 mL predilute	254M-17
7 mL predilute	254M-18

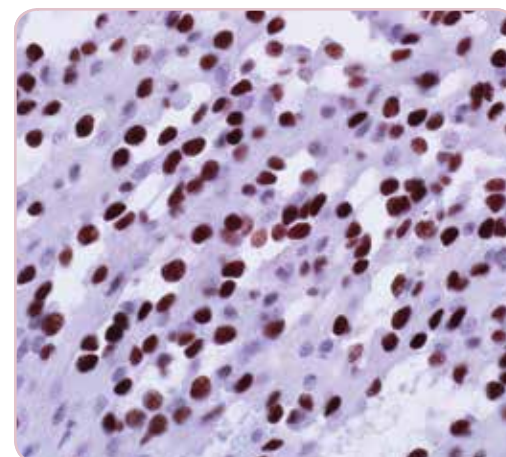
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Ewing sarcoma

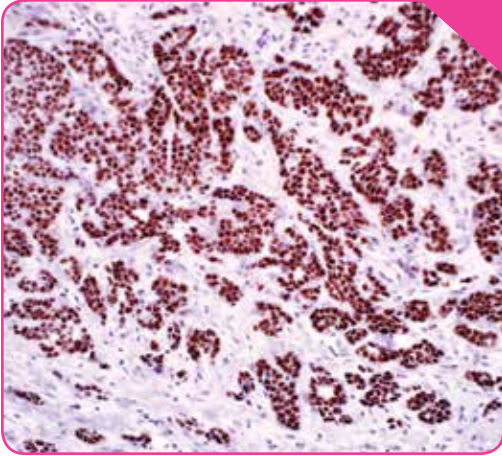


Ewing sarcoma

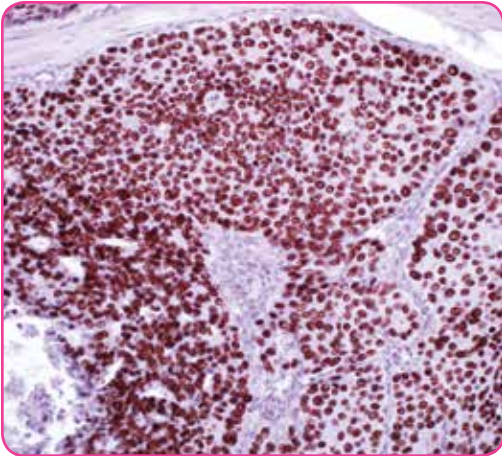


Liver, hemangioendothelioma

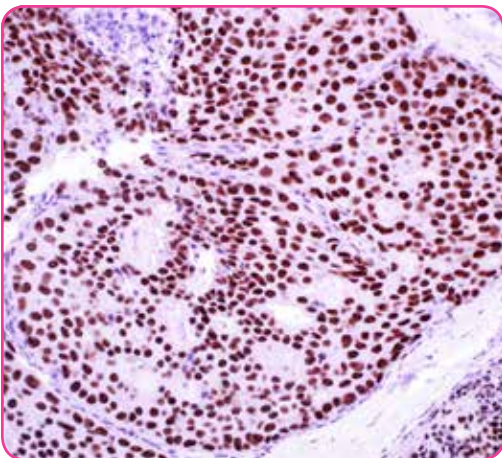
# FOXA1



Breast, invasive ductal carcinoma



Breast carcinoma



Breast carcinoma

Forkhead box A1 (FOXA1), also known as hepatocyte nuclear factor 3 alpha (HNF3a), is a transcription factor associated with embryonic development of multiple endoderm-derived organ systems. Anti-FOXA1 reactivity is seen in certain carcinomas of the breast, normal breast ductal epithelium, and epithelium in various organs. The anti-FOXA1 immunohistochemical reagent is useful for sub-classification of breast carcinoma.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

HNF3a

## Associated Specialties

Breast/Gynecological Pathology

## Reference

1. Albergaria A, et al. Expression of FOXA1 and GATA-3 in breast cancer: the prognostic significance in hormone receptor-negative tumours. *Breast Cancer Res.* 2009; 11:1-15.
2. Thorat MA, et al. Forkhead box A1 expression in breast cancer is associated with luminal subtype and good prognosis. *J Clin Pathol.* 2008; 61:327-32.
3. Robinson JL, et al. Androgen receptor driven transcription in molecular apocrine breast cancer is mediated by FoxA1. *EMBO J.* 2011; 30:3019-27.

## Ordering Information

### FOXA1 (2F83)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	405M-14
0.5 mL concentrate	405M-15
1 mL concentrate	405M-16
1 mL predilute	405M-17
7 mL predilute	405M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# FoxP1

Forkhead box P1 (FOXP1) is a transcription factor normally expressed in many cellular processes and plays an important role in development, specifically in human leukocyte populations.<sup>1,2</sup> Expression of FOXP1 can be found in neoplastic and non-neoplastic tissues.<sup>2</sup> Overexpression of FOXP1 has been observed in a subset of diffuse large B-cell lymphoma (DLBCL), and thus FOXP1 immunohistochemistry has been shown to be helpful in the subclassification of DLBCL.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP137: IgG
- SP133: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311

## Reference

1. Garaud S, et al. FOXP1 is a regulator of quiescence in healthy human CD4+ T cells and is constitutively repressed in T cells from patients with lymphoproliferative disorders. *Eur. J. Immunol.* 2017; 47:168-79.
2. Wlodarska I, et al. FOXP1, a gene highly expressed in a subset of diffuse large B-cell lymphoma, is recurrently targeted by genomic aberrations. *Leukemia.* 2005; 19:1299-305.

## Ordering Information

### FOXP1 (EP137)

Rabbit Monoclonal  
Primary Antibody



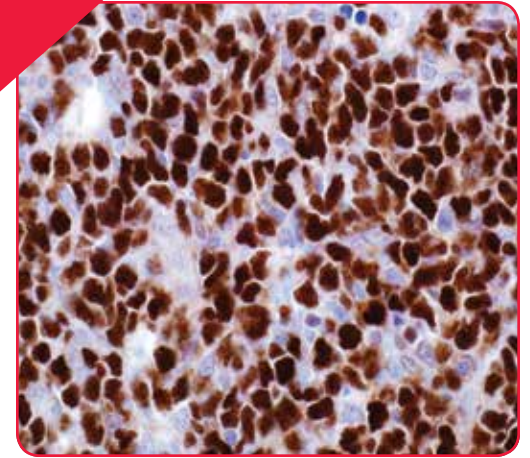
Volume	Part No.
0.1 mL concentrate	350R-24
0.5 mL concentrate	350R-25
1 mL concentrate	350R-26
1 mL predilute	350R-27
7 mL predilute	350R-28

### FoxP1 (SP133)

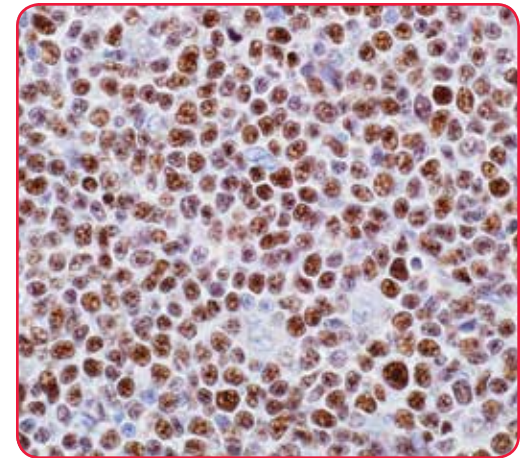
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	350R-14
0.5 mL concentrate	350R-15
1 mL concentrate	350R-16
1 mL predilute	350R-17
7 mL predilute	350R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*



Diffuse large B-cell lymphoma (DLBCL)



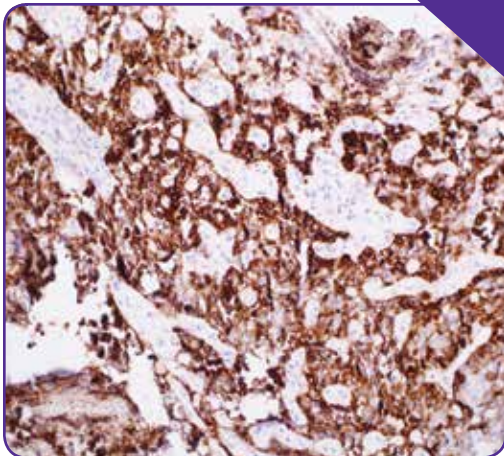
Diffuse large B-cell lymphoma (DLBCL)



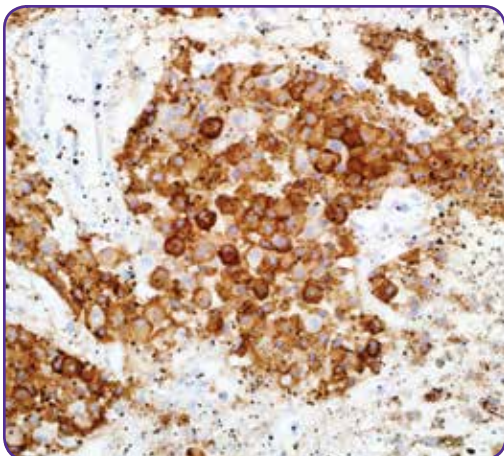
Diffuse large B-cell lymphoma (DLBCL)



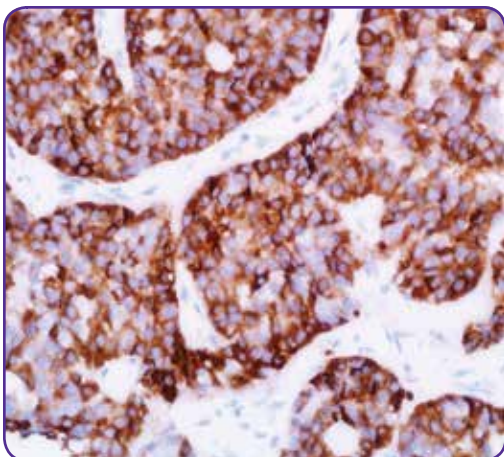
# FSH



Pituitary gland



Pituitary gland



Pituitary adenoma

Follicle-stimulating hormone (FSH) is a member of the pituitary glycoprotein hormone family which also includes luteinizing hormone (LH), chorionic gonadotropin (hCG), and thyroid-stimulating hormone (TSH).<sup>1</sup> Members of the pituitary glycoprotein hormone family consist of a shared alpha chain and a beta chain encoded by a separate gene.<sup>1-3</sup> The FSHB gene encodes the beta subunit of FSH.<sup>1-3</sup> FSH enables ovarian folliculogenesis and is essential for Sertoli cell proliferation and spermatogenesis.<sup>2</sup> Anti-FSH is a useful marker in classification of pituitary neoplasms because it labels FSH-producing cells (gonadotrophs).<sup>3-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pituitary

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP257: IgG

## Associated Specialties

Anatomic Pathology

Neuropathology

## Reference

1. Baenziger JU, et al. Pituitary glycoprotein hormone oligosaccharides: Structure, synthesis and function of the asparagine-linked oligosaccharides on lutropin, follitropin and thyrotropin. *Biochim Biophys Acta*. 1988; 947:287-306.
2. Nussey SS, et al. *Endocrinology: An integrated approach*. BIOS Scientific Publishers Ltd. 2001; p. 217-79.
3. Uccella S, et al. Localization of inhibin/activin subunits in normal pituitary and in pituitary adenomas. *Pituitary*. 2000; 3:131-9.
4. Schmid M, et al. Pituitary hormone mRNA in null cell adenomas and oncocytomas by in situ hybridization comparison with immunohistochemical and clinical data. *Pathol Res Pract*. 2001; 197:663-9.
5. La Rosa S, et al. Detection of gonadotropin-releasing hormone receptor in normal human pituitary cells and pituitary adenomas using immunohistochemistry. *Virchows Arch*. 2000; 437:264-9.

## Ordering Information

### FSH (EP257)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	207R-14
0.5 mL concentrate	207R-15
1 mL concentrate	207R-16
1 mL predilute	207R-17
7 mL predilute	207R-18

### FSH

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	207A-74
0.5 mL concentrate	207A-75
1 mL concentrate	207A-76
1 mL predilute	207A-77
7 mL predilute	207A-78

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Galectin-3

Galectin-3 is a 30-kD protein, a member of the beta-galactosidase-binding lectin family. Galectin-3 is associated with cell growth, adhesion, inflammation, mRNA processing, and apoptosis.<sup>1-2</sup> Reportedly, galectin-3 aberrant expression is related to malignant transformation and metastasis in carcinomas of the breast, colon and thyroid.<sup>3-5</sup> Galectin-3 reactivity can be seen in the nucleus of neutrophils, vascular endothelium, carcinomas of the colon, breast, and thyroid. Galectin-3 may be useful in the differentiation of benign and malignant thyroid neoplasms.<sup>6-7</sup> Galectin-3 may also be useful in the identification of certain liver disorders.<sup>8</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** papillary thyroid carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Cytopathology

Head/Neck Pathology

## Associated Grids

Grid	Page No.
Carcinomas from Thyroid and Other Sites	294
Differential Diagnosis of Thyroid and Parathyroid Tumors	295, 311
Thyroid: Malignant vs. Benign	301

## Reference

1. Inohara H, et al. Expression of galectin-3 in fine-needle aspirates as a diagnostic marker differentiating benign from malignant thyroid neoplasms. *Cancer*. 1999; 85:2475-84.
2. Herrmann ME, et al. Immunohistochemical expression of galectin-3 in benign and malignant thyroid lesions. *Arch Pathol Lab Med*. 2002; 126:710-3.
3. Papotti M, et al. Role of galectin-3 immunodetection in the cytological diagnosis of thyroid cystic papillary carcinoma. *Eur J Endocrinol*. 2002; 147: 515-21.
4. Bartolazzi A, et al. Application of an immunodiagnostic method for improving preoperative diagnosis of nodular thyroid lesions. *Lancet*. 2001; 357:1644-50.
5. Orlandi F, et al. Galectin-3 is a presurgical marker of human thyroid carcinoma. *Cancer Res*. 1998; 58:3015-20.
6. Gasbarri A, et al. Galectin-3 and CD44v6 isoforms in the preoperative evaluation of thyroid nodules. *J Clin Oncol*. 1999; 17:3494-502.
7. Chiu CG, et al. Diagnostic utility of galectin-3 in thyroid cancer. *Am J Pathol*. 2010; 176:2067-81.
8. Hsu DK, et al. Galectin-3 expression is induced in cirrhotic liver and hepatocellular carcinoma. *Int J Cancer*. 1999; 81:519-26.

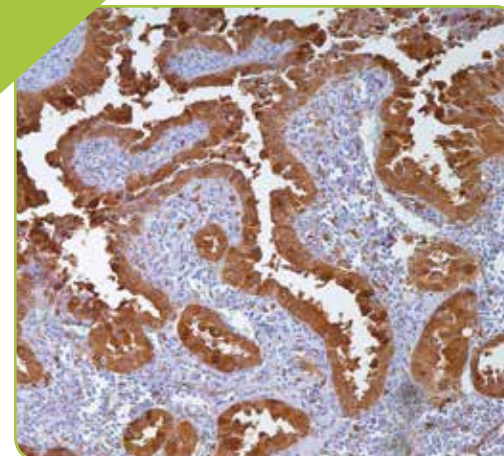
## Ordering Information

### Galectin-3 (9C4)

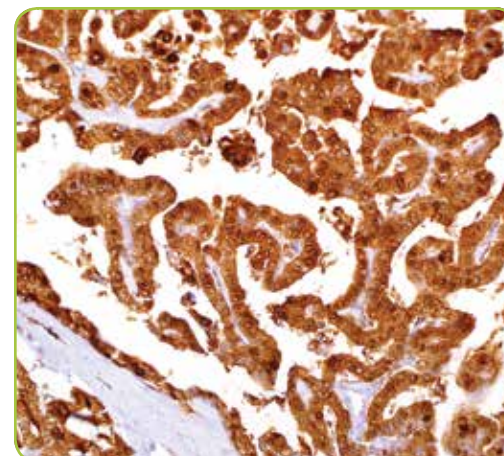
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	255M-14
0.5 mL concentrate	255M-15
1 mL concentrate	255M-16
1 mL predilute	255M-17
7 mL predilute	255M-18

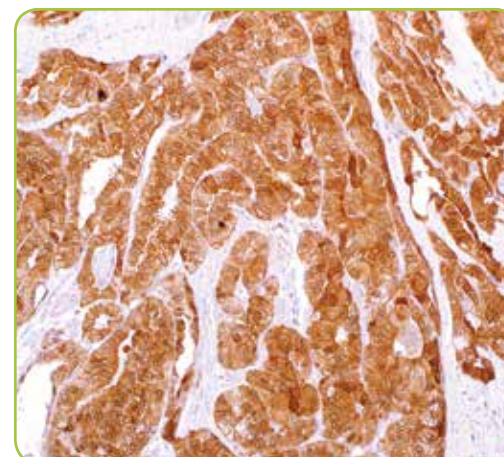
*Please contact your distributor for details on product availability and regulatory status in your country.*



Papillary thyroid carcinoma

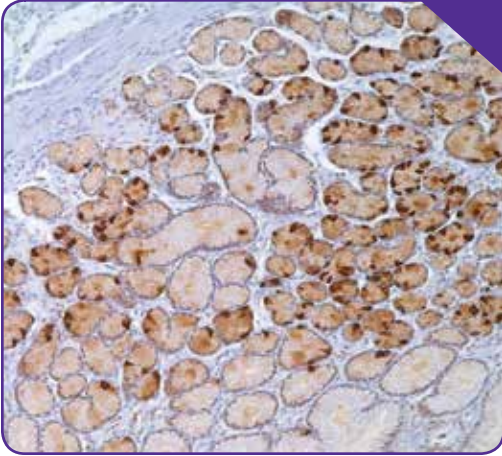


Papillary thyroid carcinoma

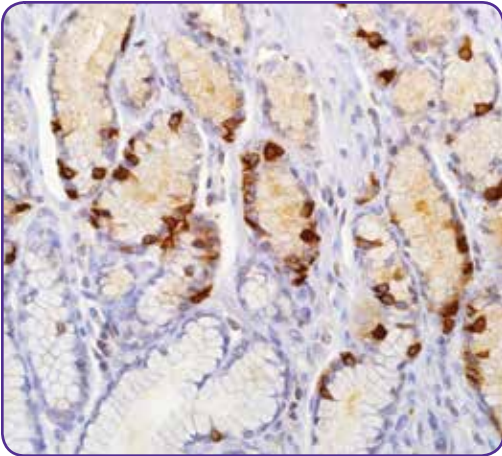


Papillary thyroid carcinoma

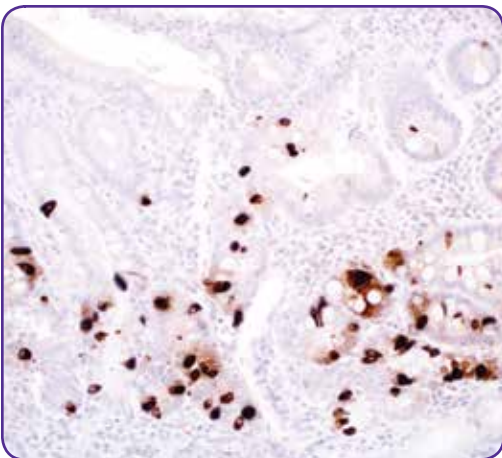
# Gastrin



Stomach



Stomach



Small intestine

Gastrin is a polypeptide hormone produced by G-cells in the gastric antrum and duodenal mucosa that serves as an important regulator of gastric acid secretion.<sup>1</sup> Gastrin is useful for the identification of gastrin-secreting non-neoplastic and neoplastic neuroendocrine cells.<sup>2-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** stomach

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Reference

1. Kasacka W, et al. Immunohistochemical identification and localisation of gastrin and somatostatin in endocrine cells of human pyloric gastric mucosa. *Folia Morphol.* 2012; 71:39-44.
2. Hur K, et al. Expression of gastrin and its receptor in human gastric cancer tissues. *J Cancer Res Clin Oncol.* 2006; 132:85-91.
3. Waldum, et al. Gastrin and Gastric Cancer. *Frontiers in Endocrinology.* 2017; 8:1-7.

## Ordering Information

### Gastrin

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	256A-14
0.5 mL concentrate	256A-15
1 mL concentrate	256A-16
1 mL predilute	256A-17
7 mL predilute	256A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# GATA1

GATA1 is a nuclear transcription factor that belongs to the family of GATA proteins, which suppresses the proliferation of megakaryocytic and erythroid precursors while promoting their differentiation. GATA1 immunohistochemical reactivity is seen in erythroid, megakaryocytic, and mast cell lineages.<sup>1,2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** bone marrow, acute myeloid leukemia

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Hematopoietic Neoplasms and Anaplastic Large Cell Lymphoma	313

## Reference

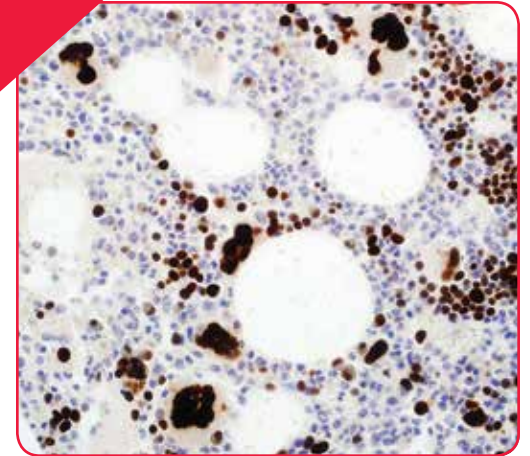
1. Elefany A, et al. GATA Transcription Factors Associate with a Novel Class of Nuclear Bodies in Erythroblasts and Megakaryocytes. *The EMBO Journal*. 1996; 15:319-33.
2. Rainis L, et al. Mutations in Exon 2 of GATA1 are Early Events in Megakaryocytic Malignancies Associated with Trisomy 21. *Blood*. 2003; 102:981-6.

## Ordering Information

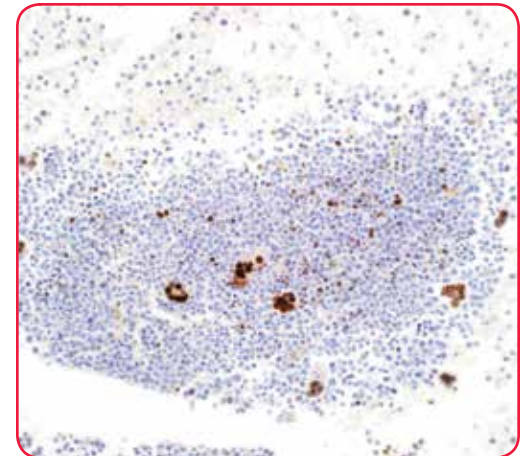
**GATA1 (4F5)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	417M-14
0.5 mL concentrate	417M-15
1 mL concentrate	417M-16
1 mL predilute	417M-17
7 mL predilute	417M-18

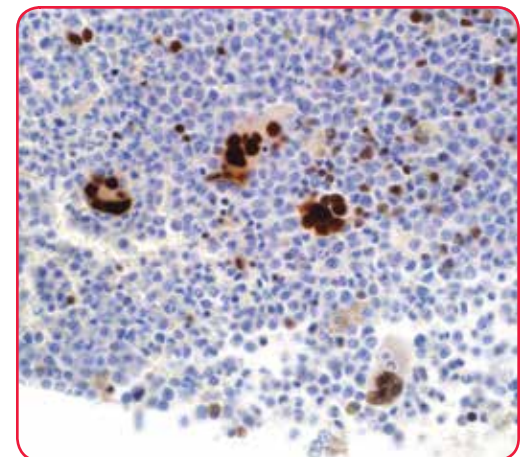
*Please contact your distributor for details on product availability and regulatory status in your country.*



Bone marrow

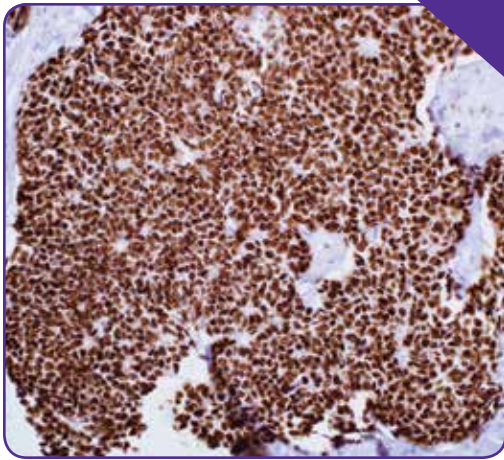


Bone marrow, myeloproliferative neoplasm

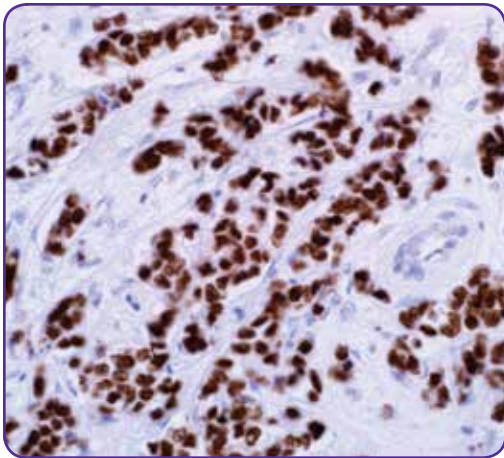


Bone marrow, myeloproliferative neoplasm

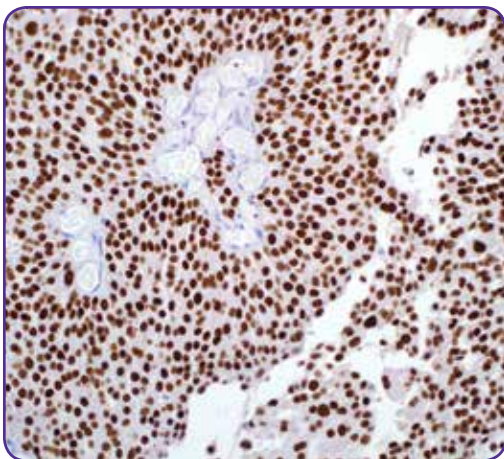
# GATA3



Breast, ductal carcinoma *in situ*



Breast, invasive ductal carcinoma



Urothelial carcinoma

GATA binding protein 3 or GATA3, is a zinc finger transcription factor and plays an important role in promoting and directing cell proliferation, development, and differentiation in many tissues and cell types.<sup>1-4</sup> The human GATA3 gene has been mapped to chromosome 10p15.<sup>3</sup> GATA3 expression is primarily seen in breast carcinoma and urothelial carcinoma.<sup>1-2</sup> Anti-GATA3 can also be useful in the identification of unknown primary carcinoma when carcinomas of the breast or bladder are a possibility.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** breast carcinoma, urothelial carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Breast/Gynecological Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292
Differential Diagnosis of Metastatic Adenocarcinomas	295
Liver: Primary and Metastatic Epithelial Neoplasms	308
Kidney: Epithelial Neoplasms	309
Prostate Lesions	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310
Kidney, Urothelial, and Soft Tissue Neoplasms	321

## Reference

1. Higgins JP, et al. Placental S100 (S100P) and GATA3: markers for transitional epithelium and urothelial carcinoma discovered by complementary DNA microarray. *Am J Surg Pathol.* 2007; 31:673-80.
2. Liu H, et al. Immunohistochemical evaluation of GATA3 expression in tumors and normal tissues: a useful immunomarker for breast and urothelial carcinomas. *Am J Clin Pathol.* 2012; 138:57-64.
3. Joulin V, et al. A T-cell specific TCR delta DNA binding protein is a member of the human GATA family. *EMBO J.* 1991; 10:1809-16.
4. Labastie M, et al. Structure and expression of the human GATA3 gene. *Genomics.* 1994; 21:1-6.

## Ordering Information

### GATA3 (L50-823)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	390M-14
0.5 mL concentrate	390M-15
1 mL concentrate	390M-16
1 mL predilute	390M-17
7 mL predilute	390M-18
25 mL predilute	390M-10

Please contact your distributor for details on product availability and regulatory status in your country.

# GCDFP-15

GCDFP-15 is a 15-kD glycoprotein which is localized in the apocrine metaplastic epithelium lining breast cysts and in apocrine glands in the axilla, vulva, eyelid, ear canal, and in salivary glands.<sup>1</sup> GCDFP-15 positivity is seen in breast carcinomas.<sup>2,4-6</sup> On the other hand, colorectal carcinomas, lung carcinoma, mesotheliomas rarely stain with this antibody.<sup>3</sup> Because of its specificity for breast carcinoma, this antibody is often helpful in distinguishing metastasis of unknown primary.<sup>4,6-10</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 23A3: IgG<sub>2a</sub>
- EP1582Y: IgG

## Synonyms and Abbreviations

BRST-2

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292
Carcinomas	292, 293
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Breast Lesion	302
Skin Adnexal Tumors	305

## Reference

1. Mazoujian G, et al. Immunohistochemistry of gross cystic disease fluid protein (GCDFP-15) in 65 benign sweat gland tumors of the skin. *Am J Dermatopathol.* 1988; 10:28-35.
2. Ansai S, et al. An immunohistochemical study of lysozyme, CD-15 (Leu M1), and gross cystic disease fluid protein-15 in various skin tumors. Assessment of the specificity and sensitivity of markers of apocrine differentiation. *Am J Dermatopathol.* 1995; 17:249-55.
3. Mazoujian G, et al. Immunohistochemistry of a gross cystic disease fluid protein (GCDFP-15) of the breast. A marker of apocrine epithelium and breast carcinomas with apocrine features. *Am J Pathol.* 1983; 110:105-12.

For the complete list of references see the product IFU.

## Ordering Information

### GCDFP-15 (23A3)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	257M-14
0.5 mL concentrate	257M-15
1 mL concentrate	257M-16
1 mL predilute	257M-17
7 mL predilute	257M-18
25 mL predilute	257M-10

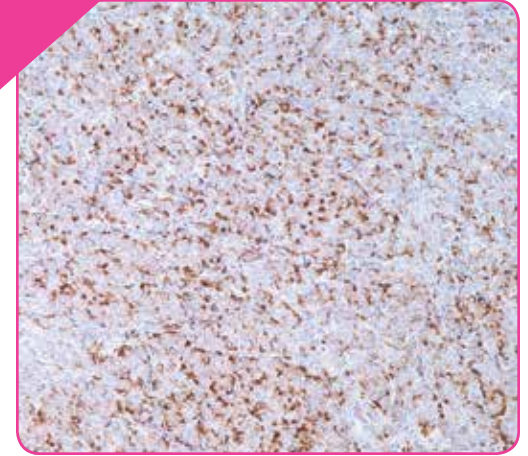
### GCDFP-15 (EP1582Y)

Rabbit Monoclonal  
Primary Antibody

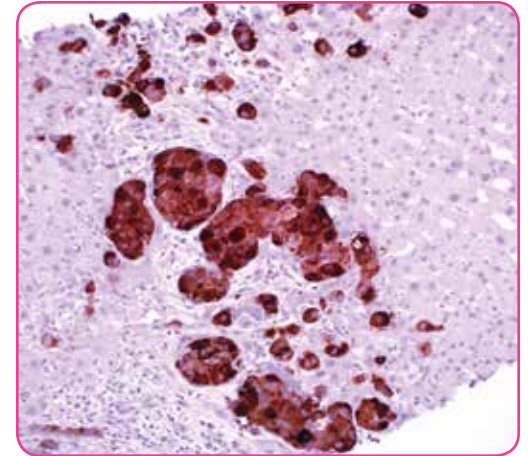


Volume	Part No.
0.1 mL concentrate	257R-14
0.5 mL concentrate	257R-15
1 mL concentrate	257R-16
1 mL predilute	257R-17
7 mL predilute	257R-18

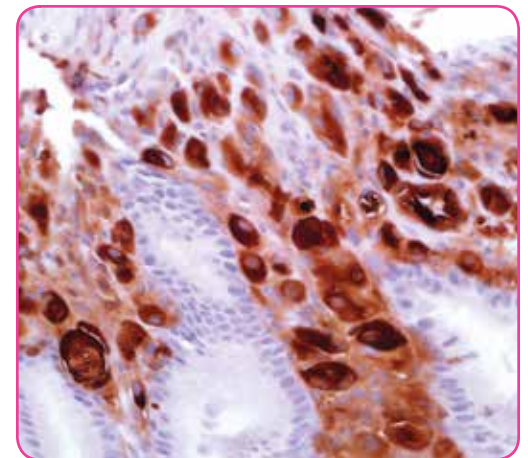
Please contact your distributor for details on product availability and regulatory status in your country.



Breast carcinoma

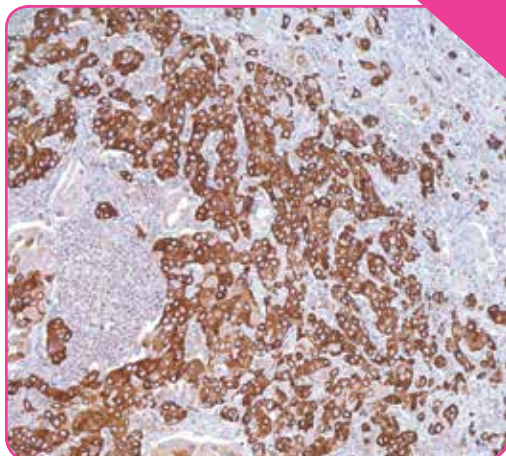


Liver, metastatic breast carcinoma

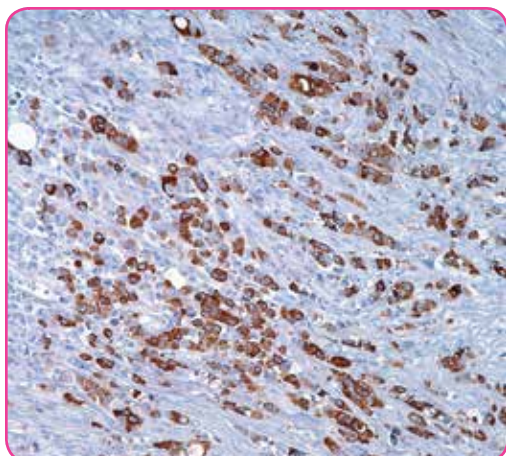


Stomach, metastatic breast carcinoma

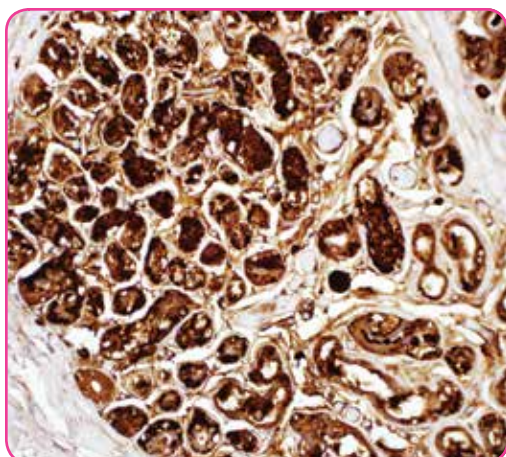
# GCDFP-15 + Mammaglobin Cocktail



Breast invasive ductal carcinoma



Breast, infiltrating ductal carcinoma



Breast

Anti-GCDFP-15, mouse monoclonal (23A3), and anti-mammaglobin, mouse monoclonal (304-1A5) and rabbit monoclonal (31A5), is an antibody cocktail. GCDFP-15 is a 15-kD glycoprotein which is localized in the apocrine metaplastic epithelium lining breast cysts and in apocrine glands in the axilla, vulva, eyelid, and ear canal. Mammaglobin (10-kD) is a breast-associated glycoprotein distantly related to the secretoglobulin family that includes human uteroglobin and lipophilin.<sup>1-6</sup> This antibody cocktail is useful in identifying breast carcinoma.<sup>4-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast, breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 23A3: IgG<sub>2a</sub>
- 304-1A5: IgG<sub>1</sub>
- 31A5: IgG

## Associated Specialties

Breast/Gynecological Pathology

## Reference

1. Cohen C, et al. Mammary Paget's disease and associated carcinoma. An immunohistochemical study. Arch Pathol Lab Med. 1993; 117:291-4.
2. Bhargava R, et al. Mammaglobin vs GCDFP-15: an immunohistologic validation survey for sensitivity and specificity. Am J Clin Pathol. 2007; 127:103-13.
3. Tornos C, et al. Expression of WT1, CA 125, and GCDFP-15 as useful markers in the differential diagnosis of primary ovarian carcinomas versus metastatic breast cancer to the ovary. Am J Surg Pathol. 2005; 29:1482-9.
4. Takeda Y, et al. Analysis of expression patterns of breast cancer-specific markers (mammaglobin and gross cystic disease fluid protein 15) in lung and pleural tumors. Arch Pathol Lab Med. 2008; 132:239-43.
5. Liegl B, et al. Mammary and extramammary Paget's disease: an immunohistochemical study of 83 cases. Histopathology. 2007; 50:439-47.
6. Watson MA, et al. Mammaglobin expression in primary, metastatic, and occult breast cancer. Cancer Res. 1999; 59:3028-31.

## Ordering Information

### GCDFP-15 (23A3) + Mammaglobin Cocktail (304-1A5 & 31A5)

Mouse/Rabbit Monoclonal Antibodies

Volume	Part No.
1 mL predilute	906H-07
7 mL predilute	906H-08

*Please contact your distributor for details on product availability and regulatory status in your country.*

Human growth hormone (GH) is a single-chain polypeptide containing 191 amino acid residues with two disulfide bridges.<sup>1</sup> GH participates in a wide range of biological functions such as metabolism of proteins, carbohydrates and lipids and is also involved with growth, development and immunity.<sup>1</sup> GH is synthesized in acidophilic cells of the anterior pituitary gland by a subpopulation of cells with the somatotroph phenotype.<sup>2</sup> Anti-GH is a useful marker in the classification of pituitary tumors and can be used in the study of pituitary disease.<sup>2-4</sup>

### Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pituitary

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP267: IgG

### Associated Specialties

Anatomic Pathology

Neuropathology

### Reference

1. Rezaei, et al. Zarkesh-Esfahani. "Optimization of Production of Recombinant Human Growth Hormone in Escherichia Coli." Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences. 2012; 17.7:681-5.
2. Al-Brahim NY, et al. My Approach to Pathology of the Pituitary Gland. J Clin Pathol. 2006; 59:1245-53.
3. Fukaya T, et al. Morphofunctional study of pituitary adenomas with acromegaly by immunoperoxidase technique and electron microscopy. Cancer. 1980; 45:1598-1603.
4. Kovacs K, et al. Adenoma of the human pituitary producing growth hormone and thyrotropin. A histologic, immunocytologic and fine-structural study. Virch Arch Pathol Anat. 1982; 395:59-68.

### Ordering Information

#### GH (EP267)

Rabbit Monoclonal  
Primary Antibody



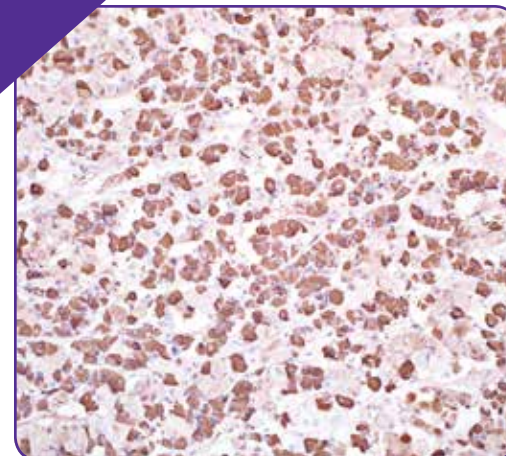
Volume	Part No.
0.1 mL concentrate	208R-14
0.5 mL concentrate	208R-15
1 mL concentrate	208R-16
1 mL predilute	208R-17
7 mL predilute	208R-18

#### GH

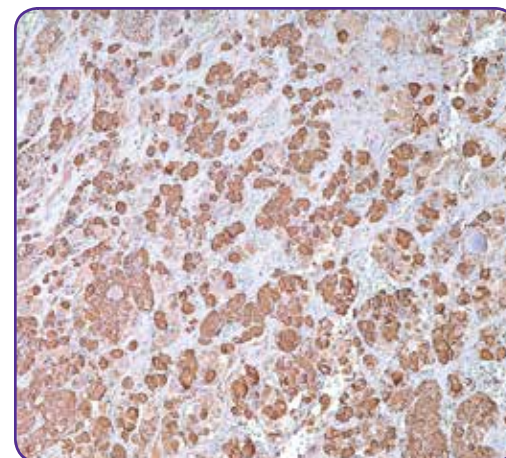
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	208A-74
0.5 mL concentrate	208A-75
1 mL concentrate	208A-76
1 mL predilute	208A-77
7 mL predilute	208A-78

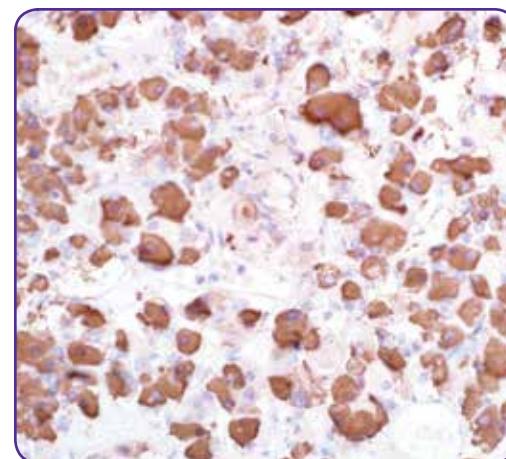
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pituitary adenoma



Pituitary gland



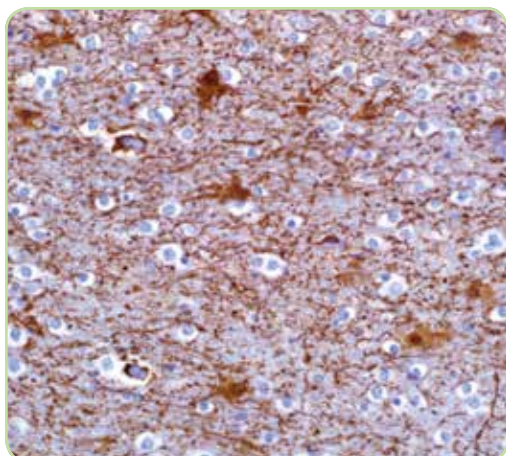
Pituitary adenoma



# Glial Fibrillary Acidic Protein



Brain



Brain



Brain

Anti-GFAP detects astrocytes, Schwann cells, satellite cells, enteric glial cells, and some groups of ependymal cells. This marker is mainly used to distinguish neoplasms of astrocytic origin from other neoplasms in the central nervous system.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** brain

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP672Y: IgG
- SP78: IgG

## Synonyms and Abbreviations

GFAP

## Associated Specialties

Neuropathology

## Associated Grids

Grid	Page No.
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Retroperitoneal Lesions	299, 319
Neuroid Skin Lesions	305
Brain: CNS Tumors	318
Meningeal Solitary Fibrous Tumor (SFT)	318
Retroperitoneal Neoplasms	318

## Reference

1. Choi BH, et al. Expression of glial fibrillary acidic protein in immature oligodendroglia. *Science*. 1984; 223:407-9.
2. Jessen KR, et al. Astrocyte-like glia in the peripheral nervous system: an immunohistochemical study of enteric glia. *J Neurosci*. 1983; 3:2206-18.
3. Kawahara E, et al. Expression of glial fibrillary acidic protein (GFAP) in peripheral nerve sheath tumors. A comparative study of immunoreactivity of GFAP, vimentin, S-100 protein, and neurofilament in 38 schwannomas and 18 neurofibromas. *Am J Surg Pathol*. 1988; 12:115-20.

## Ordering Information

### Glial Fibrillary Acidic Protein (EP672Y)

Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	258R-14
0.5 mL concentrate	258R-15
1 mL concentrate	258R-16
1 mL predilute	258R-17
7 mL predilute	258R-18

### Glial Fibrillary Acidic Protein (GFAP) (SP78)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	258R-24
0.5 mL concentrate	258R-25
1 mL concentrate	258R-26
1 mL predilute	258R-27
7 mL predilute	258R-28

Please contact your distributor for details on product availability and regulatory status in your country.

# Glucagon

Pancreatic islets (islets of Langerhans) contain several cell types, including glucagon secreting alpha cells and insulin secreting beta cells, that work together to maintain glucose homeostasis.<sup>1-2</sup> Glucagon is a peptide hormone that increases blood glucose through gluconeogenesis and glycogenolysis.<sup>1-3</sup> Anti-glucagon labels glucagon secreting cells of both normal and neoplastic origin.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pancreas

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP74: IgG

## Associated Specialties

Anatomic Pathology

## Reference

1. Quesada I, et al. Physiology of the pancreatic alpha-cell and glucagon secretion: role in glucose homeostasis and diabetes. *J Endocrinol.* 2008; 199:5-19.
2. Gurlo T, et al. Evaluation of immunohistochemical staining for glucagon in human pancreatic tissue. *J Histotechnol.* 2016; 39:8-16.
3. Wewer Albrechtsen NJ, et al. The biology of glucagon and the consequences of hyperglucagonemia. *Biomark Med.* 2016; 10:1141-51.

## Ordering Information

### Glucagon (EP74)

Rabbit Monoclonal  
Primary Antibody



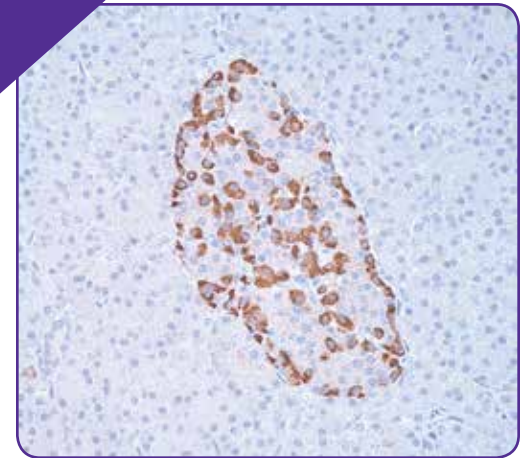
Volume	Part No.
0.1 mL concentrate	259R-14
0.5 mL concentrate	259R-15
1 mL concentrate	259R-16
1 mL predilute	259R-17
7 mL predilute	259R-18

### Glucagon

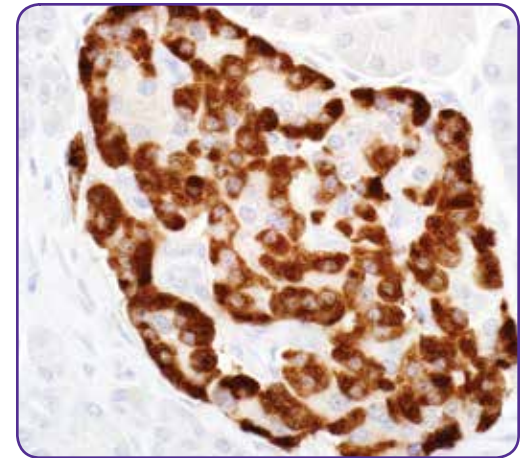
Rabbit Polyclonal Antibody

Volume	Part No.
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1 mL concentrate	259A-16
1 mL predilute	259A-17
7 mL predilute	259A-18

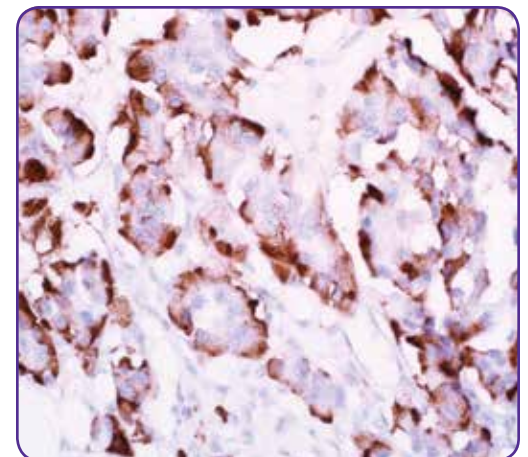
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreas

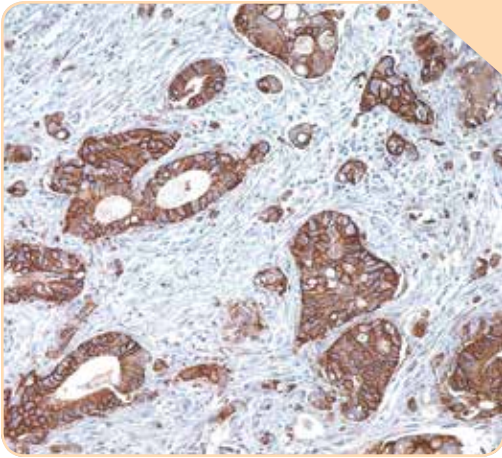


Pancreas

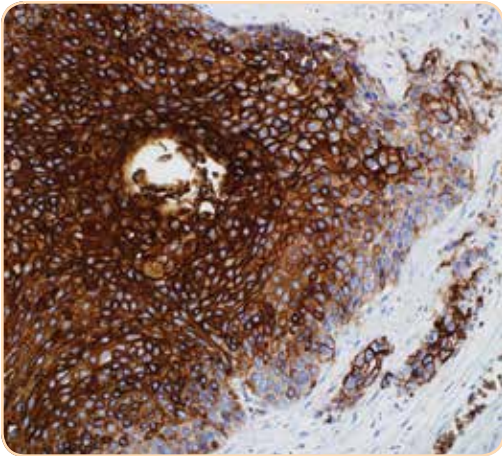


Pancreatic neuroendocrine tumor

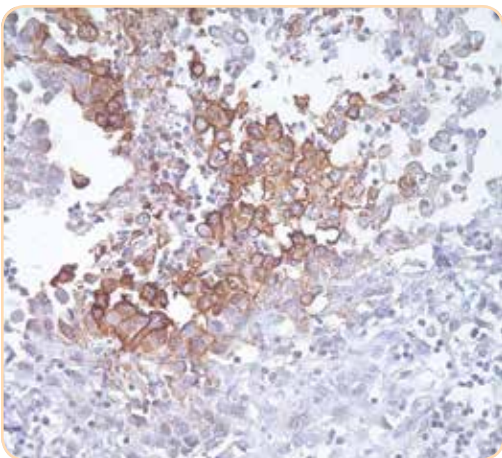
# GLUT1



Colorectal carcinoma



Esophageal squamous cell carcinoma



Pleural mesothelioma

Glucose transporter type I (GLUT1), a prototype member of the GLUT superfamily, is a membrane-associated, erythrocyte glucose transport protein. It is a major glucose transporter in the mammalian blood-brain barrier, and also mediates glucose transport in endothelial cells of the vasculature, adipose tissue, and cardiac muscle. GLUT1 is detectable in many human tissues including those of colon, lung, stomach, and breast. GLUT1 is overexpressed in malignant cells and in a variety of tumors that include mesothelioma and colon carcinoma. Immunohistochemical detection of GLUT1 has been shown to discriminate between reactive mesothelium and malignant mesothelioma in more than one study.<sup>1,2</sup> Anti-GLUT1 is also useful in distinguishing benign endometrial hyperplasia from atypical endometrial hyperplasia and adenocarcinoma. GLUT1 expression has been shown to be associated with increased malignant potential and invasiveness.<sup>3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** colorectal carcinoma, mesothelioma

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Cytopathology

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Spindle Cell Lesions	300
Thymus	301

## Reference

1. Kato Y, et al. Immunohistochemical detection of GLUT-1 can discriminate between reactive mesothelium and malignant mesothelioma. *Mod Pathol.* 2006; 20:215-20.
2. Afify A, et al. Diagnostic utility of GLUT-1 expression in the cytologic evaluation of serous fluids. *Acta Cytol.* 2005; 49:621-6.
3. Parente P, et al. Immunohistochemical expression of the glucose transporters Glut-1 and Glut-3 in human malignant melanomas and benign melanocytic lesions. *J Exp Clin Cancer Res.* 2008; 27:34.
4. Zimmerman RL, et al. Diagnostic utility of Glut-1 and CA 15-3 in discriminating adenocarcinoma from hepatocellular carcinoma in liver tumors biopsied by fine-needle aspiration. *Cancer.* 2002; 96:53-7.

## Ordering Information

### GLUT1

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	355A-14
0.5 mL concentrate	355A-15
1 mL concentrate	355A-16
1 mL predilute	355A-17
7 mL predilute	355A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# GLUT3

Glucose transporter membrane 3 (GLUT3) is a membrane-bound glucose transporter. Anti-GLUT3 reactivity is seen in the testis, spermatozoa, and brain.<sup>1</sup> However, no reactivity with anti-GLUT3 was observed in other tissues. Anti-GLUT3 reactivity is seen in the majority of testicular germ cell tumors including seminoma, embryonal carcinoma, and yolk sac tumor. Anti-GLUT3 reactivity was not seen in non-germ cell tumors making anti-GLUT3 a useful immunohistochemical marker for the identification of testicular germ cell tumors.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** embryonal carcinoma, yolk sac tumor

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Genitourinary (GU) Pathology

## Reference

1. Haber RS, et al. Tissue distribution of the human GLUT3 glucose transporter. *Endocrinology*. 1993; 132:2538.
2. Howitt BE, et al. Identification and characterization of 2 testicular germ cell markers, Glut3 and CyclinA2. *Appl Immunohistochem Mol Morphol*. 2013; 21:401.

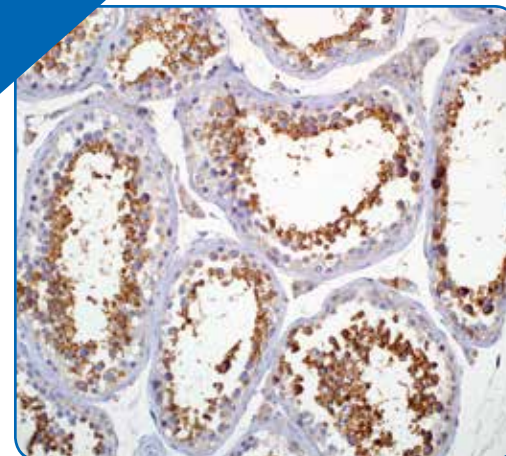
## Ordering Information

### GLUT3

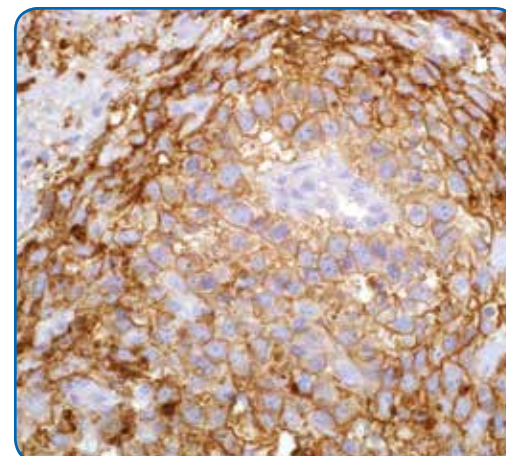
Rabbit Polyclonal Antibody

Volume	Part No.
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0.5 mL concentrate	413A-15
1 mL concentrate	413A-16
1 mL predilute	413A-17
7 mL predilute	413A-18

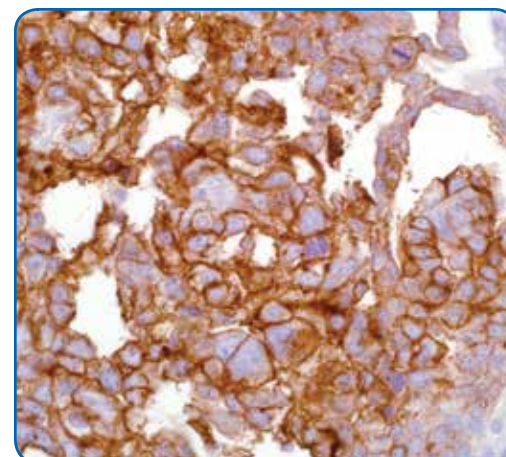
*Please contact your distributor for details on product availability and regulatory status in your country.*



Testis

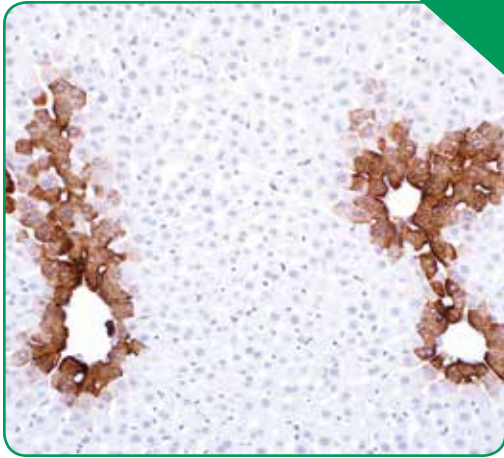


Yolk sac tumor

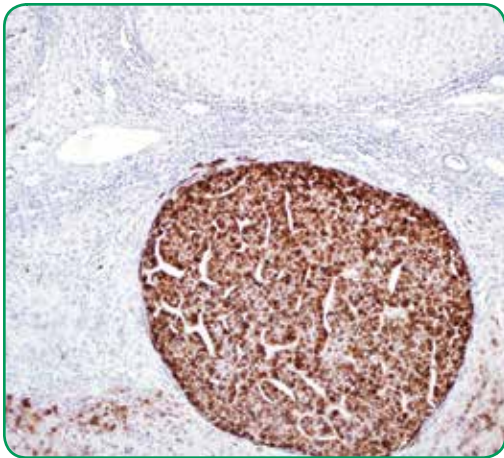


Yolk sac tumor

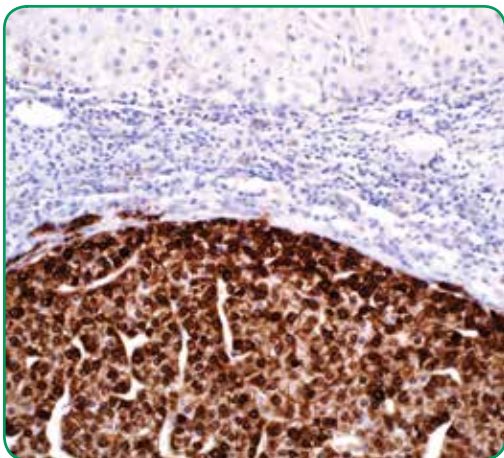
# Glutamine Synthetase



Liver



Hepatocellular carcinoma (HCC)



Hepatocellular carcinoma (HCC)

Glutamine synthetase (GS) catalyzes the synthesis of glutamine from glutamate and ammonia in the mammalian liver. In normal liver, GS expression is seen in centrilobular (zone 3) hepatocytes, but not in mid-zone (zone 2) or periportal (zone 1) hepatocytes. Glutamine, the end product of GS activity, is the major energy source of tumor cells. Based on findings from experimental hepatocarcinogenesis, GS-positive tumor cells are believed to be derived from GS-positive hepatocytes. Thus, anti-GS has been suggested as a marker for hepatocellular carcinoma (HCC).<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** hepatocellular carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Synonyms and Abbreviations

GS

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Liver: Primary and Metastatic Epithelial Neoplasms	308

## Reference

1. Di Tommaso L, et al. Diagnostic value of HSP70, glypican 3, and glutamine synthetase in hepatocellular nodules in cirrhosis. *Hepatology*. 2007; 45:725-34.
2. Nakamoto Y. Promising new strategies for hepatocellular carcinoma. *Hepatol Res*. 2016; 47:251-65.

## Ordering Information

### Glutamine Synthetase (GS-6)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	389M-14
0.5 mL concentrate	389M-15
1 mL concentrate	389M-16
1 mL predilute	389M-17
7 mL predilute	389M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Glycophorin A

Glycophorins A and B are major sialoglycoproteins expressed across the surface of the human erythrocyte membrane and contain the antigenic determinants that define the MNS blood group system.<sup>1</sup> The high sialic acid content of glycophorin A contributes to the generation of a net negative surface charge across erythrocyte membranes that minimizes interactions between red blood cells and prevents their aggregation. Anti-glycophorin A has utility in identifying cells of the erythroid lineage.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** bone marrow

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>/k

## Synonyms and Abbreviations

GPA

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Erythroid	313
Hematopoietic Neoplasms and Anaplastic Large Cell Lymphoma	313

## Reference

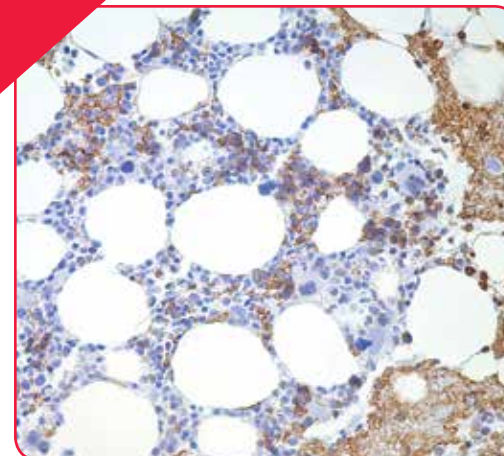
1. Reid ME. MNS blood group system: a review. *Immunohematology*. 2009; 25:95-101.
2. Olsen RJ, et al. Acute leukemia immunohistochemistry: a systematic diagnostic approach. *Arch Pathol Lab Med*. 2008; 132:462-75.

## Ordering Information

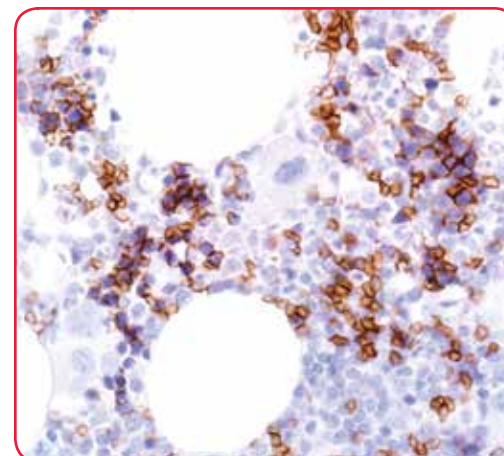
**Glycophorin A (GA-R2)**  
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	260M-15
1 mL concentrate	260M-16
1 mL predilute	260M-17
7 mL predilute	260M-18

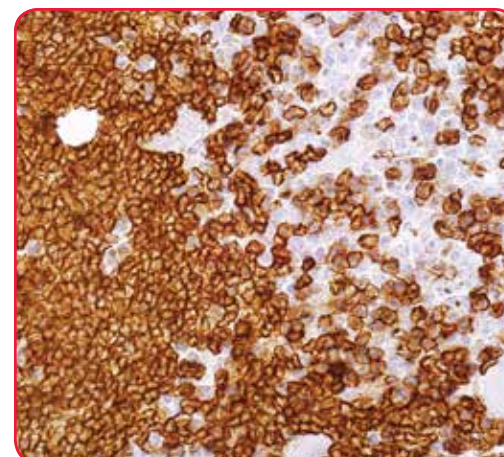
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Bone marrow

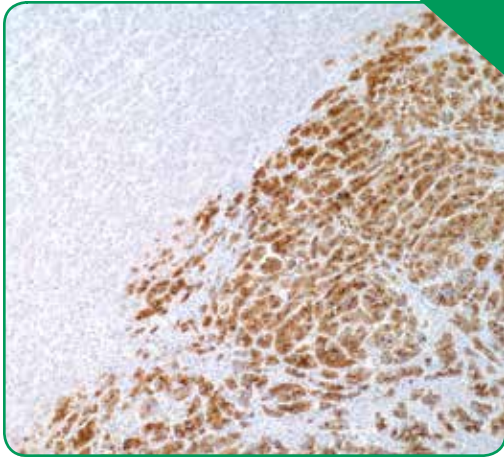


Bone marrow

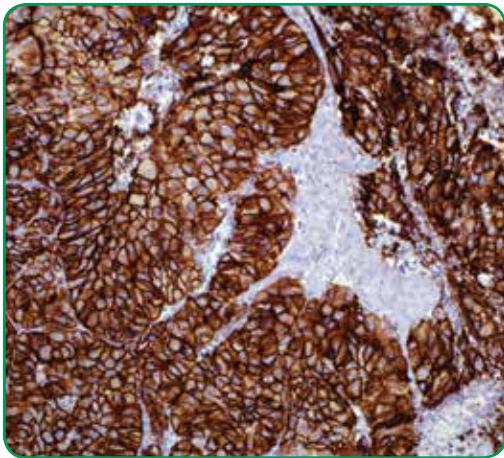


Bone marrow clot

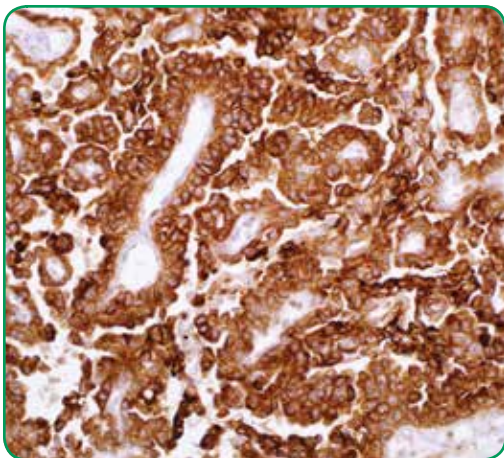
# Glypican-3



Hepatocellular carcinoma (HCC)



Hepatocellular carcinoma (HCC)



Yolk sac tumor

Glypican-3 (GPC-3) is a membrane-bound heparin sulfate proteoglycan known to participate in cell growth and differentiation.<sup>1</sup> GPC-3 expression has been detected in the majority of hepatocellular carcinomas (HCC), but was rarely observed in non-neoplastic hepatic tissue, making it a useful marker for HCC.<sup>1-3</sup> Additionally, this marker is expressed in many yolk sac tumors.<sup>1,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** hepatocellular carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

GPC-3

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
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Liver: Malignant vs. Benign	297
Various Germ Cell Tumor Components	301
Liver: Primary and Metastatic Epithelial Neoplasms	308
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309

## Reference

1. Kandil DH, et al. Glypican-3 a novel diagnostic marker for hepatocellular carcinoma and more. *Adv Anat Pathol.* 2009; 16:125-9.
2. Coston WMP, et al. Distinction of hepatocellular carcinoma from benign hepatic mimickers using Glypican-3 and CD34 immunohistochemistry. *Am J Surg Pathol.* 2008; 32:433-44.
3. Capurro M, et al. Glypican-3: a novel serum and histochemical marker for hepatocellular carcinoma. *Gastroenterology.* 2003; 125:89-97.
4. Zynger DL, et al. Glypican 3: a novel marker in testicular germ cell tumors. *Am J Surg Pathol.* 2006; 30:1570-5.

## Ordering Information

### Glypican-3 (1G12)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	261M-94
0.5 mL concentrate	261M-95
1 mL concentrate	261M-96
1 mL predilute	261M-97
7 mL predilute	261M-98
25 mL predilute	261M-90

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Granzyme B

Granzymes are serine proteases which are stored in specialized lytic granules of cytotoxic T-lymphocytes and in natural killer cells.<sup>1</sup> Anti-granzyme B has been useful in the identification of natural killer/T-cell lymphoma, as well as anaplastic large cell lymphoma.<sup>2-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** spleen, anaplastic large cell lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP230: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
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Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314
Hodgkin vs. Non-Hodgkin Lymphomas	314
NK Cell Leukemia/Lymphoma	316
T-cell Lymphomas	317

## Reference

1. Kummer JA, et al. Localization and identification of granzymes A and B-expressing cells in normal human lymphoid tissue and peripheral blood. Clin Exp Immunol. 1995; 100:164-72.
2. Oudejans JJ, et al. Granzyme B expression in Reed-Sternberg cells of Hodgkin disease. Am J Pathol. 1996; 148:233-40.
3. Kato N, et al. Neutrophil-rich anaplastic large cell lymphoma presenting in the skin. Am J Dermatopathol. 2003; 25:142-7.
4. Liu J, et al. Nasal natural killer/T cell lymphoma with cutaneous involvement: case report and Chinese literature review reported in China mainland. J Dermatol. 2003; 30:735-41.

## Ordering Information

### Granzyme B (EP230)

Rabbit Monoclonal  
Primary Antibody



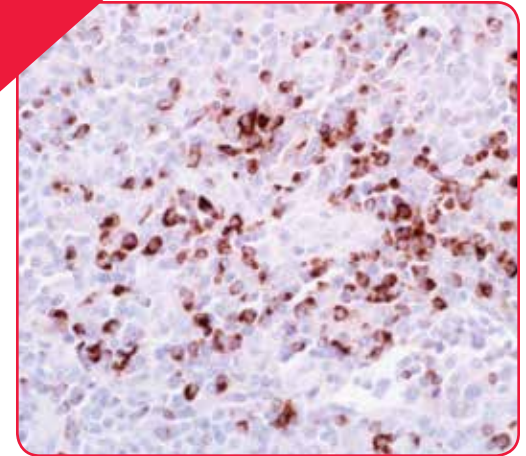
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0.5 mL concentrate	262R-15
1 mL concentrate	262R-16
1 mL predilute	262R-17
7 mL predilute	262R-18

### Granzyme B

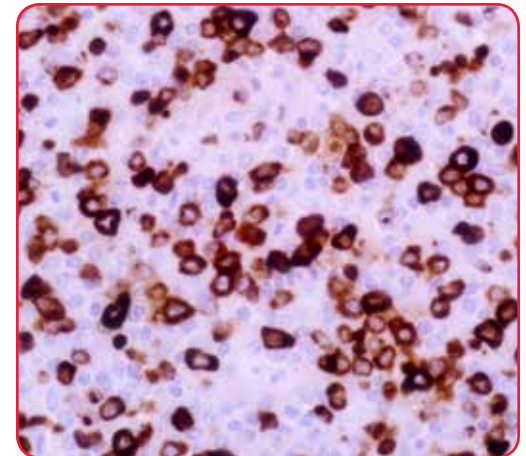
Rabbit Polyclonal Antibody

Volume	Part No.
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0.5 mL concentrate	262A-15
1 mL concentrate	262A-16
1 mL predilute	262A-17
7 mL predilute	262A-18

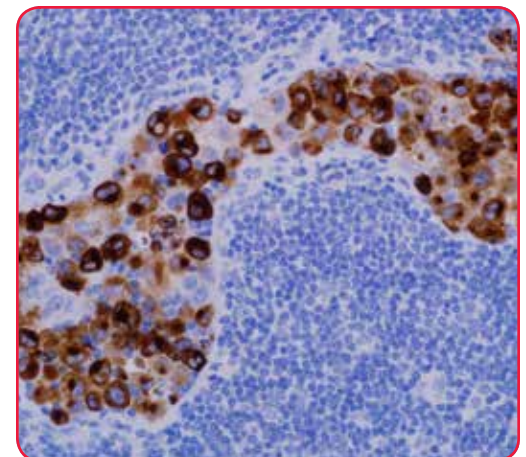
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Angioimmunoblastic T-cell lymphoma



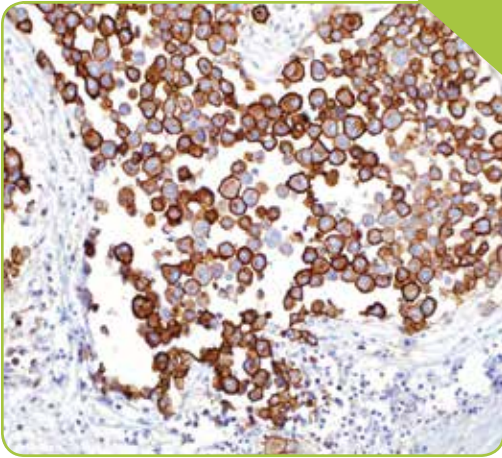
NK/T-cell lymphoma



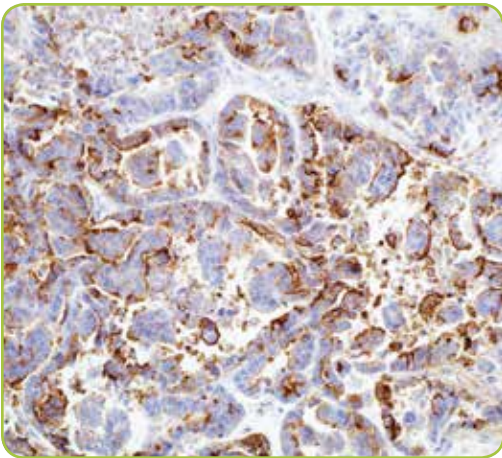
Anaplastic large cell lymphoma



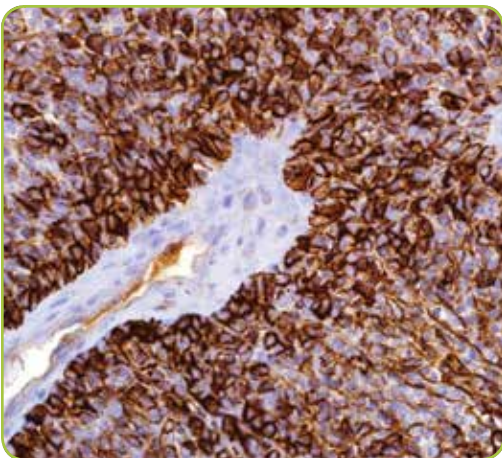
# HBME-1



Epithelioid mesothelioma



Pleural mesothelioma



Thyroid tumor

Hector Battifora mesothelial-1 (HBME-1) is a membrane antigen that exists in the microvilli of mesothelial cells and other epithelial cells.<sup>1</sup> Anti-HBME-1 labels thyroid papillary carcinoma and follicular carcinoma but not normal thyroid making it a valuable marker for distinguishing thyroid malignancies from benign thyroid lesions.<sup>2</sup> It has also been demonstrated to label mesothelial cells, both benign and malignant (malignant mesothelioma) and thus can aid in the identification of mesothelioma.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic, membranous  
**Control** mesothelioma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgM/k

## Synonyms and Abbreviations

Mesothelial Cell

## Associated Specialties

Cytopathology  
Head/Neck Pathology

## Associated Grids

Grid	Page No.
Carcinomas from Thyroid and Other Sites	294
Differential Diagnosis of Metastatic Adenocarcinomas	295
Thyroid: Malignant vs. Benign	301
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Reference

- Cheung CC, et al. Immunohistochemical diagnosis of papillary thyroid carcinoma. *Mod Pathol.* 2001; 14:338-42.
- Bateman AC, et al. Immunohistochemical phenotype of malignant mesothelioma: predictive value of CA125 and HBME-1 expression. *Histopathology.* 1997; 30:49-56.

## Ordering Information

**HBME-1 (HBME-1)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	283M-14
0.5 mL concentrate	283M-15
1 mL concentrate	283M-16
1 mL predilute	283M-17
7 mL predilute	283M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

hCG is a hormone synthesized by syncytiotrophoblasts and belongs to a group of glycoprotein hormones known as gonadotropins. Gonadotropins regulate normal growth, sexual development and reproductive function.<sup>1,2</sup> This antibody detects syncytiotrophoblasts in placenta and in tumors such as choriocarcinoma and some cases of seminoma.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** placenta

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Placental Trophoblastic Cells	303
Placental Trophoblastic Proliferations	303
Uterus: Trophoblastic Proliferations	304
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309

## Reference

- Hes O, et al. Choriogonadotropin positive seminoma-a clinicopathological and molecular genetic study of 15 cases. *Ann Diagn Pathol.* 2014; 18:89-94.
- Mazina O, et al. Determination of biological activity of gonadotropins hCG and FSH by Forster resonance energy transfer based biosensors. *Sci. Rep.* 2017; 7:42219.

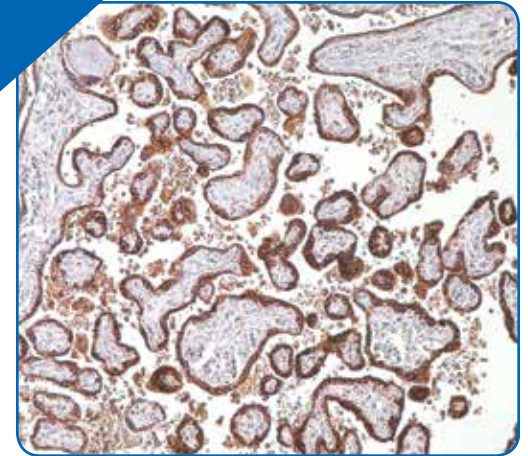
## Ordering Information

### hCG

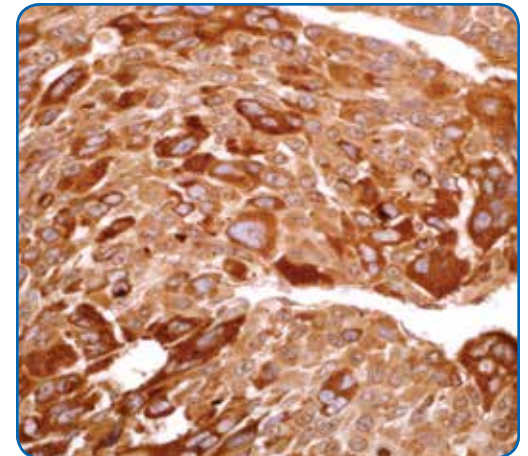
Rabbit Polyclonal Antibody

Volume	Part No.
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0.5 mL concentrate	234A-15
1 mL concentrate	234A-16
1 mL predilute	234A-17
7 mL predilute	234A-18

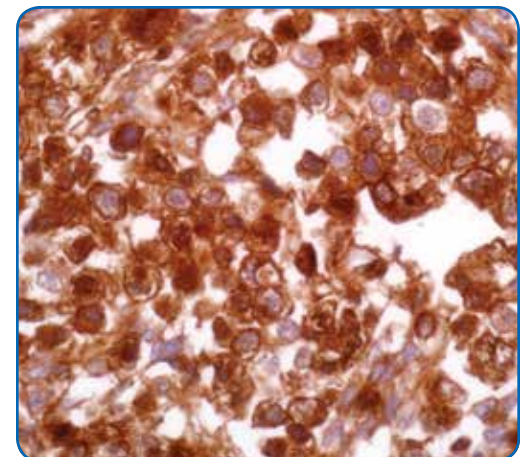
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Placenta

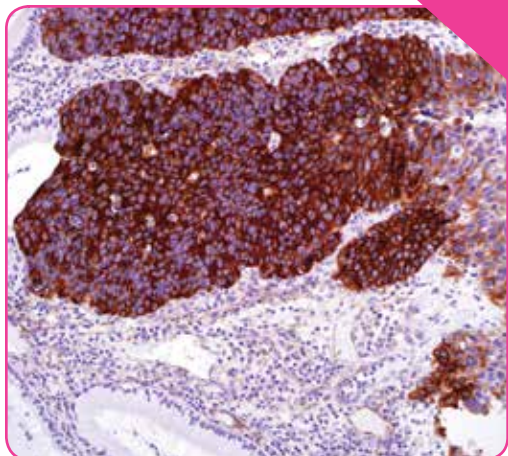


Choriocarcinoma

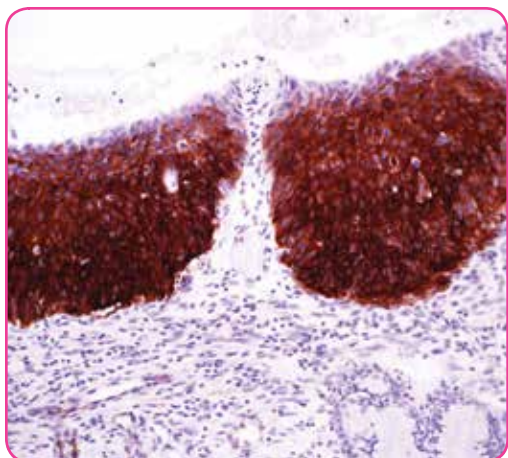


Ovary, choriocarcinoma

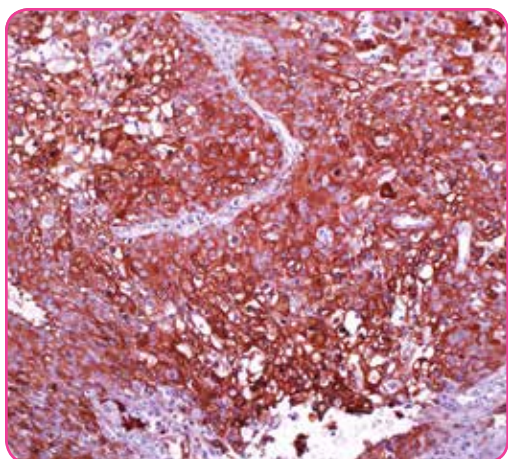
# Heat Shock Protein 27



High-grade cervical intraepithelial neoplasia (CIN III)



High-grade cervical intraepithelial neoplasia (CIN III)



Cervical squamous cell carcinoma

Heat shock proteins (HSPs) are a family of molecular chaperones that facilitate a host of critical cellular functions, including protein homeostasis, transport processes, and signal transduction. These proteins can be detected under normal physiological conditions but there is a general increase in expression upon exposure to cellular stresses. In cancerous disease states, HSPs function in promoting tumor cell survival.<sup>1</sup> Among the members of the HSP family that have been subject to extensive study, HSP27 has been demonstrated to be present in a variety of cancer types, including malignancies of the breast,<sup>2</sup> colon,<sup>3</sup> kidney,<sup>4</sup> and cervix.<sup>5</sup> Anti-HSP27 has also been shown to be helpful in distinguishing between high grade cervical intraepithelial neoplasms from low grade lesions.<sup>6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** cervical intraepithelial neoplasm, cervical squamous cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

HSP27

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Cervical Squamous Cell Neoplasms	309

## Reference

1. Vahid S, et al. Molecular chaperone Hsp27 regulates the Hippo tumor suppressor pathway in cancer. *Sci Rep.* 2016; 6:31842.
2. Grzegorzolka J, et al. Hsp-27 expression in invasive ductal breast carcinoma. *Folia Histochem Cytobiol.* 2012; 50:527-33.
3. Yu Z, et al. Clinical significance of HSP27 expression in colorectal cancer. *Mol Med Rep.* 2010; 3:953-8.
4. Erkizan O, et al. Significance of heat shock protein-27 expression in patients with renal cell carcinoma. *Urology.* 2004; 64:474-8.
5. Ono A, et al. Overexpression of heat shock protein 27 in squamous cell carcinoma of the uterine cervix: a proteomic analysis using archival formalin-fixed, paraffin-embedded tissues. *Hum Pathol.* 2009; 40:41-9.
6. Tozawa-Ono A, et al. Heat shock protein 27 and p16 immunohistochemistry in cervical intraepithelial neoplasia and squamous cell carcinoma. *Hum Cell.* 2012; 25:24-8.

## Ordering Information

**Heat Shock Protein 27 (G3.1)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	398M-14
0.5 mL concentrate	398M-15
1 mL concentrate	398M-16
1 mL predilute	398M-17
7 mL predilute	398M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Helicobacter pylori

*Helicobacter pylori* (*H. pylori*) is strongly associated with inflammation of the stomach and is also implicated in the development of gastric malignancy, peptic ulcers, and gastric lymphomas in humans. *H. pylori* can exist in a number of locations: in the mucus, attached to epithelial cells, or inside of vacuoles in epithelial cells, where it produces adhesions that bind to membrane-associated lipids and carbohydrates in or on epithelial cells.<sup>1-3</sup>

The most reliable method for detecting *H. pylori* infection is a biopsy during endoscopy histologic examination and detection by immunohistochemistry. Immunohistochemical staining of *H. pylori* on the surface of gastric mucosa is a valuable tool for identification of *H. pylori* infections.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cell wall

**Control** *H. pylori* infected stomach tissue

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

*H. pylori*

## Associated Specialties

Anatomic Pathology

## Reference

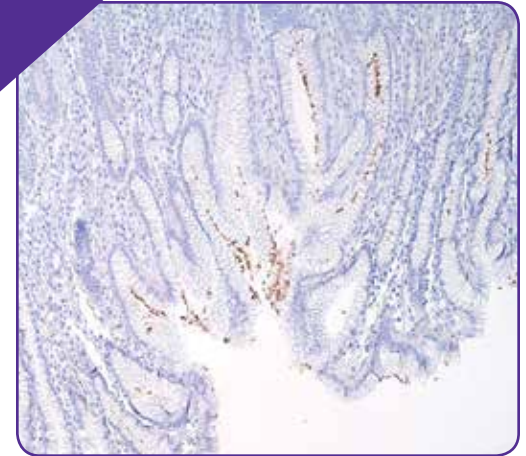
1. Jhala NC, et al. Infiltration of *Helicobacter pylori* in the gastric mucosa. *Am J Clin Pathol.* 2003; 119:101-7.
2. Shimizu T, et al. Immunohistochemical detection of *Helicobacter pylori* in the surface mucous gel layer and its clinicopathological significance. *Helicobacter.* 1996; 1:197-206.
3. Toulaymat M, et al. Endoscopic biopsy pathology of *Helicobacter pylori* gastritis. Comparison of bacterial detection by immunohistochemistry and Genta stain. *Arch Pathol Lab Med.* 1999; 123:778-81.

## Ordering Information

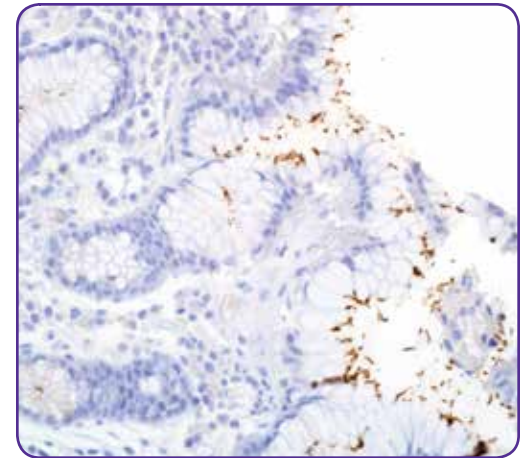
**Helicobacter pylori**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	215A-74
0.5 mL concentrate	215A-75
1 mL concentrate	215A-76
1 mL predilute	215A-77
7 mL predilute	215A-78
25 mL predilute	215A-70

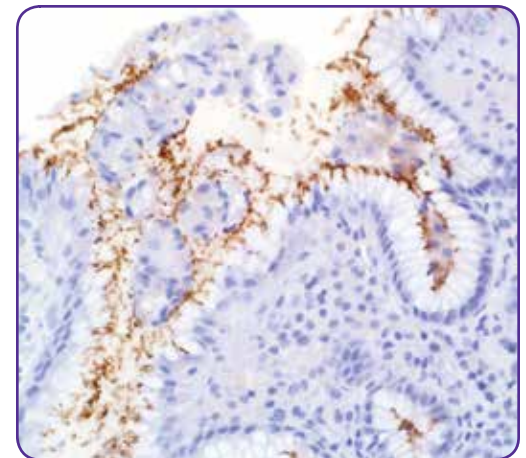
*Please contact your distributor for details on product availability and regulatory status in your country.*



Gastric mucosa

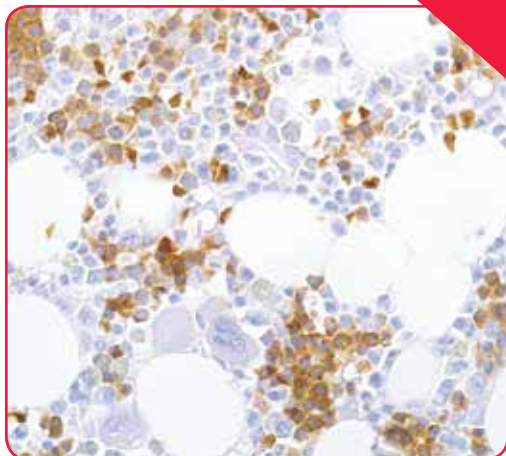


Gastric mucosa

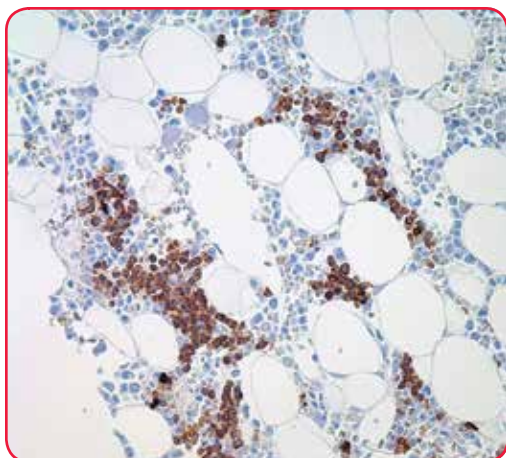


Gastric mucosa

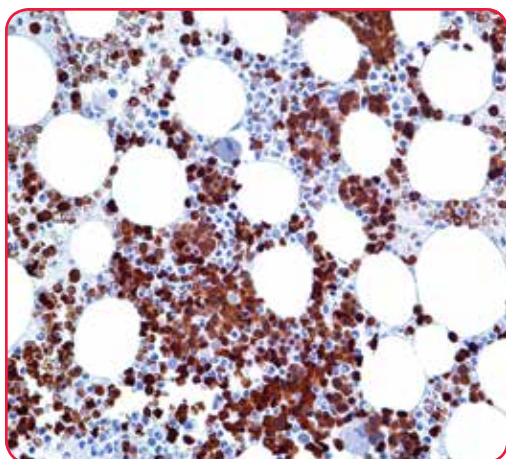
# Hemoglobin A



Bone marrow



Bone marrow



Bone marrow

Hemoglobin alpha chain belongs to the globin family and is involved in oxygen transport from the lung to the various peripheral tissues. Hemoglobin A is comprised of two alpha chains and two beta chains.<sup>1</sup> Immunohistochemical localization of hemoglobin is excellent as an erythroid marker for the detection of immature, dysplastic, and megaloblastic erythroid cells in myeloproliferative disorders, such as erythroleukemia. In contrast, myeloid cells, lymphoid cells, plasma cells, histiocytes, and megakaryocytes do not stain with anti-hemoglobin A.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** bone marrow, spleen

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Erythroid	313
Splenic Hematopoietic Proliferations in Neoplastic and Benign Disorders	317

## Reference

1. Wynbrandt J, et al. The encyclopedia of genetic disorders and birth defects. Third Edition. Facts on File, Inc. New York. Print 2008. .
2. O'Malley DP, et al. Morphologic and immunohistochemical evaluation of splenic hematopoietic proliferations in neoplastic and benign disorders. Mod Pathol. 2005; 18:1550-61.

## Ordering Information

**Hemoglobin A  
(EPR3608)**

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	360R-14
0.5 mL concentrate	360R-15
1 mL concentrate	360R-16
1 mL predilute	360R-17
7 mL predilute	360R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Hepatitis B Virus Core Antigen

Anti-hepatitis B core antigen labels hepatocytes infected with hepatitis B virus, a common cause of hepatitis leading to cirrhosis. Hepatitis B is the second most common cause of parenterally transmitted hepatitis.<sup>1-4</sup> The reactivity is located predominantly at hepatocyte nuclei and, less predominantly, in the cytoplasm or associated with the cell membrane. The presence of nuclear staining was found to correlate with active viral replication.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear, cytoplasmic, membranous

**Control** hepatitis b infected tissue

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

## Reference

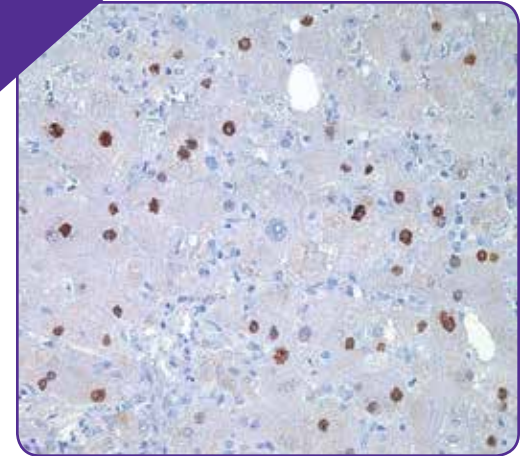
1. Goodman ZD, et al. Immunohistochemical localization of hepatitis B surface antigen and hepatitis B core antigen in tissue sections. A source of false positive staining. *Am J Clin Pathol.* 1988; 89:533-7.
2. van den Oord JJ, et al. Binding of biotin to hepatitis B surface antigen: a possible pitfall in immunohistochemistry. *J Histochem Cytochem.* 1989; 37:551-4.
3. Sharma RR, et al. Immunohistochemistry for core and surface antigens in chronic hepatitis. *Trop Gastroenterol.* 2002; 23:16-9.
4. Mukhopadhyaya A, et al. Liver histology and immunohistochemical findings in asymptomatic Indians with incidental detection of hepatitis B virus infection. *Indian J Gastroenterol.* 2006; 25:128-31.

## Ordering Information

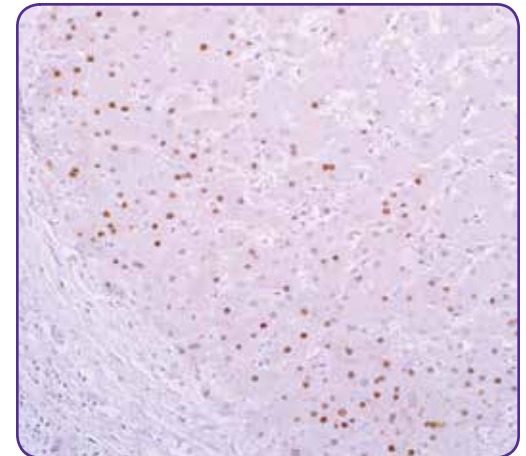
**Hepatitis B Virus Core Antigen**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	216A-14
0.5 mL concentrate	216A-15
1 mL concentrate	216A-16
1 mL predilute	216A-17
7 mL predilute	216A-18

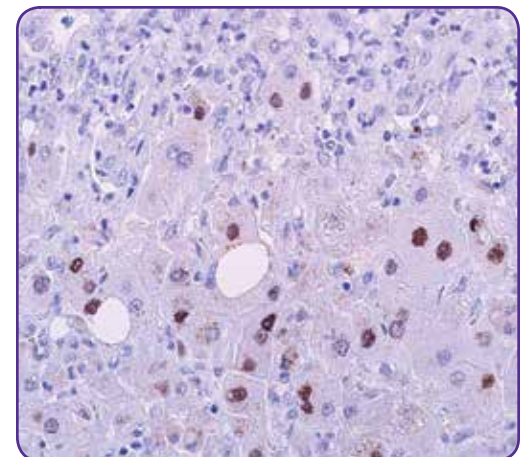
*Please contact your distributor for details on product availability and regulatory status in your country.*



Chronic hepatitis B

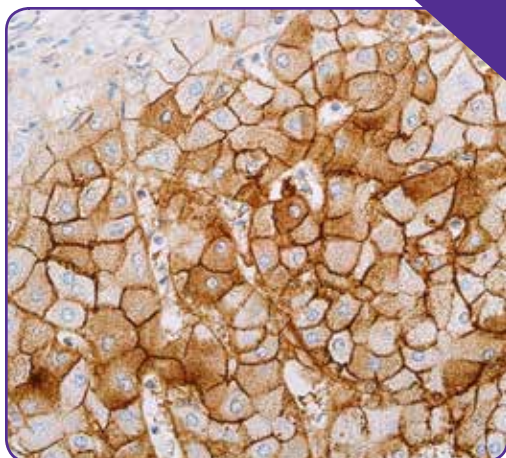


Cirrhotic liver

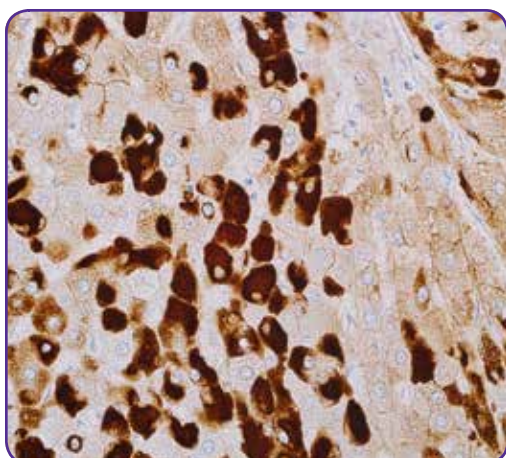


Cirrhotic liver

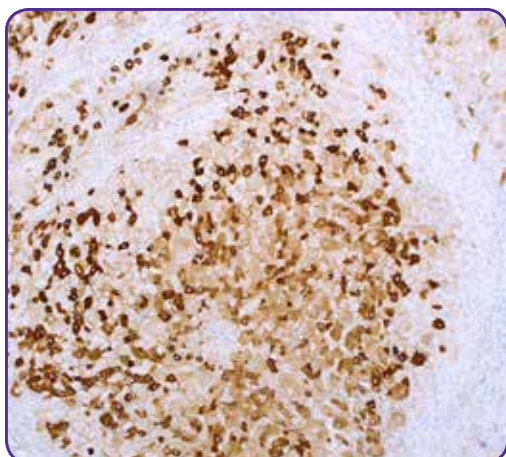
# Hepatitis B Virus Surface Antigen



Chronic hepatitis B



Liver cirrhosis



Liver cirrhosis

Anti-hepatitis B surface antigen labels the hepatocytes infected with hepatitis B virus, a common cause of hepatitis leading to cirrhosis. Hepatitis B is the second most common cause of parenterally transmitted hepatitis.<sup>1-5</sup> The reactivity is located frequently in the cytoplasm. Membranous staining can also be seen, which may indicate a high replicative state for the virus.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** hepatitis b infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Anatomic Pathology

## Reference

1. Goodman ZD, et al. Immunohistochemical localization of hepatitis B surface antigen and hepatitis B core antigen in tissue sections. A source of false positive staining. *Am J Clin Pathol.* 1988; 89:533-7.
2. van den Oord JJ, et al. Binding of biotin to hepatitis B surface antigen: a possible pitfall in immunohistochemistry. *J Histochem Cytochem.* 1989; 37:551-4.
3. Sharma RR, et al. Immunohistochemistry for core and surface antigens in chronic hepatitis. *Trop Gastroenterol.* 2002; 23:16-9.
4. Mukhopadhyaya A, et al. Liver histology and immunohistochemical findings in asymptomatic Indians with incidental detection of hepatitis B virus infection. *Indian J Gastroenterol.* 2006; 25:128-31.
5. Ramakrishna B, et al. Correlation of hepatocyte expression of hepatitis B viral antigens with histological activity and viral titer in chronic hepatitis B virus infection: an immunohistochemical study. *J Gastroenterol Hepatol.* 2008; 23:1734-8.

## Ordering Information

### Hepatitis B Virus Surface Antigen (A10F1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	217M-24
0.5 mL concentrate	217M-25
1 mL concentrate	217M-26
1 mL predilute	217M-27
7 mL predilute	217M-28

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Hepatocyte Specific Antigen (Hep Par-1)

Anti-hepatocyte specific antigen, also known as anti-Hep Par-1, recognizes both benign and malignant liver-derived tissues including such tumors as hepatoblastoma, hepatocellular carcinoma, and hepatic adenoma. It recognizes both normal adult and fetal liver tissue. The typical pattern is a granular cytoplasmic staining. This antibody is useful in differentiating hepatocellular carcinomas with adenoid features from adenocarcinomas, either primary in the liver or metastatic lesions to the liver.<sup>1-3</sup> In labeling hepatoblastoma, it is useful in differentiating this entity from other small round cell tumors.<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** liver

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP265: IgG
- OCH1E5: IgG<sub>1</sub>/k

## Synonyms and Abbreviations

Hep Par-1

Hep-Par1

## Associated Specialties

Anatomic Pathology

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Liver Neoplasms	297
Liver: Malignant vs. Benign	297
Liver: Primary and Metastatic Epithelial Neoplasms	308

## Reference

1. Minervini MI, et al. Utilization of hepatocyte-specific antibody in the immunocytochemical evaluation of liver tumors. *Mod Pathol.* 1997; 10:686-92.
2. Chu PG, et al. Hepatocyte antigen as a marker of hepatocellular carcinoma: an immunohistochemical comparison to carcinoembryonic antigen, CD10, and alpha-fetoprotein. *Am J Surg Pathol.* 2002; 26:978-88.
3. Wieczorek T, et al. Comparison of thyroid transcription factor-1 and hepatocyte antigen immunohistochemical analysis in the differential diagnosis of hepatocellular carcinoma, metastatic adenocarcinoma, renal cell carcinoma, and adrenal cortical carcinoma. *Am J Clin Pathol.* 2002; 118:911-21.

For the complete list of references see the product IFU.

## Ordering Information

### Hepatocyte Specific Antigen (Hep-Par1) (EP265)

CELL MARQUE  
RabMAb  
Technology from Abcam

Rabbit Monoclonal Primary Antibody

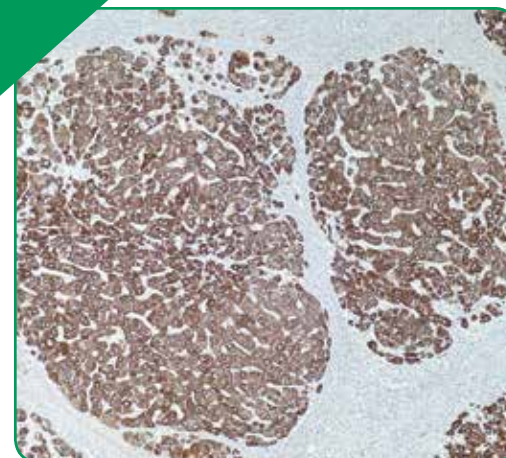
Volume	Part No.
0.1 mL concentrate	264R-14
0.5 mL concentrate	264R-15
1 mL concentrate	264R-16
1 mL predilute	264R-17
7 mL predilute	264R-18

### Hepatocyte Specific Antigen (Hep Par-1) (OCH1E5)

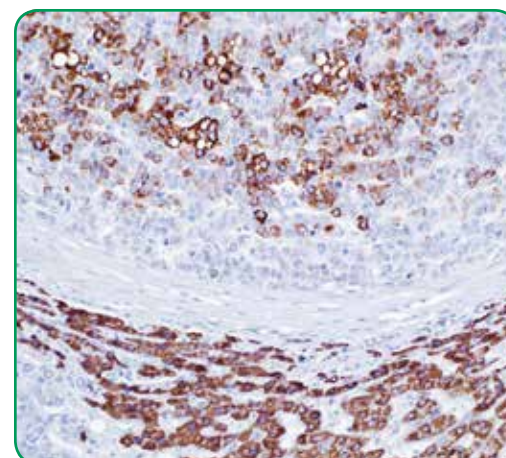
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	264M-94
0.5 mL concentrate	264M-95
1 mL concentrate	264M-96
1 mL predilute	264M-97
7 mL predilute	264M-98
25 mL predilute	264M-90

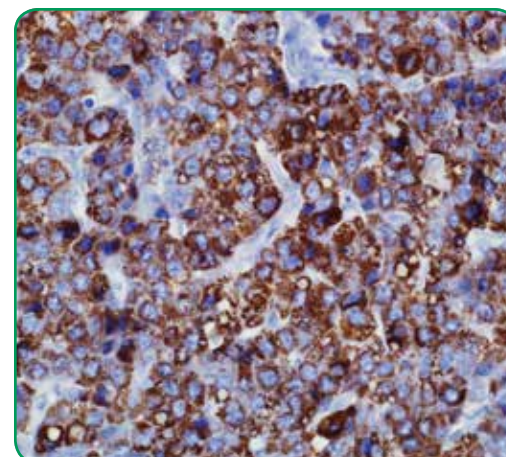
Please contact your distributor for details on product availability and regulatory status in your country.



Liver cirrhosis



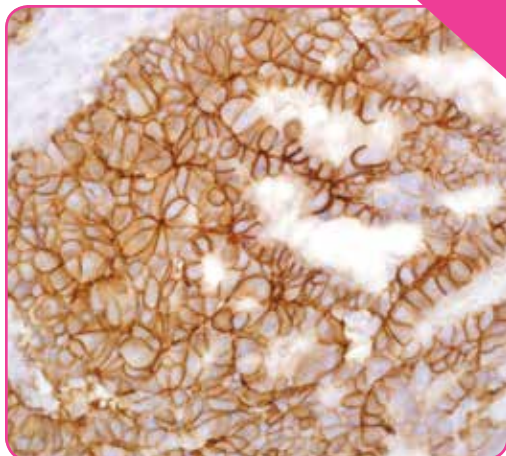
Hepatocellular carcinoma (HCC)



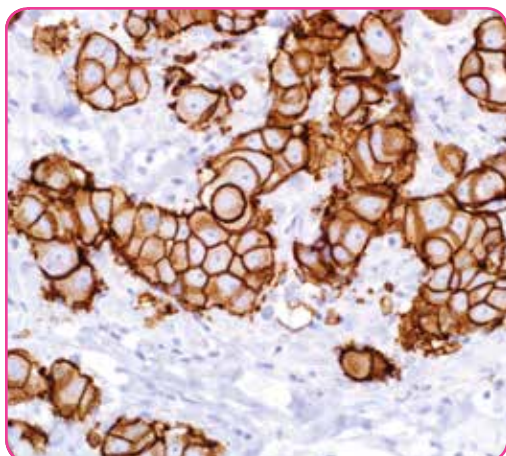
Hepatocellular carcinoma (HCC)



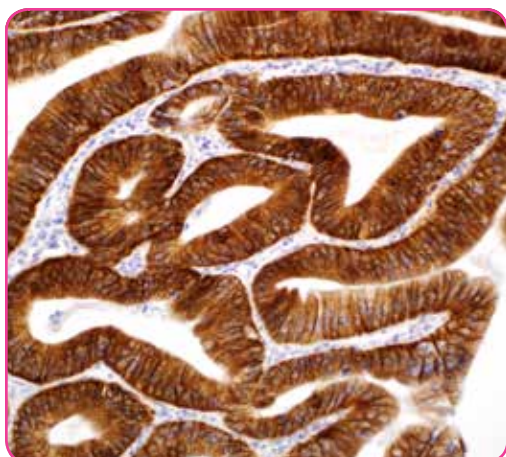
# Her2/Neu



Breast carcinoma



Breast, invasive ductal carcinoma



Esophagogastric junction carcinoma

Human epidermal growth factor receptor 2 (c-erbB-2) is a transmembrane glycoprotein in the epidermal growth factor receptor family.<sup>1</sup> It is expressed at low levels in a variety of normal epithelia, such as breast duct epithelium. Approximately 15% to 20% of breast cancers express high levels of HER2 protein.<sup>2</sup> Pathologic interpretation of HER2 testing in gastric carcinoma via immunohistochemistry involves different criteria than that in the case of breast carcinoma.<sup>3,4</sup> Another key difference from breast cancer staining is that HER2-positive gastric carcinomas are usually of the gland-forming intestinal type and may show incomplete basolateral or lateral staining in addition to complete membrane staining and all of these are considered as a positive result with immunohistochemistry.<sup>3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP3: IgG
- SP3: IgG<sub>1</sub>

## Associated Specialties

Breast/Gynecological Pathology

## Reference

1. King CR, et al. Amplification of novel v-erbB-related gene in a human mammary carcinoma. *Science*. 1985; 229:974-976.
2. Slamon DJ, et al. Human breast cancer: the correlation of relapse and survival with amplification of the Her-2/neu oncogene. *Science*. 1987; 235:177-182.
3. Hofman M, et al. Assessment of a HER2 scoring system for gastric cancer: results from a validation study. *Histopathol*. 2008; 52:797-805.
4. Ruschoff J, et al. HER2 testing in gastric cancer: what is different in comparison to breast cancer? *Pathologe*. 2010; 31:208-217.

## Ordering Information

### Her2/Neu (EP3)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	237R-24
0.5 mL concentrate	237R-25
1 mL concentrate	237R-26
1 mL predilute	237R-27
7 mL predilute	237R-28
25 mL predilute	237R-20

### Her2/Neu (SP3)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	237R-14
0.5 mL concentrate	237R-15
1 mL concentrate	237R-16
1 mL predilute	237R-17
7 mL predilute	237R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Herpes Simplex Virus I

Herpes simplex virus is quite ubiquitous and is variable in its presentation in human disease. Type I usually infects the non-genital mucosal surfaces. It may affect the skin or internal organs (typically brain, lung, liver, adrenal gland, or GI tract) of immunocompromised individuals.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** Herpes simplex virus infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** 10A3: IgG<sub>1</sub>

## Synonyms and Abbreviations

HSV I

## Associated Specialties

Anatomic Pathology

## Reference

1. Adams RL, et al. The immunocytochemical detection of herpes simplex virus in cervical smears--a valuable technique for routine use. *J Pathol.* 1984; 143:241-7.
2. Silverberg SG, et al. Principles and Practice of Surgical Pathology and CytoPathology, 3rd edition. 1997; p214-7.
3. Vago L, et al. Coinfection of the central nervous system by cytomegalovirus and herpes simplex virus type 1 or 2 in AIDS patients: autopsy study on 82 cases by immunohistochemistry and polymerase chain reaction. *Acta Neuropathol.* 1996; 92:404-8.
4. Nikkels AF, et al. Distribution of varicella zoster virus and herpes simplex virus in disseminated fatal infections. *J Clin Pathol.* 1996; 49:243-8.
5. Shintaku M, et al. Herpes simplex pancreatitis. *Arch Pathol Lab Med.* 2003; 127:231-4.

## Ordering Information

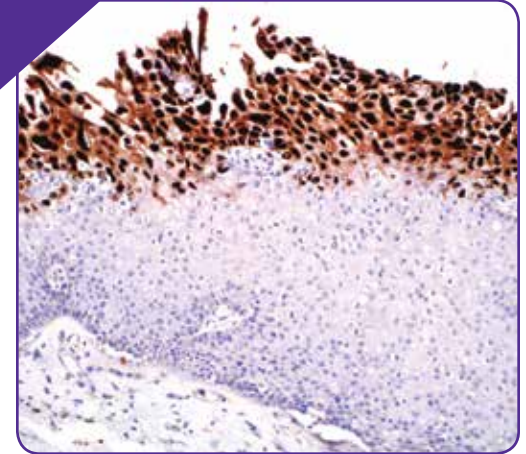
### Herpes Simplex Virus I (10A3) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	361M-14
0.5 mL concentrate	361M-15
1 mL concentrate	361M-16
1 mL predilute	361M-17
7 mL predilute	361M-18

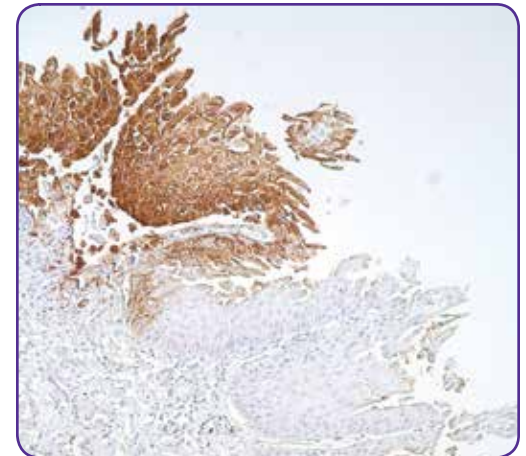
### Herpes Simplex Virus I Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	361A-14
0.5 mL concentrate	361A-15
1 mL concentrate	361A-16
1 mL predilute	361A-17
7 mL predilute	361A-18

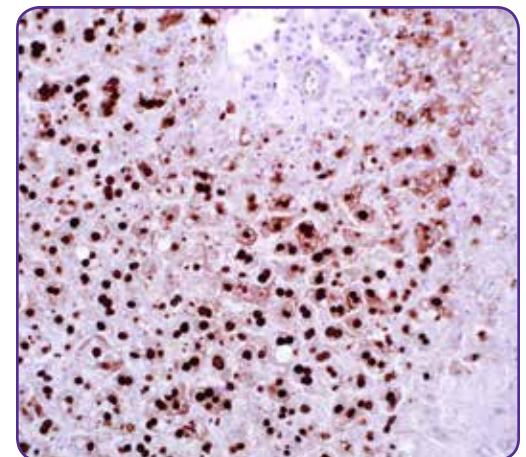
*Please contact your distributor for details on product availability and regulatory status in your country.*



Esophagitis

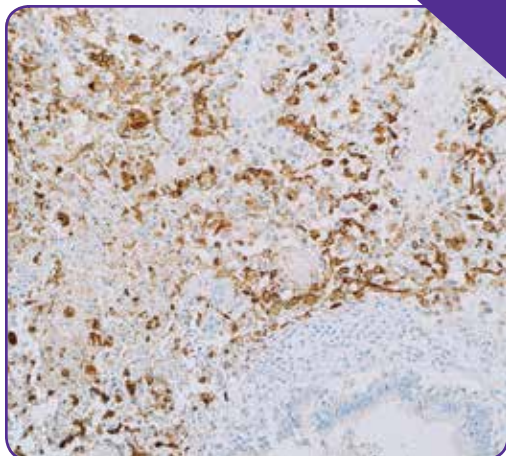


Esophagitis

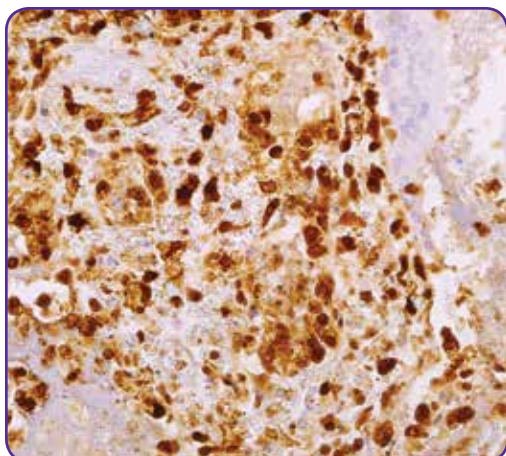


Liver

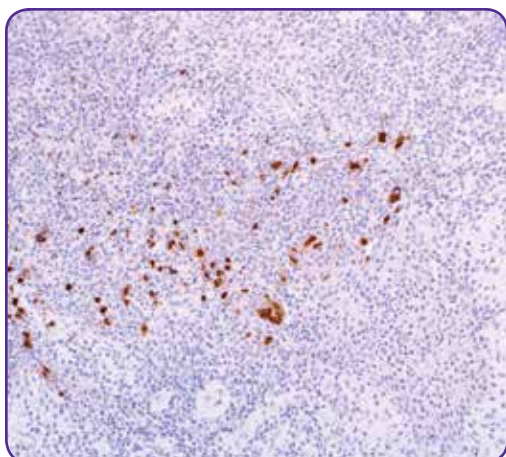
# Herpes Simplex Virus II



Infected pulmonary tissue



Lung



Mucosal tissue

Herpes simplex virus is quite ubiquitous and is quite variable in its presentation in human disease. Type II typically involves the genitalia. It may affect the skin or internal organs (typically brain, lung, liver, adrenal gland, or gastrointestinal tract) of immunocompromised individuals. This polyclonal antibody reacts with Type II Herpes viruses.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** Herpes simplex virus infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

HSV II

## Associated Specialties

Anatomic Pathology

## Reference

1. Adams RL, et al. The immunocytochemical detection of herpes simplex virus in cervical smears--a valuable technique for routine use. *J Pathol.* 1984; 143:241-7.
2. Silverberg SG, et al. Principles and Practice of Surgical Pathology and CytoPathology, 3rd edition. 1997. p. 214-7.
3. Vago L, et al. Coinfection of the central nervous system by cytomegalovirus and herpes simplex virus type 1 or 2 in AIDS patients: autopsy study on 82 cases by immunohistochemistry and polymerase chain reaction. *Acta Neuropathol.* 1996; 92:404-8.
4. Nikkels AF, et al. Distribution of varicella zoster virus and herpes simplex virus in disseminated fatal infections. *J Clin Pathol.* 1996; 49:243-8.
5. Shintaku M, et al. Herpes simplex pancreatitis. *Arch Pathol Lab Med.* 2003; 127:231-4.

## Ordering Information

### Herpes Simplex Virus II

### Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	362A-74
0.5 mL concentrate	362A-75
1 mL concentrate	362A-76
1 mL predilute	362A-77
7 mL predilute	362A-78

*Please contact your distributor for details on product availability and regulatory status in your country.*

# HGAL

Human germinal center associated lymphoma (HGAL) protein is specifically expressed in the cytoplasm of germinal center B-cells, but is absent in mantle and marginal zone B-cells and in the interfollicular and paracortical regions in normal tonsils and lymph nodes.<sup>1</sup> Its high degree of specificity for germinal center B-cells makes anti-HGAL an ideal marker for the detection of germinal center-derived B-cell lymphomas. Anti-HGAL has the highest overall sensitivity of detecting follicular lymphoma (FL) and in detecting the interfollicular and diffuse components of FL compared with antibodies against BCL2, LMO2, CD10, and BCL6. The addition of anti-HGAL to the immunohistologic panel is beneficial in the work-up of nodal and extranodal B-cell lymphomas, and the efficacy of anti-HGAL in detecting the follicular, interfollicular, and diffuse components of FL is of particular value in the setting of variant immunoarchitectural patterns.<sup>2,3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>/k

## Associated Specialties

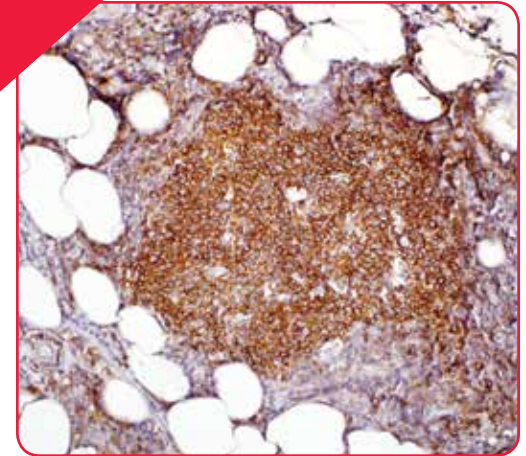
Hematopathology

## Associated Grids

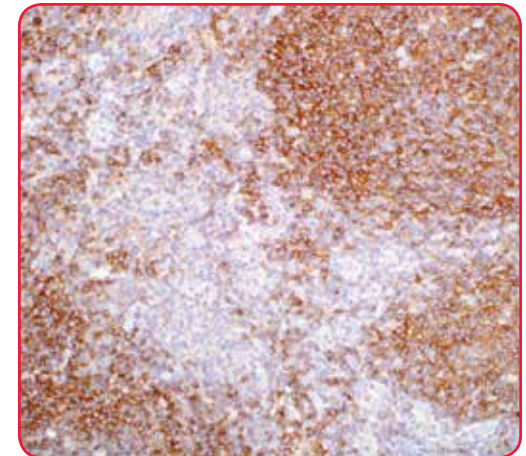
Grid	Page No.
Mature B-cell Neoplasms	315

## Reference

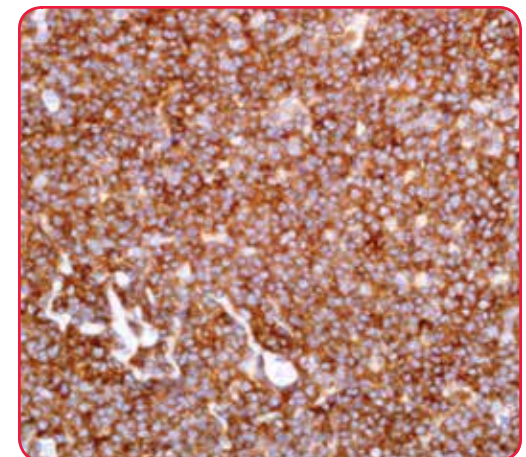
1. Natkunam Y, et al. Expression of the human germinal center-associated lymphoma (HGAL) protein, a new marker of germinal center B-cell derivation. *Blood*. 2005; 105:3979-86.
2. Natkunam Y, et al. Expression of the human germinal center-associated lymphoma (HGAL) protein identifies a subset of classic Hodgkin lymphoma of germinal center derivation and improved survival. *Blood*. 2007; 109:298-305.
3. Younes SF, et al. Immunoarchitectural patterns in follicular lymphoma: efficacy of HGAL and LMO2 in the detection of the interfollicular and diffuse components. *Am J Surg Pathol*. 2010; 34:1266-76.
4. Higgins RA, et al. Application of immunohistochemistry in the diagnosis of non-Hodgkin and Hodgkin lymphoma. *Arch Pathol Lab Med*. 2008; 132:441-6.



Follicular lymphoma



Lymph node



Lymph node

## Ordering Information

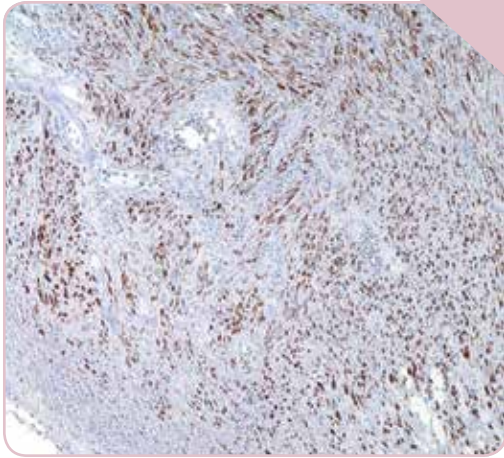
### HGAL (MRQ-49)

Mouse Monoclonal Antibody

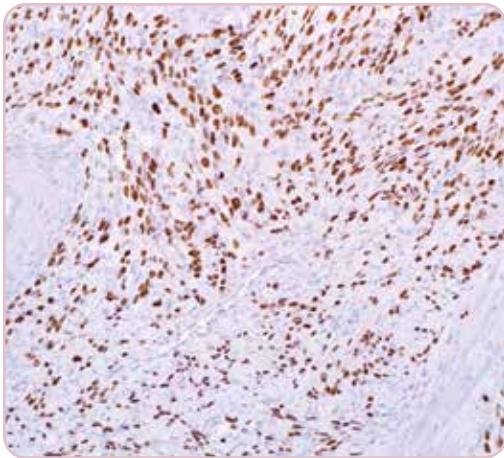
Volume	Part No.
0.1 mL concentrate	375M-94
0.5 mL concentrate	375M-95
1 mL concentrate	375M-96
1 mL predilute	375M-97
7 mL predilute	375M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

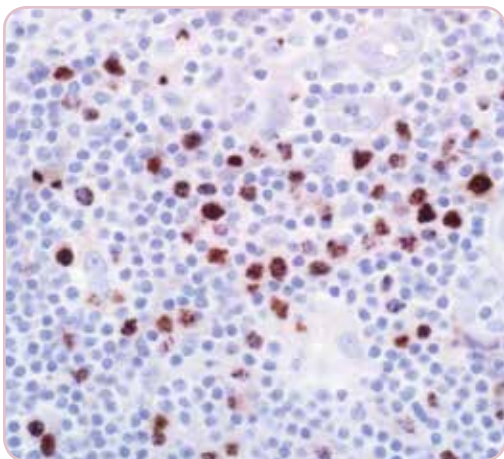
# HHV-8



Kaposi sarcoma



Kaposi sarcoma



Lymph node, Castleman disease

Human herpesvirus 8 (HHV-8), also known as Kaposi sarcoma-associated herpes virus, has been found to be the likely etiologic agent of Kaposi sarcoma.<sup>1,2,3</sup> Studies have shown that HHV-8 codes for a viral homolog of human cellular interleukin-6 (vIL-6).<sup>1,2,4</sup> Human cellular interleukin-6 (IL-6) has been demonstrated to have a role in several biological responses such as immune regulation, tumorigenesis and hematopoiesis.<sup>4</sup> It has been proposed that vIL-6's mimic of IL-6 has a role in HHV-8's survival and infection of other hosts.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** Kaposi sarcoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>1</sub>

## Associated Specialties

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Skin: Spindle Cell Tissues and Tumors	306, 307
Mature B-cell Neoplasms with Reduced CD20 Expression	316
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324
Vascular Tumors	324

## Reference

1. Suthaus J, et al. HHV-8-encoded viral IL-6 collaborates with mouse IL-6 in the development of multicentric Castleman disease in mice. *Blood*. 2012; 119:5173-81.
2. Staskus K, et al. Cellular tropism and viral interleukin-6 expression distinguish human herpesvirus 8 involvement in Kaposi's sarcoma, primary effusion lymphoma, and multicentric Castleman's disease. *Journal of Virology*. 1999; 73:4181-7.
3. Nagata N, et al. Diagnostic value of endothelial markers and HHV-8 staining in gastrointestinal Kaposi sarcoma and its difference in endoscopic tumor staging. *World J Gastroenterol*. 2013; 19:3608-14.
4. Sakakibara S, et al. Viral interleukin-6: Role in Kaposi's sarcoma-associated herpesvirus-associated malignancies. *J Interferon Cytokine Res*. 2011; 31:791-801.

## Ordering Information

**HHV-8 (13B10)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	265M-14
0.5 mL concentrate	265M-15
1 mL concentrate	265M-16
1 mL predilute	265M-17
7 mL predilute	265M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# HMB-45

HMB-45 is a mouse monoclonal antibody raised against metastatic melanoma cells and reacting with antigens present on immature melanosomes. The antibody is useful in the identification of both melanotic and amelanotic melanomas from other neoplastic lesions with similar morphology.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

Melanoma

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Epithelioid Cell Neoplasms	296
Lymph Node: Melanocytic Lesions vs. Interdigitating Dendritic Cells	297
PEComa	299
Spindle Cell Melanoma vs. Epithelioid Peripheral Nerve Sheath Tumor	300
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Cutaneous Lesion	304
Melanomas	305
Melanotic Lesions	305
Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors	305
Soft Tissue Neoplasms	322

## Ordering Information

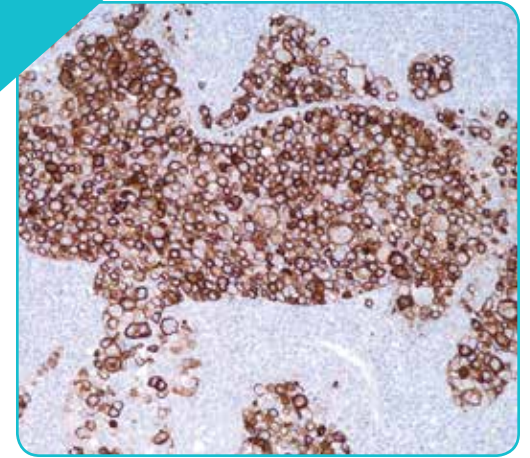
### HMB-45 (HMB-45) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	282M-94
0.5 mL concentrate	282M-95
1 mL concentrate	282M-96
1 mL predilute	282M-97
7 mL predilute	282M-98

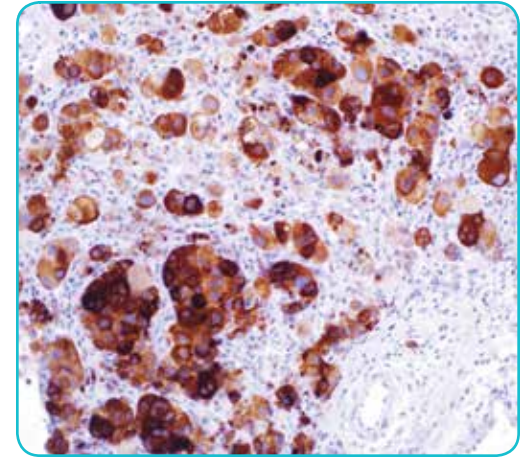
Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

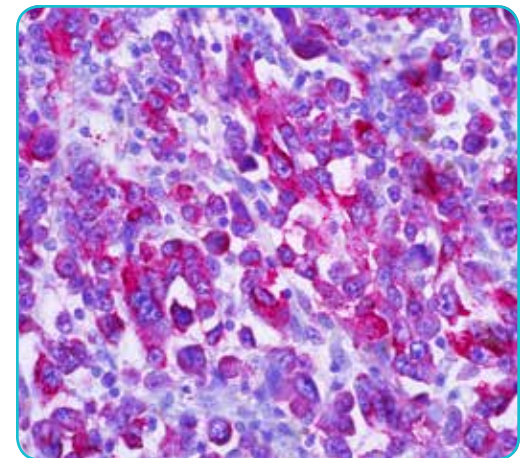
1. Gown AM, et al. Monoclonal antibodies specific for melanocytic tumors distinguish subpopulations of melanocytes. *Am J Pathol.* 1986; 123:195-203.
2. Wick MR, et al. Immunohistochemical diagnosis of sinonasal melanoma, carcinoma, and neuroblastoma with monoclonal antibodies HMB-45 and anti-synaptophysin. *Arch Pathol Lab Med.* 1988; 112:616-20.
3. Abrahamsen HN, et al. Sentinel lymph nodes in malignant melanoma: extended histopathologic evaluation improves diagnostic precision. *Cancer.* 2004; 100:1683-91.
4. Vaggelli L, et al. Radioisotopic lymphatic mapping of the sentinel node in melanoma: importance of immunohistochemistry. *Tumori.* 2000; 86:346-8.
5. Baisden BL, et al. HMB-45 immunohistochemical staining of sentinel lymph nodes: a specific method for enhancing detection of micrometastases in patients with melanoma. *Am J Surg Pathol.* 2000; 24:1140-6.



Melanoma

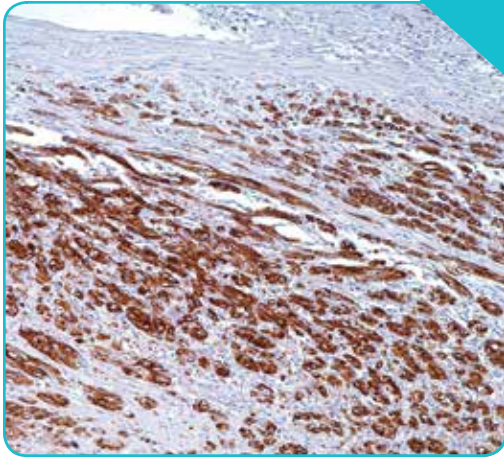


Melanoma

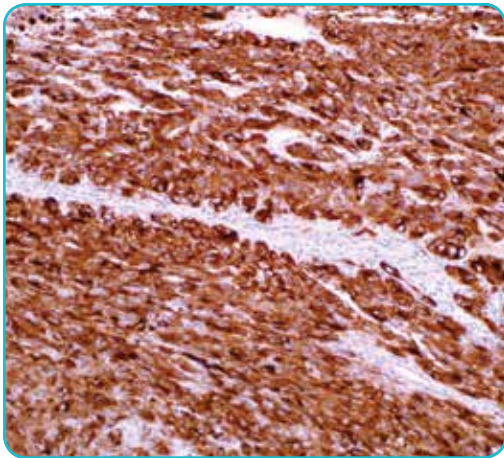


Melanoma

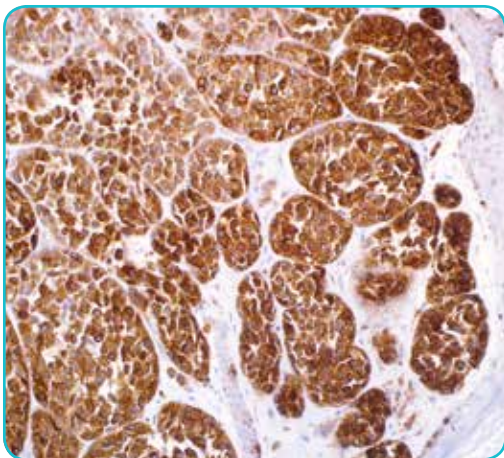
# HMB-45 + MART-1 (Melan A) + Tyrosinase



Metastatic malignant melanoma



Melanoma



Melanoma

HMB-45 is a mouse monoclonal antibody that reacts with antigens present on immature melanosomes. MART-1, also known as Melan A, is a melanocyte differentiation antigen present in melanocytes of normal skin, retina, nevi, and most melanomas. Tyrosinase is an enzyme which is involved in the biosynthesis of melanin expressed in epidermal melanocytes, pigmented epithelia of the eye, and most melanomas. The cocktail of HMB-45 + MART-1 (Melan A) + Tyrosinase reactivity seen in melanomas makes this combination a useful immunohistochemical reagent for identification of melanomas and melanocytic lesions.<sup>1-9</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic  
**Control** skin, melanoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>1</sub>/k + IgG<sub>1</sub> + IgG<sub>2a</sub>

## Synonyms and Abbreviations

Melanoma Cocktail  
Pan-Melanoma

## Associated Specialties

Dermatopathology

## Reference

1. Orchard G. Evaluation of melanocytic neoplasms: application of a pan-melanoma antibody cocktail. *Br J Biomed Sci.* 2002; 59:196-202.
2. Gupta D, et al. Vaginal melanoma: a clinicopathologic and immunohistochemical study of 26 cases. *Am J Surg Pathol.* 2002; 26:1450-7.
3. Prasad ML, et al. Expression of melanocytic differentiation markers in malignant melanomas of the oral and sinonasal mucosa. *Am J Surg Pathol.* 2001; 25:782-7.
4. Yaziji H, et al. Immunohistochemical markers of melanocytic tumors. In *J Surg Pathol.* 2003; 11:11-5.
5. Shidham VB, et al. Improved immunohistochemical evaluation of micrometastases in sentinel lymph nodes of cutaneous melanoma with 'MCW melanoma cocktail'--a mixture of monoclonal antibodies to MART-1, Melan-A, and tyrosinase. *BMC Cancer.* 2003; 3:15.
6. Perez RP, et al. Expression of melanoma inhibitory activity in melanoma and nonmelanoma tissue specimens. *Hum Pathol.* 2000; 31:1381-8.
7. Hoang MP, et al. Recurrent melanocytic nevus: a histologic and immunohistochemical evaluation. *J Cutan Pathol.* 2001; 28:400-6.
8. Baidson BL, et al. HMB-45 immunohistochemical staining of sentinel lymph nodes: a specific method for enhancing detection of micrometastases in patients with melanoma. *Am J Surg Pathol.* 2000; 24:1140-6.
9. Vaggelli L, et al. Radioisotopic lymphatic mapping of the sentinel node in melanoma: importance of immunohistochemistry. *Tumori.* 2000; 86:346-8.

## Ordering Information

**HMB-45 + Mart-1 (Melan A)  
(A103) + Tyrosinase (T311)**  
Mouse Monoclonal Antibody

Volume	Part No.
1 mL predilute	904H-07
7 mL predilute	904H-08
25 mL predilute	904H-00

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Human Placental Lactogen (hPL)

Human placental lactogen (hPL), also previously known as 'human chorionic somatomammotropin', is a 22-kD protein with partial homology to growth hormone. hPL is first detectable in the maternal serum in the fifth week of gestation and is involved in maintaining nutrient supply to the fetus. Anti-hPL reactivity is seen in syncytiotrophoblastic cells of placenta and choriocarcinoma.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** placenta

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Placental Trophoblastic Cells	303
Placental Trophoblastic Proliferations	303
Uterus: Trophoblastic Proliferations	304
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309

## Reference

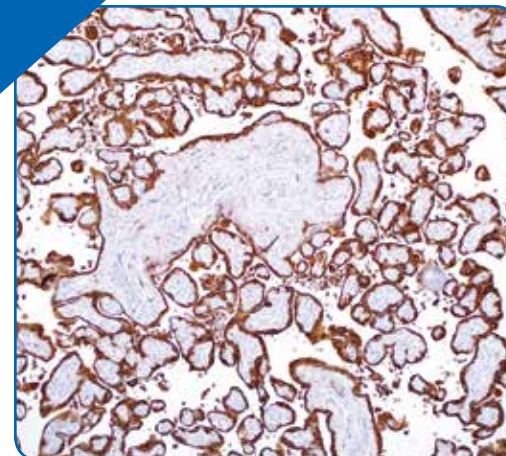
1. Shih IM, et al. p63 expression is useful in the distinction of epithelioid trophoblastic and placental site trophoblastic tumors by profiling trophoblastic subpopulations. *Am J Surg Pathol.* 2004; 28:1177-83.
2. Ulbright TM, et al. Trophoblastic tumors of the testis other than classic choriocarcinoma: 'monophasic' choriocarcinoma and placental site trophoblastic tumor: a report of two cases. *Am J Surg Pathol.* 1997; 21:282-8.

## Ordering Information

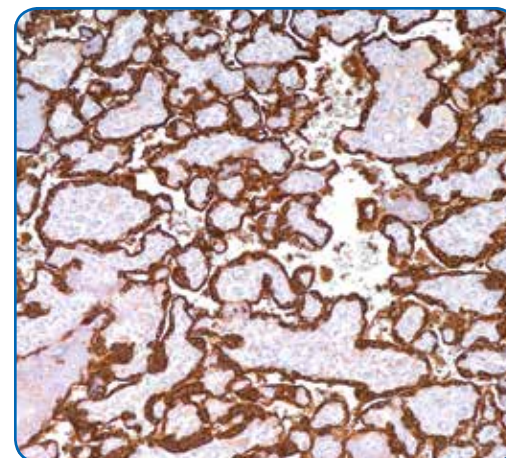
**Human Placental Lactogen (hPL)**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	266A-14
0.5 mL concentrate	266A-15
1 mL concentrate	266A-16
1 mL predilute	266A-17
7 mL predilute	266A-18

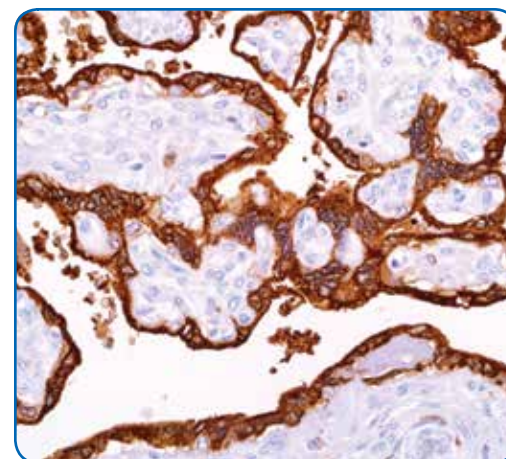
*Please contact your distributor for details on product availability and regulatory status in your country.*



Placenta



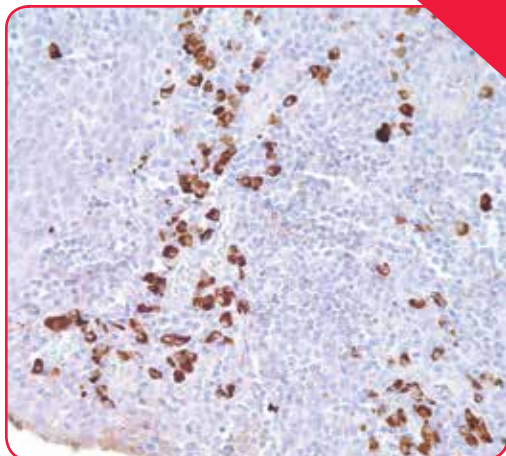
Placenta



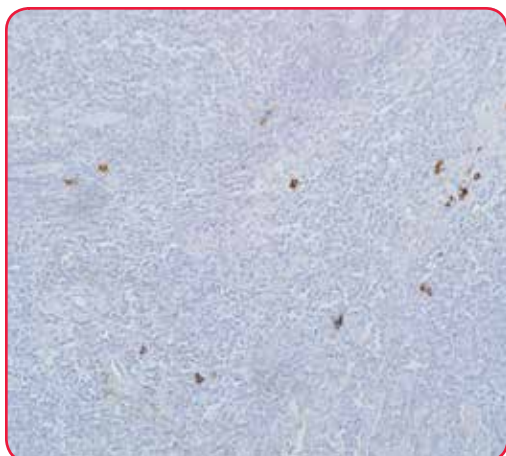
Placenta



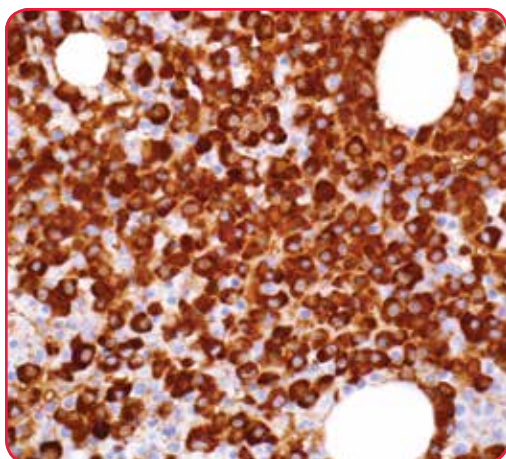
# IgA



Tonsil



Nodular lymphocyte predominant Hodgkin lymphoma (NLPHL)



Plasma cell myeloma, IgA-secreting

Immunoglobulin A (IgA) plays a critical role in mucosal immunity. It is present in the mucosal secretions such as tears, saliva, colostrum, intestinal juice, vaginal fluid, and secretions from the prostate and respiratory epithelium, and represents a key first line of defense against invasion by inhaled and ingested pathogens at the vulnerable mucosal surfaces. It is also found in small amounts in blood. Because it is resistant to degradation by enzymes, secretory IgA can survive in harsh environments such as the digestive and respiratory tracts, to provide protection against microbes that multiply in body secretions. It is useful when identifying multiple myeloma and plasmacytomas.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic  
**Control** tonsil  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** EP170: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Immunoglobulin, Heavy and Light Chain	314

## Reference

1. Ansari NA, et al. Immunoglobulin heavy and light chain isotypes in multiple myeloma patients. *Asian Pac J Cancer Prev.* 2007; 8:593-6.
2. Leong AS, et al. *Manual of diagnostic antibodies for Immunohistology.* London: Greenwich Medical Media Ltd. 1999. p 217-19.
3. Shao H, et al. Nodal and extranodal plasmacytomas expressing immunoglobulin A: an indolent lymphoproliferative disorder with a low risk of clinical progression. *Am J Surg Pathol.* 2010; 34:1425-35.

## Ordering Information

**IgA (EP170)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	267R-14
0.5 mL concentrate	267R-15
1 mL concentrate	267R-16
1 mL predilute	267R-17
7 mL predilute	267R-18

**IgA**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	267A-14
0.5 mL concentrate	267A-15
1 mL concentrate	267A-16
1 mL predilute	267A-17
7 mL predilute	267A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# IgD

The monoclonal antibody against IgD reacts with immunoglobulin D delta chains. In tonsil and lymph node, immunohistochemical staining for IgD immunoglobulin heavy chain is usually used to highlight the tonsil and nodal architecture since the IgD antibody stains mantle zone cells in secondary follicles and mantle cells in primary follicles.<sup>1</sup> It has been reported that IgD can be detected in the surface/cytoplasm of neoplastic cells of common small B lymphoid cell lymphomas, such as small lymphocytic lymphoma, mantle cell lymphoma, marginal zone lymphoma (especially splenic marginal zone lymphoma), and follicular lymphoma.<sup>1-2</sup> IgD expression in L & P cells of nodular lymphocyte predominant Hodgkin lymphoma has been seen in subsets of cases (27% to 71.4%).<sup>1-3</sup> The IgD positive L & P cells are usually located in the extrafollicular area with a relatively T-cell-rich background.<sup>1,3</sup> IgD expression is rarely seen in T-cell rich B-cell lymphoma. Studies have demonstrated that Reed-Sternberg cells of classic Hodgkin lymphoma were negative for IgD.<sup>1,3</sup> IgD multiple myeloma is a rare bone marrow plasma cell dyscrasia and can be identified by the IgD antibody, especially when a dry tap is encountered.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP173: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Immunoglobulin, Heavy and Light Chain	314
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Prakash S, et al. IgD positive L&H cells identify a unique subset of nodular lymphocyte predominant Hodgkin lymphoma. *Am J Surg Pathol.* 2006; 30:585-92.
2. Sohani A, et al. Nodular lymphocyte-predominant Hodgkin lymphoma with atypical T cells: a morphologic variant mimicking peripheral T-cell lymphoma. *Am J Surg Pathol.* 2011; 35:1666-78.
3. Kluijn PM, et al. Paediatric nodal marginal zone B-cell lymphadenopathy of the neck: a Haemophilus influenzae-driven immune disorder? *J Pathol.* 2015; 236:302-14.
4. Pandey S, et al. Unusual myelomas: a review of IgD and IgE variants. *Oncology (Williston Park).* 2013; 27:798-803.

## Ordering Information

**IgD (EP173)**  
Rabbit Monoclonal  
Primary Antibody

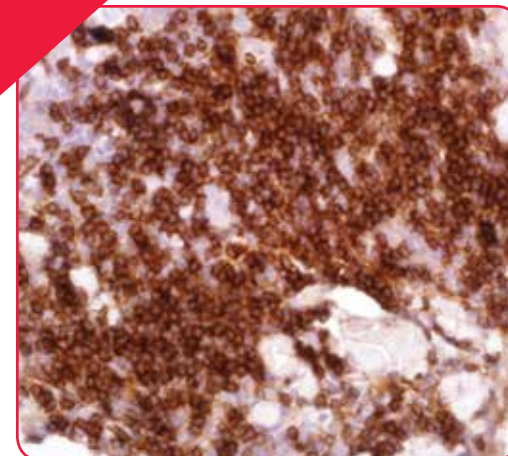


Volume	Part No.
0.1 mL concentrate	268R-14
0.5 mL concentrate	268R-15
1 mL concentrate	268R-16
1 mL predilute	268R-17
7 mL predilute	268R-18

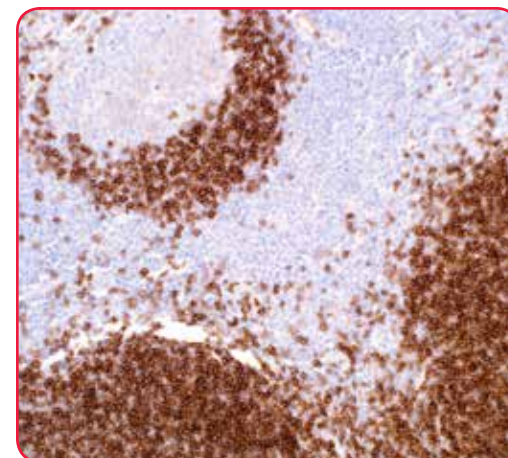
**IgD**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	268A-14
0.5 mL concentrate	268A-15
1 mL concentrate	268A-16
1 mL predilute	268A-17
7 mL predilute	268A-18

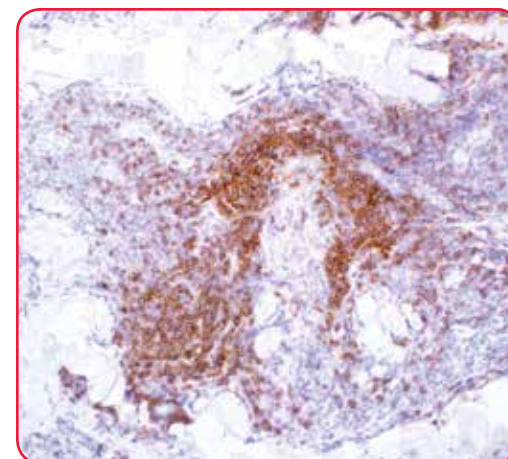
*Please contact your distributor for details on product availability and regulatory status in your country.*



Cutaneous marginal zone lymphoma

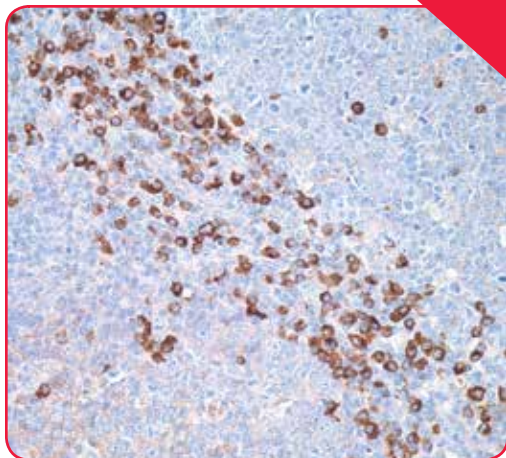


Tonsil

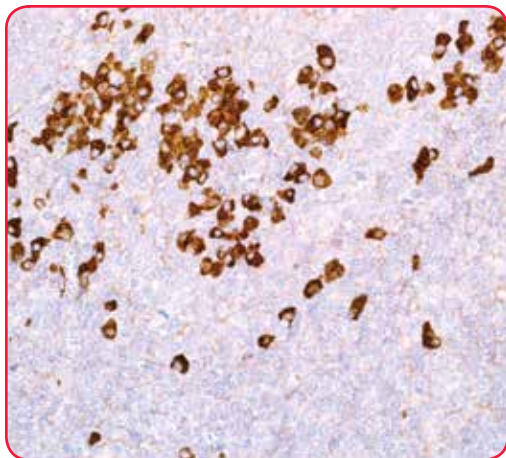


Lymph node

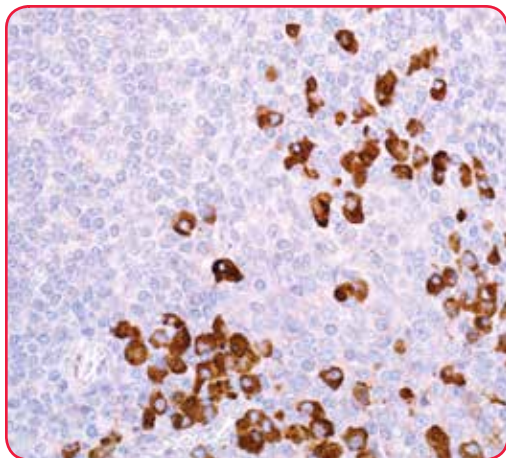
# IgG



Tonsil



Tonsil



Tonsil

Anti-IgG reacts with immunoglobulin gamma (IgG) chains. This antibody is useful when differentiating and sub-classifying hematolymphoid neoplasms.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Hematopathology

Anatomic Pathology

## Associated Grids

Grid	Page No.
Immunoglobulin, Heavy and Light Chain	314

## Reference

1. Arnold A, et al. Immunoglobulin-gene rearrangements as unique clonal markers in human lymphoid neoplasms. *New Eng J Med.* 1983; 309:1593-9.
2. Leong AS, et al. *Manual of Diagnostic Antibodies for Immunohistology.* Greenwich Medical Media Ltd. 1999. London. pp 217-9. Print.
3. Ando K, et al. IgA-lambda/IgG-kappa biclonal myeloma in which two clones proliferated in individual sites. *Intern Med.* 2000; 39:170-5.
4. Taylor CR, et al. Immunoperoxidase techniques: practical and theoretical aspects. *Arch Path Lab Med.* 1978; 102:113-21.
5. Warnke R, et al. Tissue section immunologic methods in lymphomas. In: *Diagnostic Immunohistochemistry.* Edited by R DeLellis. Masson Publishing, 1981. New York. pp 203-21. Print.

## Ordering Information

### IgG

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	269A-14
0.5 mL concentrate	269A-15
1 mL concentrate	269A-16
1 mL predilute	269A-17
7 mL predilute	269A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# IgG4

IgG4-related sclerosing disease has been recognized as a systemic disease entity characterized by an elevated serum IgG4 level, sclerosing fibrosis, and diffuse lymphoplasmacytic infiltration with the presence of many IgG4-positive plasma cells. Clinical manifestations are apparent in the pancreas, bile duct, gall bladder, lacrimal gland, salivary gland, retroperitoneum, kidney, lung, breast, thyroid, and prostate. Immunohistochemical analyses in the case of IgG4-related sclerosing disease not only exhibit significantly more than normal IgG4-positive plasma cells in affected tissues but also significantly higher IgG4/IgG ratios (typically >30%).<sup>1-8</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP138: IgG
- MRQ-44: IgG<sub>1</sub>/k

## Associated Specialties

Gastrointestinal (GI) Pathology

Anatomic Pathology

## Reference

1. Sakata N, et al. IgG4-positive plasma cells in inflammatory abdominal aortic aneurysm: the possibility of an aortic manifestation of IgG4-related sclerosing disease. *Am J Surg Pathol.* 2008; 32:553-9.
2. Dhobale S, et al. IgG4 related sclerosing disease with multiple organ involvements and response to corticosteroid treatment. *J Clin Rheumatol.* 2009; 15:354-7.
3. Li Y, et al. Immunohistochemistry of IgG4 can help subclassify Hashimoto's autoimmune thyroiditis. *Pathol Int.* 2009; 59:636-41.
4. Cheuk W, et al. IgG4-related sclerosing mastitis: description of a new member of the IgG4-related sclerosing diseases. *Am J Surg Pathol.* 2009; 33:1058-64.
5. Deshpande V, et al. IgG4-associated cholangitis: a comparative histological and immunophenotypic study with primary sclerosing cholangitis on liver biopsy material. *Mod Pathol.* 2009; 22:1287-95.
6. Sato Y, et al. Systemic IgG4-related lymphadenopathy: a clinical and pathologic comparison to multicentric Castleman's disease. *Mod Pathol.* 2009; 22: 589-99.
7. Koyabu M, et al. Analysis of regulatory T cells and IgG4-positive plasma cells among patients of IgG4-related sclerosing cholangitis and autoimmune liver diseases. *J Gastroenterol.* 2010; 45:732-41.
8. Kamisawa T, et al. Sclerosing cholangitis associated with autoimmune pancreatitis differs from primary sclerosing cholangitis. *World J Gastroenterol.* 2009; 21:2357-60.

## Ordering Information

### IgG4 (EP138)

Rabbit Monoclonal  
Primary Antibody



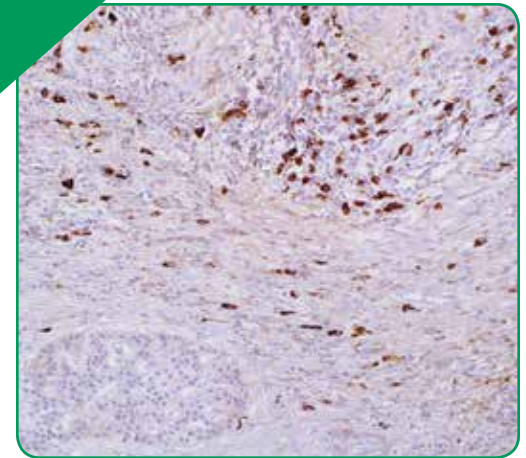
Volume	Part No.
0.1 mL concentrate	367R-14
0.5 mL concentrate	367R-15
1 mL concentrate	367R-16
1 mL predilute	367R-17
7 mL predilute	367R-18

### IgG4 (MRQ-44)

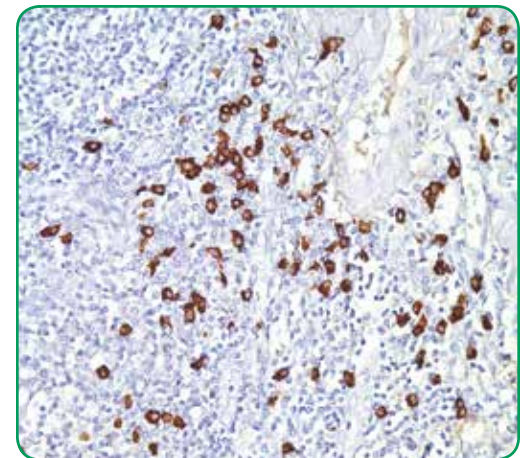
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	367M-14
0.5 mL concentrate	367M-15
1 mL concentrate	367M-16
1 mL predilute	367M-17
7 mL predilute	367M-18

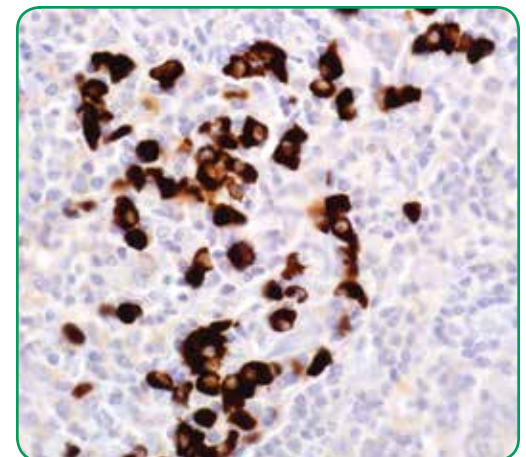
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreatic lesion

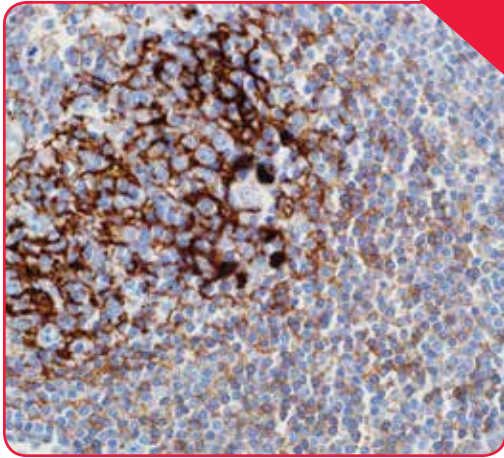


Lymph node

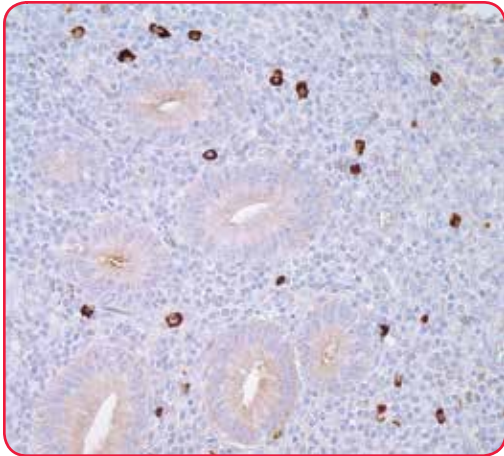


Lymph node plasma cells

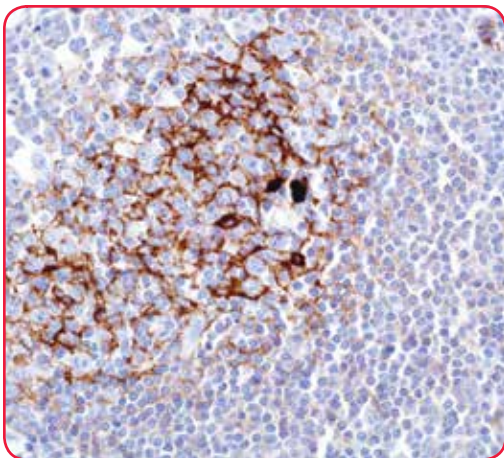
# IgM



Tonsil



Endometrium



Lymphoid tissue

Anti-IgM reacts with immunoglobulin mu (IgM) chains. IgM is one of the predominant surface immunoglobulins on B-lymphocytes. This antibody is useful when differentiating and sub-classifying hematolymphoid neoplasms.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Immunoglobulin, Heavy and Light Chain	314

## Reference

1. Arnold A, et al. Immunoglobulin-gene rearrangements as unique clonal markers in human lymphoid neoplasms. *New Eng J Med.* 1983; 309:1593-9.
2. Leong AS, et al. *Manual of Diagnostic Antibodies for Immunohistology.* Greenwich Medical Media Ltd. 1999. London. pp 217-9. Print.
3. Robinson JE, et al. Diffuse polyclonal B-cell lymphoma during primary infection with Epstein-Barr virus. *New Eng J Med.* 1980; 302:1293-7.
4. Taylor CR. Immunoperoxidase techniques: practical and theoretical aspects. *Arch Pathol Lab Med.* 1978; 102:113-21.
5. Kojima M, et al. Primary marginal zone B-cell lymphoma of the lymph node resembling plasmacytoma arising from a plasma cell variant of Castleman's disease. A clinicopathological and immunohistochemical study of seven patients. *APMIS.* 2002; 110:875-80.
6. Pambuccian SE, et al. Amyloidoma of bone, a plasma cell/plasmacytoid neoplasm. Report of three cases and review of the literature. *Am J Surg Pathol.* 1997; 21:179-86.

## Ordering Information

### IgM

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	270A-14
0.5 mL concentrate	270A-15
1 mL concentrate	270A-16
1 mL predilute	270A-17
7 mL predilute	270A-18

Please contact your distributor for details on product availability and regulatory status in your country.

# IMP3

Insulin-like growth factor II mRNA binding protein 3 (IMP3) is an oncofetal RNA-binding protein that regulates targets such as insulin-like growth factor-2 and beta-actin. IMP3 expression is at its highest during embryogenesis and silenced in normal human tissues (fibroblasts, lymphocytes, and testes are exceptions).<sup>1</sup> IMP3 plays a major role in early embryogenesis involving the development of the intestine, thymus, pancreas, and kidneys.<sup>2</sup> IMP3 mRNA transcript and protein have been demonstrated in high levels in pancreatic cancer tissues but not in benign lesions of the pancreas, chronic pancreatitis, or normal pancreatic tissues.<sup>1</sup> In a study of IMP3 being used to distinguish between pancreatic ductal adenocarcinoma from chronic sclerosing pancreatitis, IMP3 was found to have high sensitivity and specificity for pancreatic ductal adenocarcinoma and detected pancreatic ductal adenocarcinoma metastases.<sup>2</sup> IMP3 expression has also been found in a variety of other human cancers including renal cell carcinoma, adenocarcinoma of the uterine cervix, endometrial carcinoma, adenocarcinoma of the esophagus, malignant melanoma, Merkel cell carcinoma, urothelial carcinoma, neuroendocrine carcinoma of the lung, adenocarcinoma of the pancreas, and triple negative breast cancer.<sup>1,2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** pancreatic ductal adenocarcinoma, placenta

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Cytopathology

Hematopathology

## Associated Grids

Grid	Page No.
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314

## Reference

1. Schaeffer DF, et al. Insulin-like growth factor 2 mRNA binding protein 3 (IGF2BP3) overexpression in pancreatic ductal adenocarcinoma correlates with poor survival. *BMC Cancer*. 2010; 10:59.
2. Wachter D, et al. Diagnostic value of immunohistochemical IMP3 expression in core needle biopsies of pancreatic ductal adenocarcinoma. *AM J Surg Pathol*. 2011; 35:873-877.

## Ordering Information

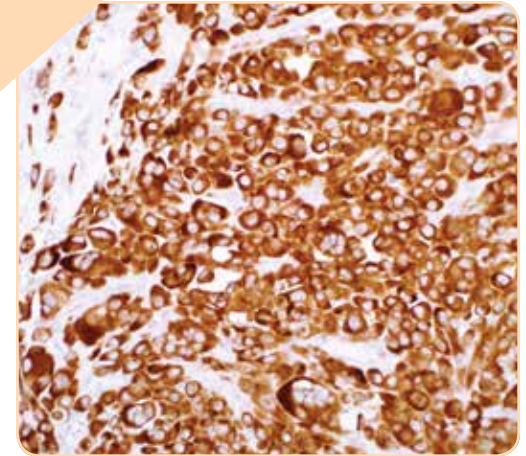
### IMP3 (EP286)

Rabbit Monoclonal  
Primary Antibody

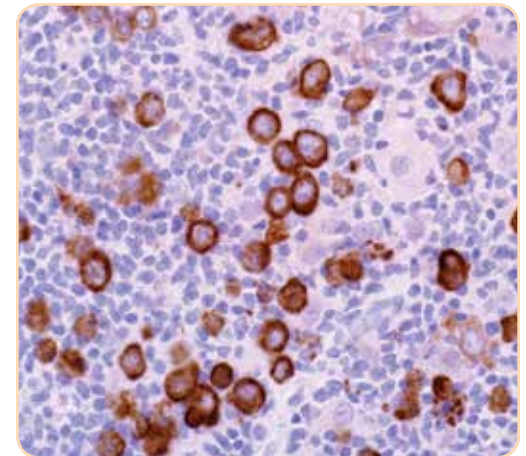


Volume	Part No.
0.1 mL concentrate	433R-14
0.5 mL concentrate	433R-15
1 mL concentrate	433R-16
1 mL predilute	433R-17
7 mL predilute	433R-18

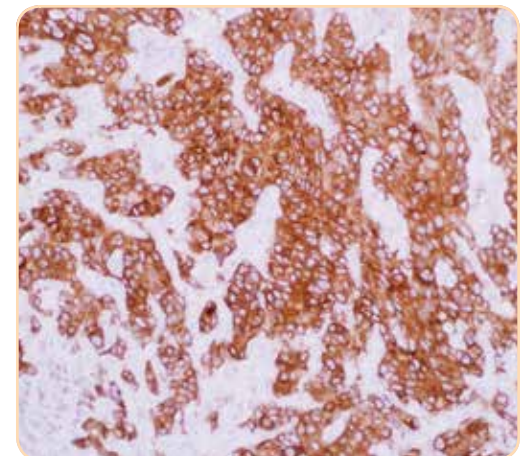
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreatic ductal adenocarcinoma

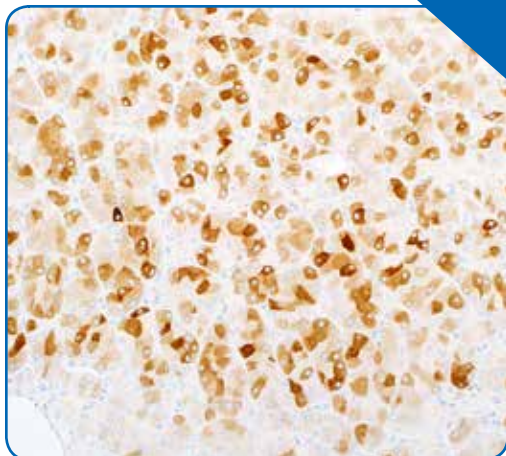


Nodular lymphocyte predominant Hodgkin lymphoma

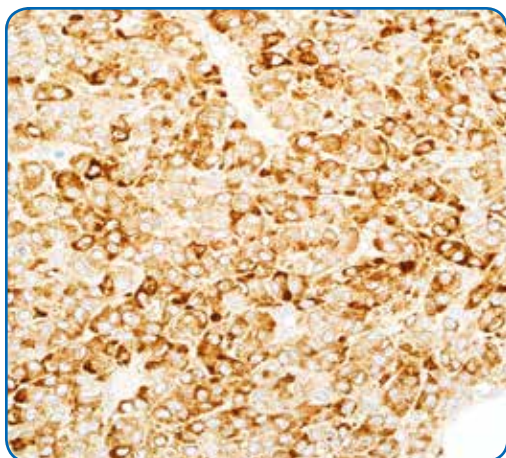


Gastric adenocarcinoma

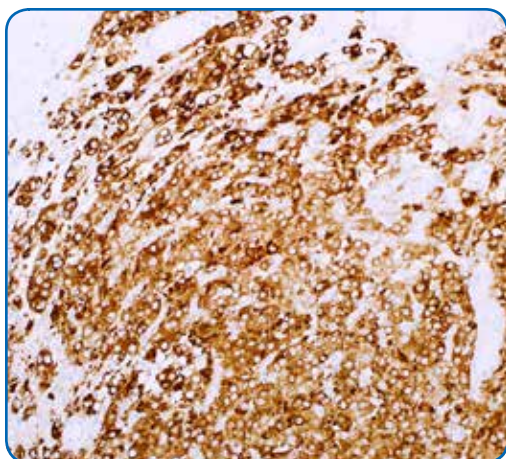
# Inhibin, alpha



Adrenocortical carcinoma



Granulosa cell tumor



Leydig cell tumor

Inhibin is a peptide hormone that inhibits FSH secretion from the pituitary.<sup>1-2</sup> Inhibin is a dimer that consists of an alpha and beta subunit.<sup>1-2</sup> In normal tissue, anti-inhibin, alpha labels granulosa cells of the ovary, Sertoli and Leydig cells of the testis, and the zona reticularis of the adrenal cortex.<sup>2</sup> Anti-inhibin, alpha has demonstrated utility in the identification of sex cord stromal tumors and adrenal cortical tumors.<sup>3-9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** adrenal cortex

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- MRQ-63: IgG
- R1: IgG<sub>2a</sub>

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Adrenal Neoplasms	292
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Sex Cord Stromal Tumors	303
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309
RCC vs. Hemangioblastoma	310

## Reference

1. Munro LM, et al. The expression of inhibin/activin subunits in the human adrenal cortex and its tumours. *J Endocrinol.* 1999; 161:341-7.
2. McCluggage WG, et al. Immunohistochemical staining of normal, hyperplastic, and neoplastic adrenal cortex with a monoclonal antibody against alpha inhibin. *J Clin Pathol.* 1998; 51:114-6.
3. Stewart CJ, et al. Diagnostic value of inhibin immunoreactivity in ovarian gonadal stromal tumours and their histological mimics. *Histopathology.* 1997; 31:67-74.
4. Yamashita K, et al. Production of inhibin A and inhibin B in human ovarian sex cord stromal tumors. *Am J Obstet Gynecol.* 1997; 177:1450-7.
5. McCluggage WG, et al. Immunohistochemical study of testicular sex cord-stromal tumors, including staining with anti-inhibin antibody. *Am J Surg Pathol.* 1998; 22:615-9.

*For the complete list of references see the product IFU.*

## Ordering Information

### Inhibin, alpha (MRQ-63)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	271R-24
0.5 mL concentrate	271R-25
1 mL concentrate	271R-26
1 mL predilute	271R-27
7 mL predilute	271R-28

### Inhibin, alpha (R1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	271M-14
0.5 mL concentrate	271M-15
1 mL concentrate	271M-16
1 mL predilute	271M-17
7 mL predilute	271M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# INI-1

The INI-1 gene, which encodes a functionally uncharacterized protein component of the hSWI/SNF chromatin remodeling complex, is often mutated or deleted in malignant rhabdoid tumor (MRT). Two isoforms of INI-1 that differ by the variable inclusion of amino acids are potentially produced by differential RNA splicing.

The morphology of MRTs can present challenges in differential diagnosis. The overall survival of MRTs relative to its potential mimics [medulloblastoma, supratentorial primitive neuroectodermal tumors (sPNETs)] is quite low, and thus differentiation from these other tumors is desirable. Lack of nuclear labeling by anti-INI-1 is characteristic of MRT. The majority of medulloblastomas and sPNETs are labeled by anti-INI-1. MRTs also originate from the kidney and soft tissues.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** brain, endothelial cells, astrocytoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Pediatric Pathology

## Associated Grids

Grid	Page No.
Epithelioid Cell Neoplasms	296
Brain: CNS Tumors	318
Small Blue Round Cell Tumors	322
Soft Tissue Tumors	322, 323

## Reference

1. Bourdeaut F, et al. hSNF5/INI1-deficient tumours and rhabdoid tumours are convergent but not fully overlapping entities. *J Pathol.* 2007; 211:323-30.
2. Fowler DJ, et al. Primary thoracic myxoid variant of extrarenal rhabdoid tumor in childhood. *Fetal Pediatr Pathol.* 2006; 25:159-68.
3. Haberler C, et al. Immunohistochemical analysis of INI1 protein in malignant pediatric CNS tumors: Lack of INI1 in atypical teratoid/rhabdoid tumors and in a fraction of primitive neuroectodermal tumors without rhabdoid phenotype. *Am J Surg Pathol.* 2006; 30:1462-8.

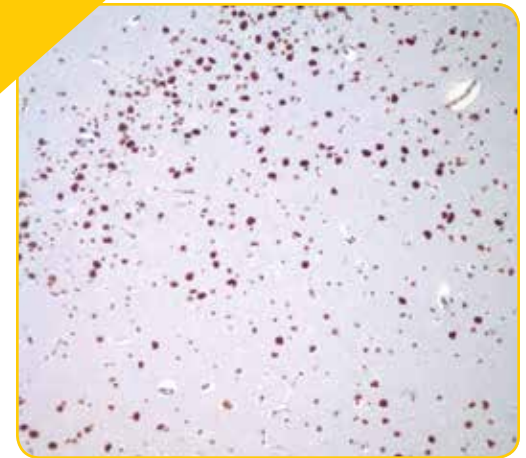
## Ordering Information

### INI-1 (MRQ-27)

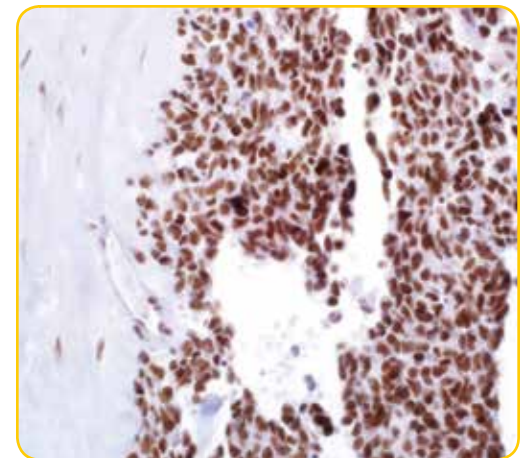
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	272M-14
0.5 mL concentrate	272M-15
1 mL concentrate	272M-16
1 mL predilute	272M-17
7 mL predilute	272M-18

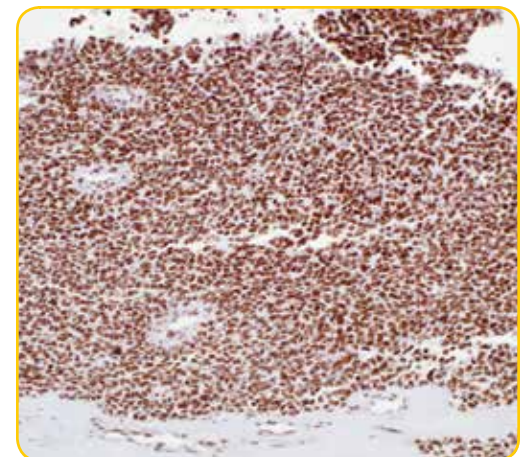
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Brain



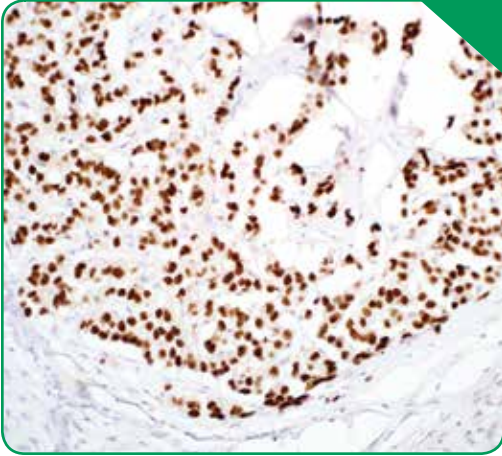
Primitive neuroectodermal tumor



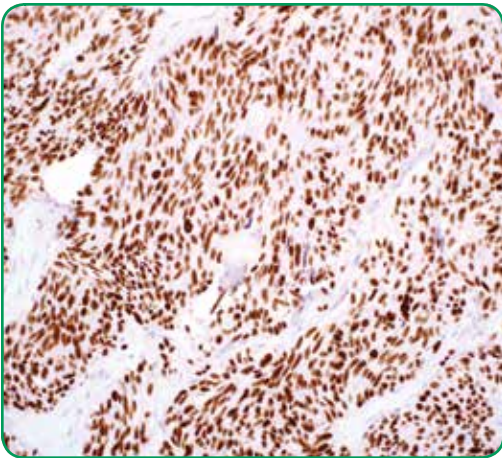
Primitive neuroectodermal tumor



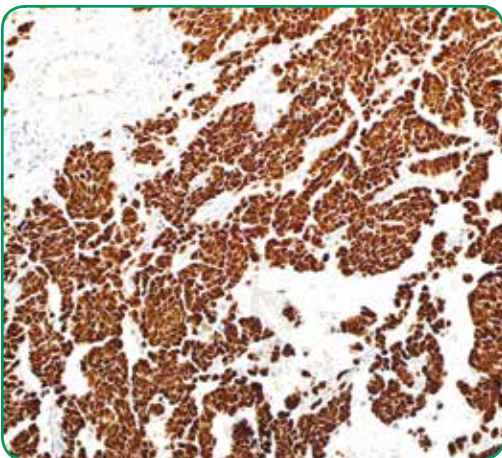
# Islet-1



Pancreatic endocrine tumor



Medullary thyroid carcinoma



Small cell lung carcinoma

Islet-1, a human insulin gene enhancer-binding protein, is a transcription factor involved in the differentiation of the neuroendocrine pancreatic cells.<sup>1-3</sup> Islet-1 plays an important role in the embryogenesis and differentiation of the insulin producing pancreatic beta cells within the islets of Langerhans.<sup>3</sup> Neuroendocrine tumors can arise from a variety of primary sites, most commonly in the bronchopulmonary system, gastrointestinal (GI) tract, and pancreas.<sup>2</sup> Neuroendocrine tumors of the GI tract and pancreas tend to be slow growing and indolent, and may metastasize to the liver before it is detected.<sup>2</sup> Islet-1 exhibits strong nuclear staining in the islets of normal pancreas and tumor cells of the pancreatic neuroendocrine tumor.<sup>1-3</sup> Islet-1 has been shown to be a reliable marker for the detection of primary and metastatic pancreatic neuroendocrine neoplasms.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** pancreas  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Anatomic Pathology  
 Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Neuroendocrine Neoplasms	298
Neuroendocrine Tumors from Different Anatomical Locations	299

## Reference

- Schmitt A, et al. Islet 1 (Isl1) Expression is a reliable marker for pancreatic endocrine tumors and their metastases. *Am J Surg Pathol.* 2008; 32:420-425.
- Koo J, et al. Value of Islet 1 and PAX8 in identifying metastatic neuroendocrine tumors of pancreatic origin. *Modern Pathology.* 2012; 25:893-901.
- Agaimy A, et al. ISL1 expression is not restricted to pancreatic well-differentiated neuroendocrine neoplasms, but is also commonly found in well and poorly differentiated neuroendocrine neoplasms of extrapancreatic origin. *Modern Pathology.* 2013; 1-9.

## Ordering Information

**Islet-1 (EP283)**  
 Rabbit Monoclonal  
 Primary Antibody



Volume	Part No.
0.1 mL concentrate	431R-14
0.5 mL concentrate	431R-15
1 mL concentrate	431R-16
1 mL predilute	431R-17
7 mL predilute	431R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Kappa

Anti-kappa detects surface immunoglobulin on normal and neoplastic B-cells. In paraffin-embedded tissue, anti-kappa exhibits strong staining of kappa-positive plasma cells and cells that have absorbed exogenous immunoglobulins. When dealing with B-cell neoplasms, the determination of light chain ratios remains the centerpiece. Most B-cell lymphomas express either kappa or lambda light chains, whereas reactive proliferations display a mixture of kappa and lambda positive cells. If only a single light chain type is detected, a lymphoproliferative disorder exists.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP171: IgG
- L1C1: IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Immunoglobulin, Heavy and Light Chain	314

## Reference

1. Ashton-Key M, et al. Immunoglobulin light chain staining in paraffin-embedded tissue using a heat mediated epitope retrieval method. *Histopathology*. 1996; 29:525-31.
2. Kurtin PJ, et al. Demonstration of distinct antigenic profiles of small B-cell lymphomas by paraffin section immunohistochemistry. *Am J Clin Pathol*. 1999; 112:319-29.
3. Abbondanzo SL, et al. Paraffin immunohistochemistry as an adjunct to hematopathology. *Ann Diagn Pathol*. 1999; 3:318-27.

## Ordering Information

**Kappa (EP171)**  
Rabbit Monoclonal  
Primary Antibody

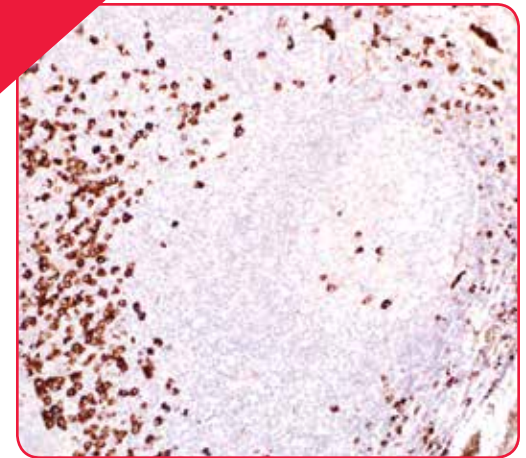


Volume	Part No.
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0.5 mL concentrate	274R-15
1 mL concentrate	274R-16
1 mL predilute	274R-17
7 mL predilute	274R-18

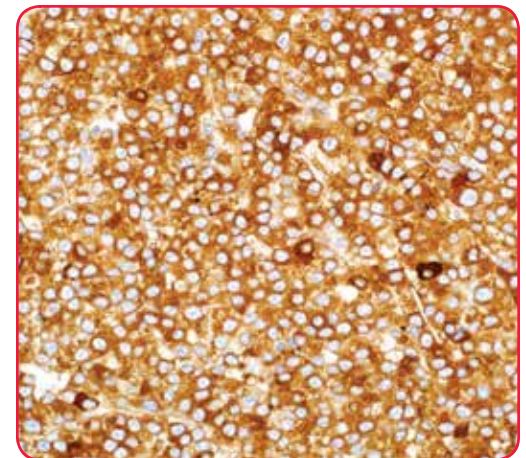
**Kappa (L1C1)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	274M-94
0.5 mL concentrate	274M-95
1 mL concentrate	274M-96
1 mL predilute	274M-97
7 mL predilute	274M-98
25 mL predilute	274M-90

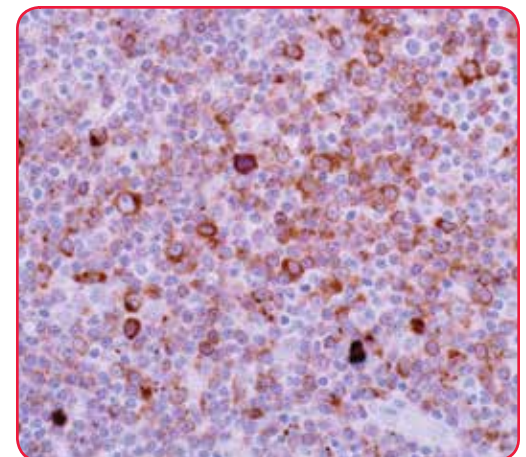
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Tonsil

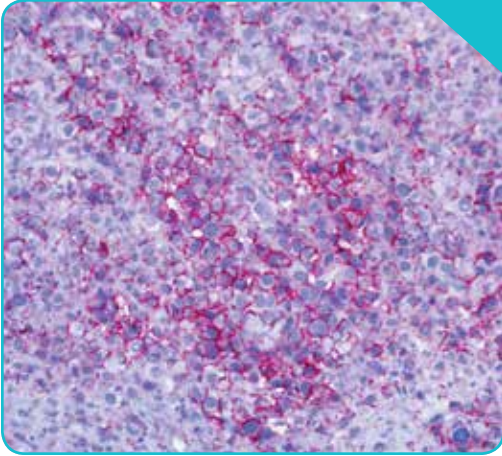


Plasma cell myeloma

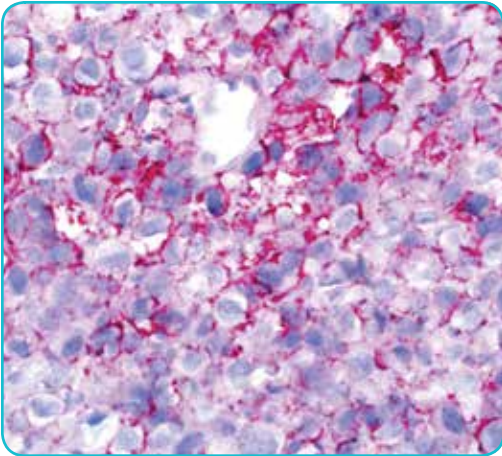


Small lymphocytic lymphoma

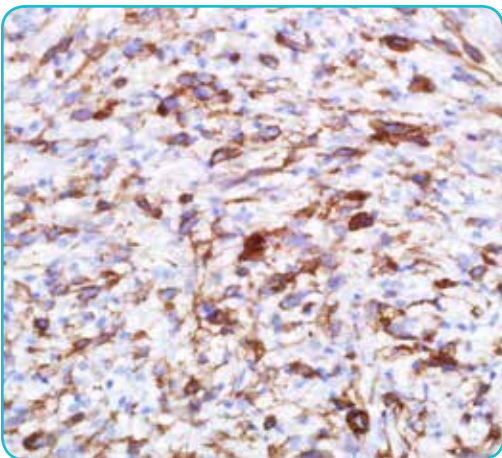
# KBA.62



Melanoma



Melanoma



Desmoplastic melanoma

KBA.62 is a monoclonal, anti-melanoma antibody that reacts with an antigen that has yet to be identified.<sup>1</sup> Notably used as a melanoma marker, KBA.62 also detects smooth muscle, basal cells of the epidermis and hair shaft epithelia of the skin.<sup>2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

Melanoma Associated Antigen

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Melanotic Lesions	305

## Reference

1. Pages C, et al. KBA.62 a useful marker for primary and metastatic melanomas. *Hum Pathol.* 2008; 39:1136-42.
2. Aung P, et al. KBA62 and PNL2: Two newer melanoma markers - immunohisto-chemical analysis of 1563 tumors including metastatic, desmoplastic, and mucosal melanomas and their mimics. *Am J Surg Pathol.* 2012; 36:265-72.

## Ordering Information

### KBA.62 (KBA.62)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	366M-94
0.5 mL concentrate	366M-95
1 mL concentrate	366M-96
1 mL predilute	366M-97
7 mL predilute	366M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Ki-67

The Ki-67 antigen is a nuclear, non-histone protein that is present in proliferating cells. In general, Ki-67 is a good marker of proliferating cell populations. Anti-Ki-67 labeling index has been shown to be a good marker to grade neoplasms including: colon carcinoma, breast carcinoma, neuroendocrine neoplasms, soft tissue tumors and lymphoma.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Comparison of Immunoreactivity of PHH3 and Ki-67 in the Cell Cycle	294
Cervical Epithelial Neoplastic Lesions	302
Cervix	302
Bladder Urothelium: Dysplasia vs. Reactive Changes	308

## Reference

1. McKeever P, et al. MIB-1 proliferation index predicts survival among patients with grade II astrocytoma. *J Neuropathol Exp Neurol.* 1998; 57:931-6.
2. Coons SW, et al. The prognostic significance of Ki-67 labeling indices for oligodendrogliomas. *Neurosurgery.* 1997; 41:878-84.
3. Allegra CJ, et al. Prognostic value of thymidylate synthase, Ki-67, and p53 in patients with Dukes' B and C colon cancer: a National Cancer Institute-National Surgical Adjuvant Breast and Bowel Project collaborative study. *J Clin Oncol.* 2003; 21:241-50.
4. Pathmanathan N, et al. Ki-67 and proliferation in breast cancer. *J Clin Pathol.* 2013; 66:512-6.
5. Swerdlow SH, et al. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues. 4th edition. 2008; p220.

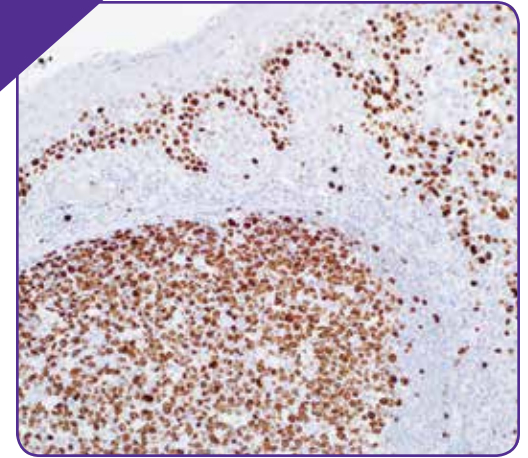
## Ordering Information

### Ki-67 (SP6)

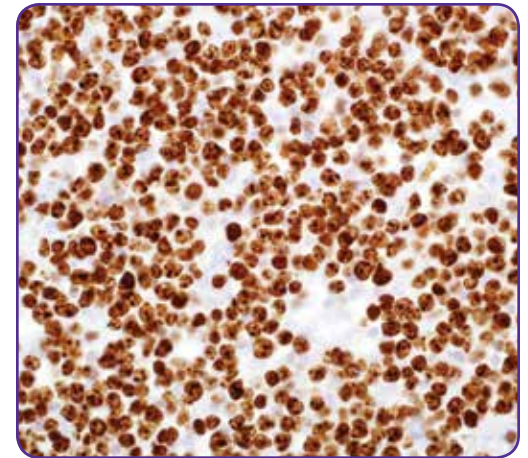
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	275R-14
0.5 mL concentrate	275R-15
1 mL concentrate	275R-16
1 mL predilute	275R-17
7 mL predilute	275R-18
25 mL predilute	275R-10

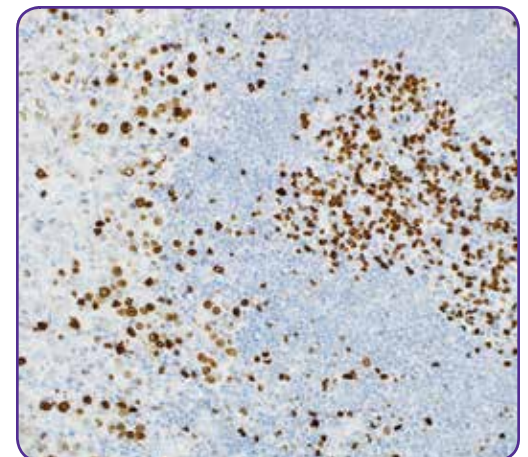
*Please contact your distributor for details on product availability and regulatory status in your country.*



Tonsil

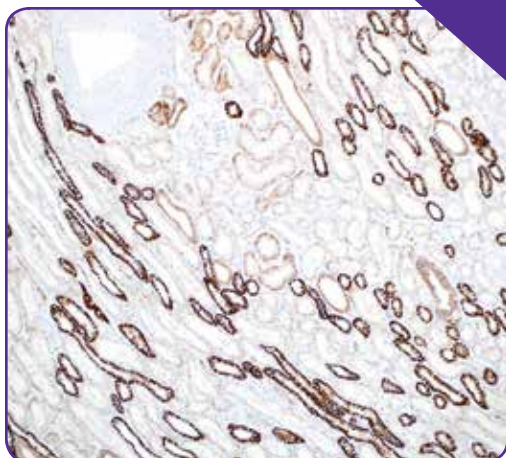


Burkitt lymphoma

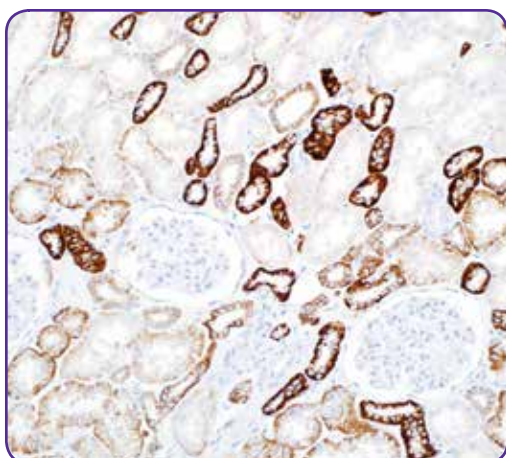


Lymph node, metastatic breast carcinoma

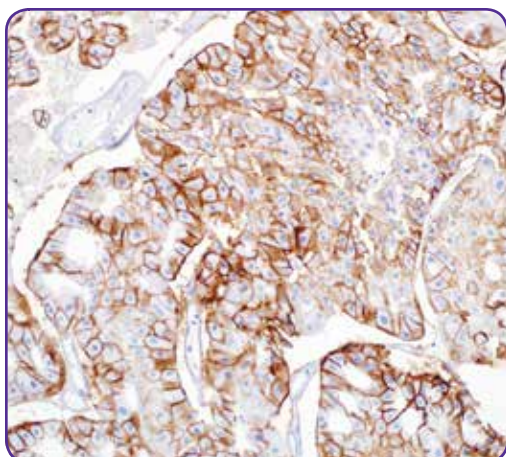
# Ksp-cadherin



Kidney



Kidney



Chromophobe renal cell carcinoma

Kidney-specific cadherin (Ksp-cadherin) is a member of the cadherin family of cell adhesion molecules that is found exclusively in the basolateral membrane of renal tubular epithelial cells of the distal tubules and collecting duct.<sup>1-3</sup> Ksp-cadherin may be useful in distinguishing between renal neoplasms of distal nephron origin from those of proximal tubule origin.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** kidney

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

Cadherin 16

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Kidney: Epithelial Neoplasms	309
Kidney Neoplasms	310

## Reference

1. Mazal PR, et al. Expression of kidney-specific cadherin distinguishes chromophobe renal cell carcinoma from renal oncocytoma. *Hum Pathol.* 2005; 36:22-8.
2. Shen SS, et al. Kidney-specific cadherin, a specific marker for the distal portion of the nephron and related renal neoplasms. *Mod Pathol.* 2005; 18:933-40.
3. Thedieck C, et al. Expression of Ksp-cadherin during kidney development and in renal cell carcinoma. *Br J Cancer.* 2005; 92:2010-7.

## Ordering Information

### Ksp-cadherin (MRQ-33)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	276M-94
0.5 mL concentrate	276M-95
1 mL concentrate	276M-96
1 mL predilute	276M-97
7 mL predilute	276M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Lambda

Anti-lambda detects surface immunoglobulin on normal and neoplastic B-cells. Anti-lambda staining is seen in B-cell follicles of human lymphoid tissue. When dealing with B-cell neoplasms, the determination of light chain ratios remains helpful. Most B-cell lymphomas express either kappa or lambda light chains, whereas reactive proliferations display a mixture of kappa and lambda positive cells. If only a single light chain type is detected, a lymphoproliferative disorder is very likely.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP172: IgG
- Lamb14: IgG<sub>2a</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Immunoglobulin, Heavy and Light Chain	314

## Reference

1. Abbondanzo SL, et al. Paraffin immunohistochemistry as an adjunct to hematopathology. *Ann Diagn Pathol.* 1999; 3:318-27.
2. Kurtin PJ, et al. Demonstration of distinct antigenic profiles of small B-cell lymphomas by paraffin section immunohistochemistry. *Am J Clin Pathol.* 1999; 112:319-29.
3. Ashton-Key M, et al. Immunoglobulin light chain staining in paraffin-embedded tissue using a heat mediated epitope retrieval method. *Histopathology.* 1996; 29:525-31.

## Ordering Information

### Lambda (EP172)

Rabbit Monoclonal  
Primary Antibody



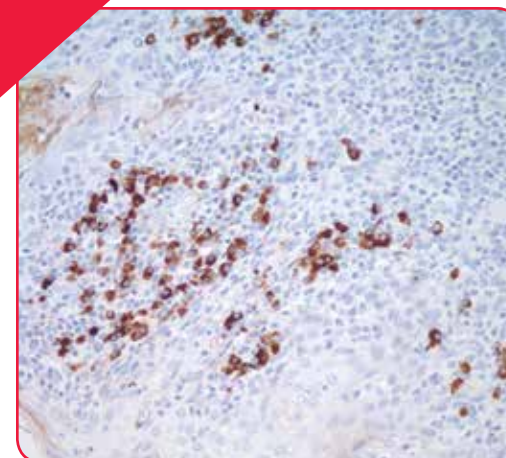
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1 mL concentrate	277R-16
1 mL predilute	277R-17
7 mL predilute	277R-18

### Lambda (Lamb14)

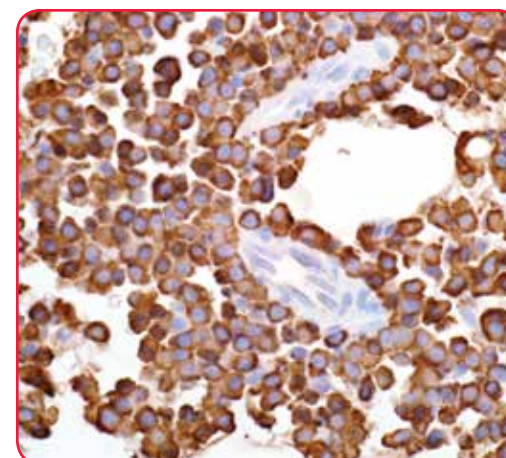
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	277M-94
0.5 mL concentrate	277M-95
1 mL concentrate	277M-96
1 mL predilute	277M-97
7 mL predilute	277M-98
25 mL predilute	277M-90

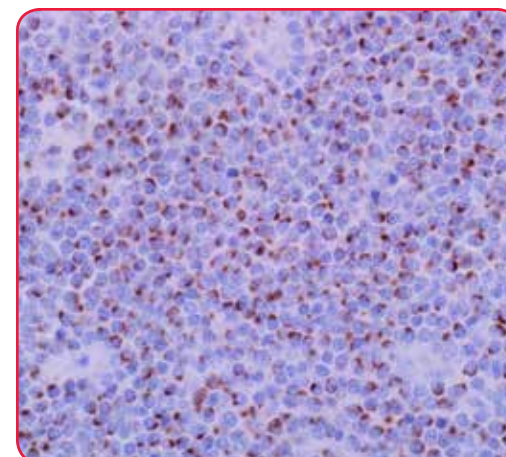
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Tonsil

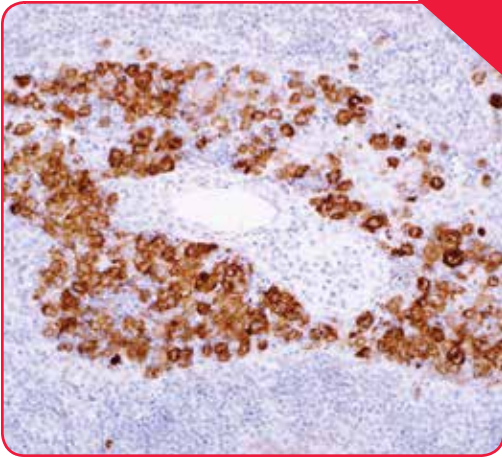


Plasma cell myeloma

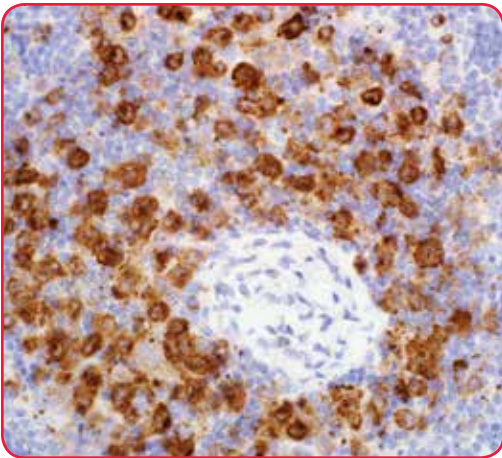


Chronic lymphocytic leukemia/ small lymphocytic lymphoma

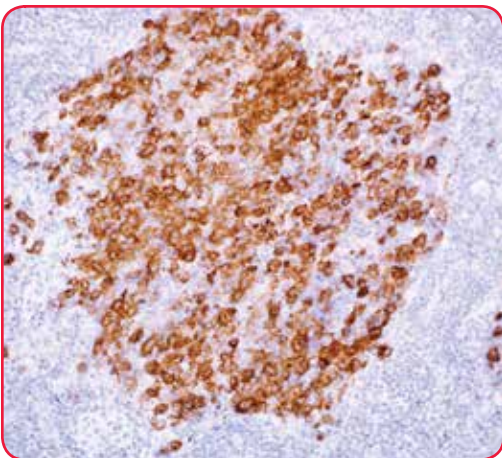
# Langerin



Langerhans cell histiocytosis



Langerhans cell histiocytosis



Langerhans cell histiocytosis

Langerin is a type II transmembrane C-type lectin associated with the formation of Birbeck granules in Langerhans cells. The demonstration of langerin immunoreactivity is considered an adjunct or alternative to CD1a antigen expression as evidence to aid in the diagnosis of Langerhans cell histiocytosis. Evaluation of langerin expression is valuable in circumstances where a diagnosis of Langerhans cell histiocytosis is suspected, but cannot be confirmed due to lack of CD1a immunoreactivity. A panel of antibodies against CD1a, langerin, CD21, CD23, CD35 and S-100 is very useful in the distinction of Langerhans cell histiocytosis, histiocytic sarcoma, interdigitating dendritic cell sarcoma, follicular dendritic cell sarcoma, disseminated juvenile xanthogranuloma, and Rosai-Dorfman disease (sinus histiocytosis with massive lymphadenopathy).<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** Langerhans cell histiocytosis

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>/k

## Associated Specialties

Hematopathology

Pediatric Pathology

## Associated Grids

Grid	Page No.
Histiocytic and Dendritic Cell Lesions	313, 320
Histiocytic and Dendritic Cell Neoplasms	313

## Reference

1. Lau SK, et al. Immunohistochemical expression of Langerin in Langerhans cell histiocytosis and non-Langerhans cell histiocytic disorders. *Am J Surg Pathol.* 2008; 32:615-619.
2. Demellawy DE, et al. Langerhans cell histiocytosis: a comprehensive review. *Pathology.* 2015; 4:294-301.
3. Park L, et al. Langerhans cell histiocytosis. *J Cutan Med Surg.* 2012; 1:45-9.

## Ordering Information

**Langerin (12D6)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	392M-14
0.5 mL concentrate	392M-15
1 mL concentrate	392M-16
1 mL predilute	392M-17
7 mL predilute	392M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# LEF1

Lymphoid Enhancing Factor 1 (LEF1) is a transcription factor that belongs to the TCF/LEF family.<sup>1</sup> LEF1 participates as a regulator in Wnt signaling pathways. LEF1 is an important factor in lymphopoiesis and is expressed normally in T and pro-B cells but not expressed in mature B cells.<sup>2</sup> Strong nuclear expression of LEF1 has been observed in majority of chronic lymphocytic leukemia/small lymphocytic lymphoma cases and LEF1 is not detected in other small B cell lymphomas.<sup>2,3</sup> Anti-LEF1 may be used as an aid for differentiation of chronic lymphocytic leukemia/small lymphocytic lymphoma from other small B cell lymphomas.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil, small lymphocytic lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Boras-Granic K, et al. Lef1 is required for the transition of Wnt signaling from mesenchymal to epithelial cells in the mouse embryonic mammary gland. *Dev Biol.* 2006; 295:219-31.
2. Tandon B, et al. Nuclear overexpression of lymphoid-enhancer-binding factor 1 identifies chronic lymphocytic leukemia/small lymphocytic lymphoma in small B-cell lymphomas. *Mod Pathol.* 2011; 24:1433-43.
3. Gandhirajan RK, et al. Small molecule inhibitors of Wnt/beta-catenin/lef-1 signaling induces apoptosis in chronic lymphocytic leukemia cells in vitro and in vivo. *Neoplasia.* 2010; 12:326-35.

## Ordering Information

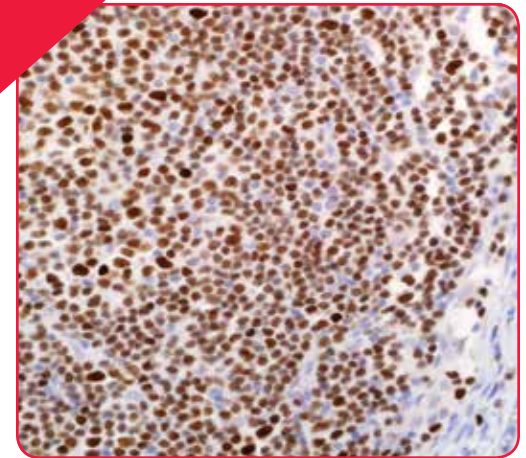
### LEF1 (EP310)

Rabbit Monoclonal  
Primary Antibody

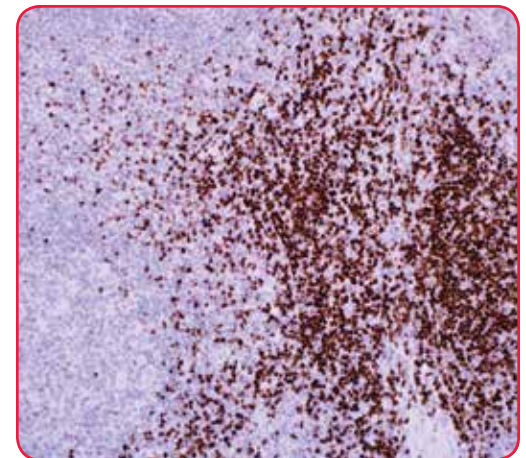


Volume	Part No.
0.1 mL concentrate	442R-14
0.5 mL concentrate	442R-15
1 mL concentrate	442R-16
1 mL predilute	442R-17
7 mL predilute	442R-18

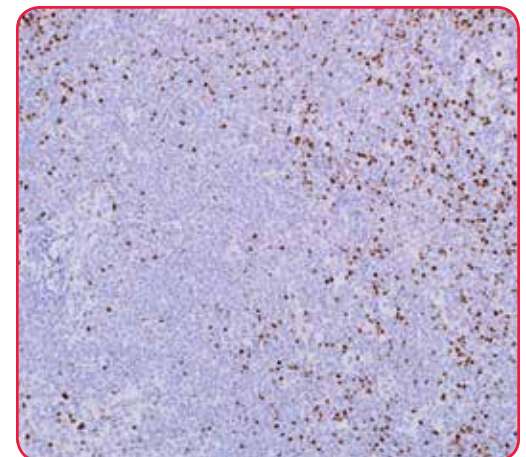
Please contact your distributor for details on product availability and regulatory status in your country.



Small lymphocytic lymphoma



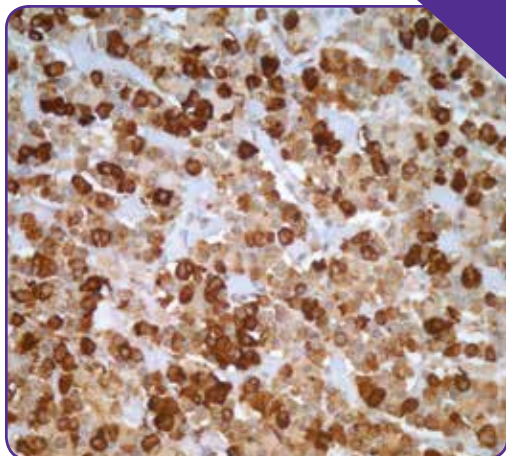
Lymph node



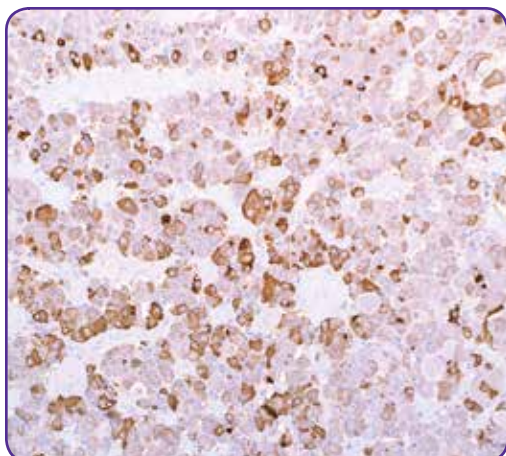
Mantle cell lymphoma



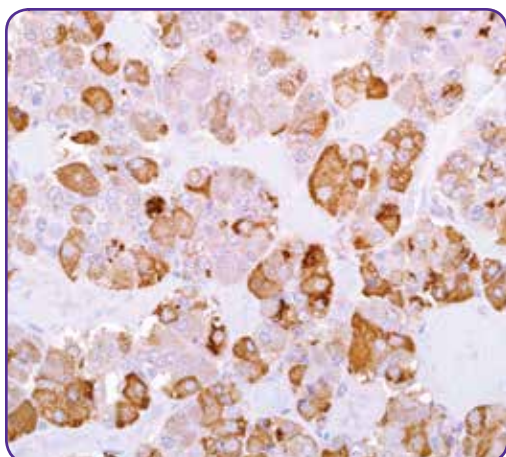
# LH



Pituitary gland



Pituitary gland



Pituitary gland

Luteinizing hormone (LH) is a heterodimeric glycoprotein produced by gonadotropic cells of the pituitary gland. Anti-LH is a useful marker to aid in the classification of pituitary tumors and the study of pituitary disease.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pituitary

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

Luteinizing Hormone

## Associated Specialties

Anatomic Pathology

Neuropathology

## Reference

1. Sano T, et al. Immunoreactive luteinizing hormone in functioning corticotroph adenomas of the pituitary. Immunohistochemical and tissue culture studies of two cases. *Virchows Arch A Pathol Anat Histopathol.* 1990; 417:361-7.
2. Felix I, et al. Changes in hormone production of a recurrent silent corticotroph adenoma of the pituitary: a histologic, immunohistochemical, ultrastructural, and tissue culture study. *Hum Pathol.* 1991; 22:719-21.
3. Saccomanno K, et al. Immunodetection of chorionic gonadotropin and its subunits in human nonfunctioning pituitary adenomas. *J Clin Endocrinol Metab.* 1994; 78:1103-7.

## Ordering Information

### LH

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	209A-14
0.5 mL concentrate	209A-15
1 mL concentrate	209A-16
1 mL predilute	209A-17
7 mL predilute	209A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# LIN28

LIN-28 is a RNA-binding protein that acts as an inhibitor of let-7 tumor suppressor microRNAs, and posttranscriptional regulator of mRNAs involved in the renewal and development of embryonic stem cells.<sup>1-5</sup> Anti-LIN28 reactivity is seen in extragonadal seminomas/germinomas, embryonal carcinoma, teratomas, and yolk sac tumors. Anti-LIN28 reactivity is only seen in a small fraction of various extragonadal-non-germ cell tumors, and adult testis tissues. Therefore, Anti-LIN28 is a useful marker in the differential identification of germ cell tumors and cancers of non-germ cell origin.<sup>6-12</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** yolk sac tumor, embryonal carcinoma, seminoma, dysgerminoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301

## Reference

1. Peng S, et al. Genome-wide studies reveal that Lin28 enhances the translation of genes important for growth and survival of human embryonic stem cells. *Stem Cells*. 2011; 29:496-504.
2. Zhu H, et al. The Lin28/let-7 axis regulates glucose metabolism. *Cell*. 2011; 147:81-94.
3. Tzialikas J, et al. LIN28: roles and regulation in development and beyond. *Development*. 2015; 142:2397-404.
4. Nguyen LH, et al. Lin28 and let-7 in cell metabolism and cancer. *Transl Pediatr*. 2015; 4:4-11.
5. Viswanathan SR, et al. Lin28 promotes transformation and is associated with advanced human malignancies. *Nat Genet*. 2009; 41:843-8.
6. West JA, et al. A role for Lin28 in primordial germ-cell development and germ-cell malignancy. *Nature*. 2009; 460:909-13.
7. Cao D, et al. RNA-binding protein LIN28 is a marker for primary extragonadal germ cell tumors: an immunohistochemical study of 131 cases. *Mod Pathol*. 2011; 24:288-96.
8. Nogales FF, et al. A diagnostic immunohistochemical panel for yolk sac (primitive endodermal) tumours based on an immunohistochemical comparison with the human yolk sac. *Histopathology*. 2014; 65:51-9.

For the complete list of references see the product IFU.

## Ordering Information

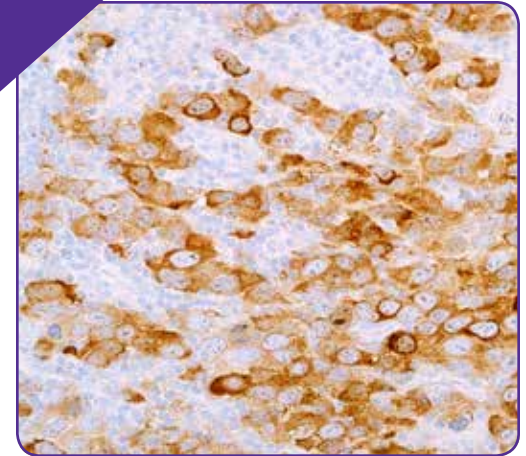
### LIN28 (EP150)

Rabbit Monoclonal  
Primary Antibody

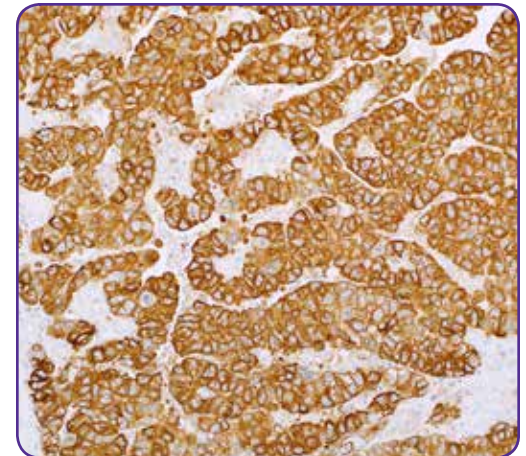


Volume	Part No.
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0.5 mL concentrate	464R-15
1 mL concentrate	464R-16
1 mL predilute	464R-17
7 mL predilute	464R-18

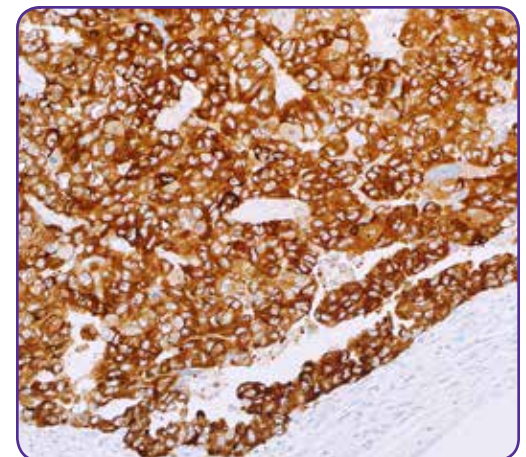
Please contact your distributor for details on product availability and regulatory status in your country.



Seminoma

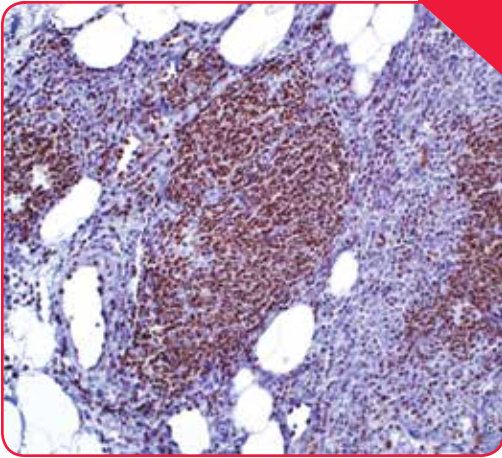


Embryonal carcinoma

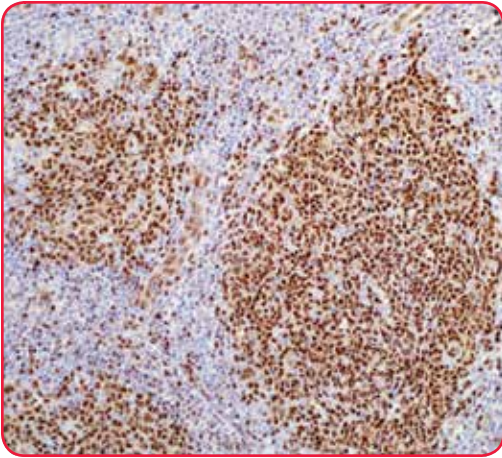


Yolk sac tumor

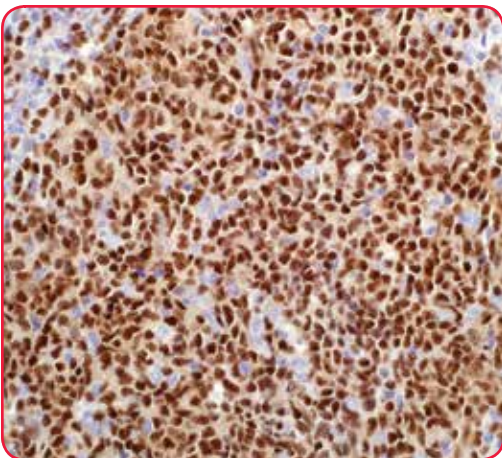
# LMO2



Follicular lymphoma



Lymph node



Lymph node

The LIM-domain-only (LMO) family of proteins function as linkers in the co-regulation of nuclear transcription by mediating protein-protein interactions. The four members of the LMO family collectively have significant roles in cell fate determination, cell growth and differentiation, and organ development.<sup>1</sup> LMO2 has a particular function in normal and lymphatic endothelial cells involving the regulation of angiogenesis and lymphangiogenesis.<sup>2</sup> Immunohistochemical studies have also demonstrated expression of LMO2 in both normal germinal center B-cells and germinal center-derived B-cell lymphomas, including follicular lymphoma and diffuse large B-cell lymphoma.<sup>3</sup> The use of anti-LMO2 is valuable as a tool in the identification of lymphomas of B-cell origin.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil, follicular lymphoma, diffuse large B-cell lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Mature B-cell Neoplasms	315

## Reference

1. Sang M, et al. LIM-domain-only proteins: multifunctional nuclear transcription coregulators that interacts with diverse proteins. *Mol Biol Rep.* 2014; 41:1067-73.
2. Coma S, et al. GATA2 and Lmo2 control angiogenesis and lymphangiogenesis via direct transcriptional regulation of neuropilin-2. *Angiogenesis.* 2013; 16:939-52.
3. Natkunam Y, et al. The oncoprotein LMO2 is expressed in normal germinal-center B cells and in human B-cell lymphomas. *Blood.* 2007; 109:1636-42.

## Ordering Information

### LMO2 (SP51)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	370R-14
0.5 mL concentrate	370R-15
1 mL concentrate	370R-16
1 mL predilute	370R-17
7 mL predilute	370R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Lysozyme

Human lysozyme is a bacteriolytic enzyme which has had its gene mapped to chromosome 12q15.<sup>1-3</sup> Lysozyme has been shown to be expressed in histiocytes, granulocytes, and monocytes.<sup>2,3,4</sup> Anti-lysozyme may aid in the identification of histiocytic neoplasias, large lymphocytes, and classifying lymphoproliferative disorders.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP134: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymph Node	297
Histiocytic and Dendritic Cell Lesions	313, 320
Histiocytic and Dendritic Cell Neoplasms	313
Histiocytic Lesions	313
Histiocytic Proliferation	319

## Reference

1. Mir MA. Lysozyme: a brief review. Postgrad Med J. 1977; 53:257-9.
2. Peters C, et al. The human lysozyme gene sequence organization and chromosomal localization. Eur J Biochem. 1989; 507-16.
3. Levi J, et al. Studies on muramidase in hematologic disorders. Cancer. 1973; 4:939-47.
4. Rehg J, et al. The utility of immunohistochemistry for the identification of hematopoietic and lymphoid cells in normal tissues and interpretation of proliferative and inflammatory lesions of mice and rats. Toxicol Pathol. 2012; 40:345-74.

## Ordering Information

### Lysozyme (EP134)

Rabbit Monoclonal  
Primary Antibody



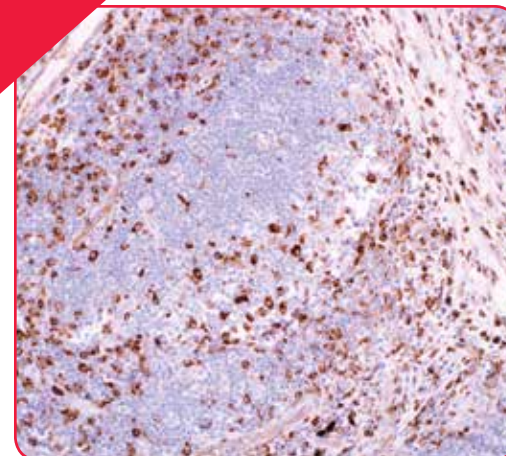
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1 mL concentrate	278R-16
1 mL predilute	278R-17
7 mL predilute	278R-18

### Lysozyme

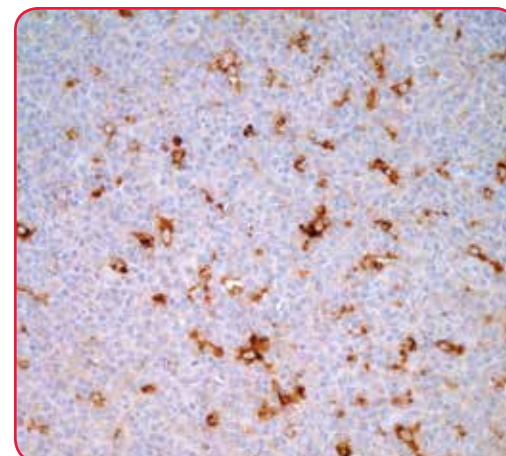
Rabbit Polyclonal Antibody

Volume	Part No.
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0.5 mL concentrate	278A-15
1 mL concentrate	278A-16
1 mL predilute	278A-17
7 mL predilute	278A-18

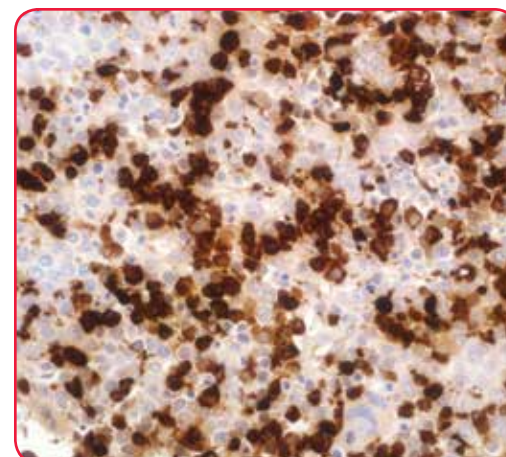
*Please contact your distributor for details on product availability and regulatory status in your country.*



Lymph node

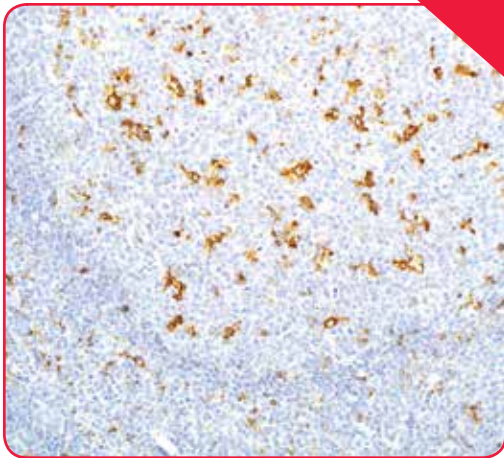


Lymphoid tissue with macrophages highlighted

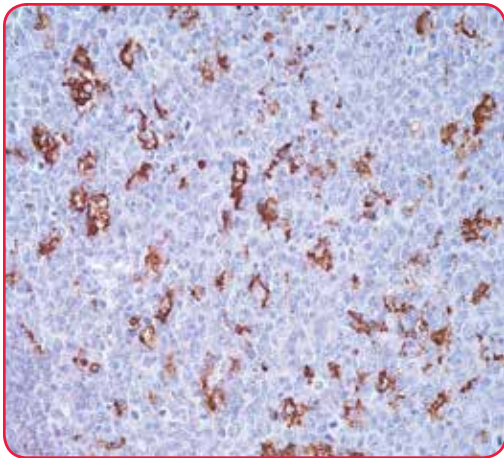


Acute myeloid leukemia

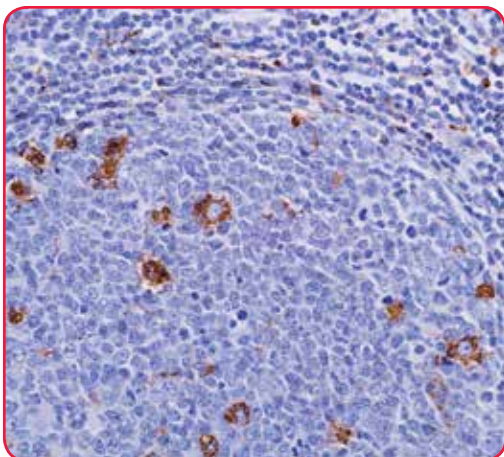
# Macrophage



Tonsil



Lymphoid tissue with macrophages highlighted



Appendix

Anti-macrophage (HAM-56) reacts with tingible macrophages, interdigitating macrophages of lymph nodes and tissue macrophages, e.g. Kupffer cells of the liver and alveolar macrophages of the lung. The antibody also stains a subpopulation of endothelial cells, most prominently those of the capillaries and smaller blood vessels.<sup>1</sup> Anti-macrophage (HAM-56) antibody reacts with monocytes, but is unreactive with B- and T-lymphocytes.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM/k

## Synonyms and Abbreviations

HAM-56

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Histiocytic Proliferation	319

## Reference

1. Gown AM, et al. Human atherosclerosis. II. Immunocytochemical analysis of the cellular composition of human atherosclerotic lesions. *Am J Pathol.* 1986; 125:191-207.
2. Alpers CE, et al. Macrophage origin of the multinucleated cells of myeloma cast nephropathy. *Am J Clin Pathol.* 1989; 92:662-665.
3. Bosman C, et al. Evidence for a hybrid macrophage phenotype in erythrophagocytic histiocytosis. *J Pediatr Hematol Oncol.* 1999; 21:31-7.
4. Soini Y, Miettinen M. Immunohistochemistry of markers of histiomonocytic cells in malignant fibrous histiocytomas. A monoclonal antibody study. *Pathol Res Pract.* 1990; 186:759-67.

## Ordering Information

**Macrophage (HAM-56)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	279M-14
0.5 mL concentrate	279M-15
1 mL concentrate	279M-16
1 mL predilute	279M-17
7 mL predilute	279M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Mammaglobin

Mammaglobin is a breast-associated glycoprotein distantly related to secretoglobulin family that includes human uteroglobin and lipophilin.<sup>1,2</sup> Anti-mammaglobin labels cytoplasm of normal breast epithelial cells as well as primary and metastatic breast carcinomas.<sup>1-4</sup> Absence of mammaglobin expression is typically seen in prostate, kidney, colon, rectum, small intestine, stomach, pancreas, lung and thyroid tissue.<sup>2,5</sup> Mammaglobin may be used as part of an immunohistochemical panel for determination of metastatic breast carcinoma and tumor of unknown primary origin.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- 31A5: IgG
- EP249: IgG

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Micropapillary Carcinomas	297
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Breast Lesion	302

## Reference

1. Fleming TP, et al. Mammaglobin, a breast-specific gene, and its utility as a marker for breast cancer. *Ann N Y Acad Sci.* 2000; 923:78-89.
2. Bhargava R, et al. Mammaglobin vs GCDPF-15: an immunohistologic validation survey for sensitivity and specificity. *Am J Clin Pathol.* 2007; 127:103-13.
3. Wang Z, et al. Mammaglobin, a valuable diagnostic marker for metastatic breast carcinoma. *Int J Clin Exp Pathol.* 2009; 2:384-9.
4. Han JH, et al. Mammaglobin expression in lymph nodes is an important marker of metastatic breast carcinoma. *Arch Pathol Lab Med.* 2003; 127:1330-4.
5. Zafrakas M, et al. Expression analysis of mammaglobin A (SCGB2A2) and lipophilin B (SCGB1D2) in more than 300 human tumors and matching normal tissues reveals their co-expression in gynecologic malignancies. *BMC Cancer.* 2006; 6:88.

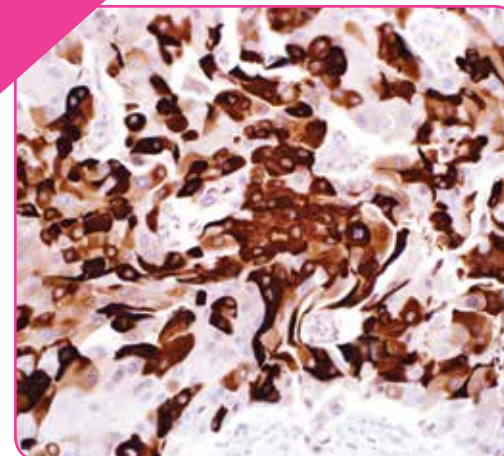
## Ordering Information

### Mammaglobin (31A5)

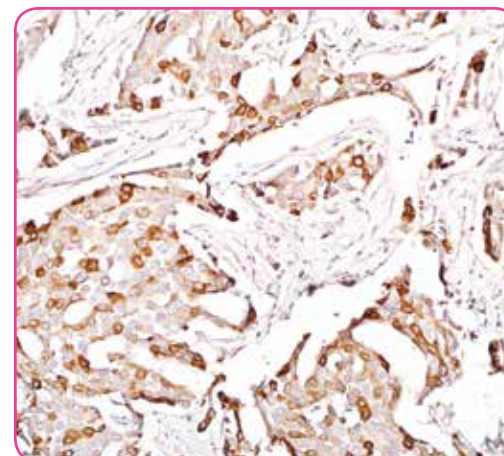
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	280R-14
0.5 mL concentrate	280R-15
1 mL concentrate	280R-16
1 mL predilute	280R-17
7 mL predilute	280R-18
25 mL predilute	280R-10

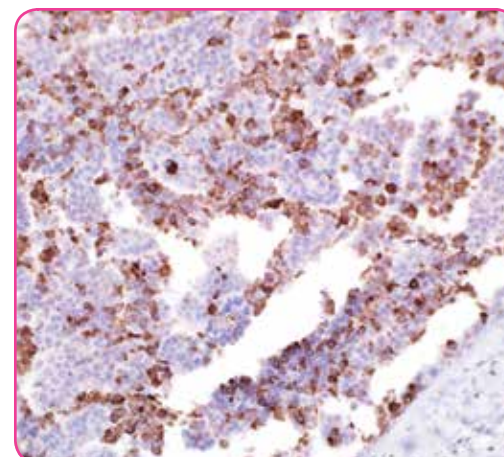
*Please contact your distributor for details on product availability and regulatory status in your country.*



Breast, invasive ductal carcinoma

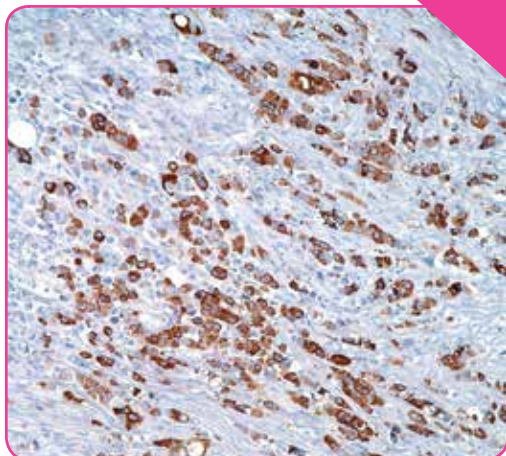


Breast, invasive ductal carcinoma

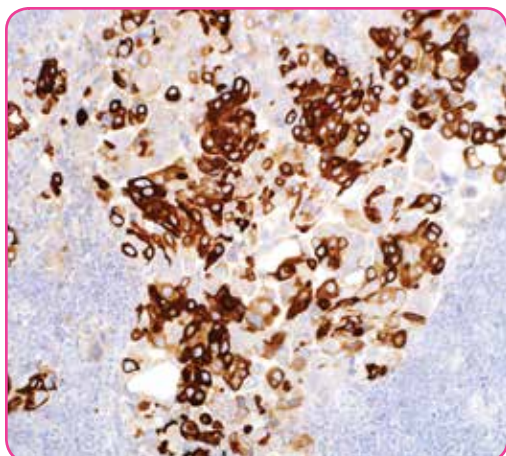


Breast, invasive ductal carcinoma

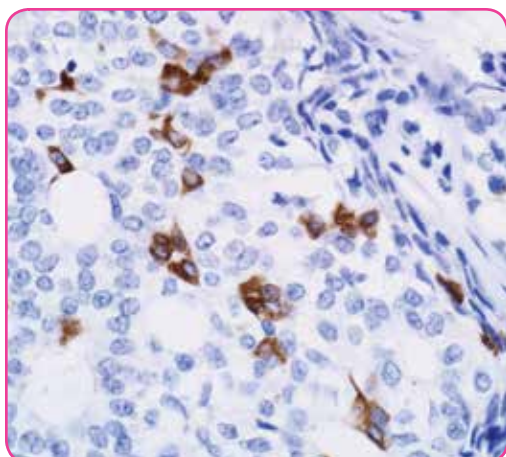
# Mammaglobin Cocktail



Breast, invasive carcinoma



Lymph node, metastatic breast carcinoma



Lymph node, metastatic breast carcinoma

Mammaglobin (10-kD) is a breast-associated glycoprotein distantly related to secretoglobin family that includes human uteroglobin and lipophilin. Mammaglobin mRNA is present in high levels in human breast cancer cell lines, which has been shown to be a sensitive marker of breast cancer.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** 304-1A5: IgG<sub>1</sub> & 31A5: IgG

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Micropapillary Carcinomas	297
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Breast Lesion	302

## Reference

1. Watson MA, et al. Mammaglobin expression in primary, metastatic, and occult cancer. *Cancer Research*. 1999; 59:3028-31.
2. Fleming TP, et al. Mammaglobin, a breast-specific gene, and its utility as a marker for breast cancer. *Ann N Y Acad Sci*. 2000; 923:78-89.
3. Han JH, et al. Mammaglobin expression in lymph nodes is an important marker of metastatic breast carcinoma. *Arch Pathol Lab Med*. 2003; 127:1330-4.

## Ordering Information

### Mammaglobin Cocktail (304-1A5 & 31A5)

Mouse & Rabbit Cocktail Antibody

Volume	Part No.
0.1 mL concentrate	280C-14
0.5 mL concentrate	280C-15
1 mL concentrate	280C-16
1 mL predilute	280C-17
7 mL predilute	280C-18

Please contact your distributor for details on product availability and regulatory status in your country.

# MART-1 (Melan A)

MART-1 (also known as Melan A) is a melanocyte differentiation antigen.<sup>1-2</sup> MART-1 is a transmembrane protein present in melanocytes of normal skin, retina, nevi, and most melanomas. MART-1 is a very useful marker for identifying metastatic melanomas.<sup>3-11</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** melanoma, skin

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- A103: IgG<sub>1</sub>
- M2-7C10: IgG<sub>2b</sub>/k

## Synonyms and Abbreviations

Melan A

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Adrenal Neoplasms	292
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Lymph Node: Melanocytic Lesions vs. Interdigitating Dendritic Cells	297
PEComa	299
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Sex Cord Stromal Tumors	303
Cutaneous Lesion	304
Melanotic Lesions	305

## Reference

1. Kawakam Y, et al. Cloning of the gene coding for a shared human melanoma antigen recognized by autologous T cells infiltrating into tumor. Proc Natl Acad Sci U S A. 1994; 91:3515-19.
2. Couli PG, et al. A new gene coding for a differentiation antigen recognized by autologous cytolytic T lymphocytes on HLA-A2 melanomas. J Exp Med. 1994; 180:35-42.
3. Kageshita T, et al. Differential expression of MART-1 in primary and metastatic melanoma lesions. J Immunother. 1997; 20:460-5.

For the complete list of references see the product IFU.

## Ordering Information

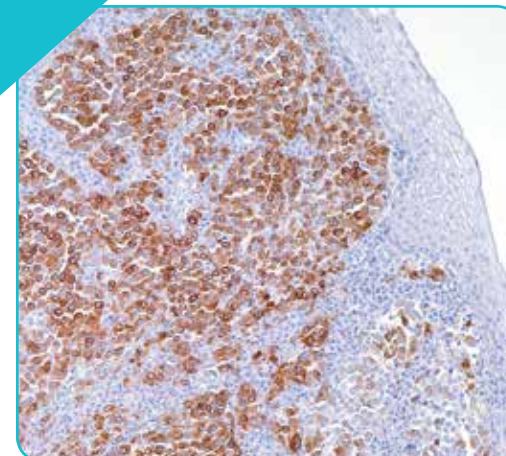
### MART-1 (Melan A) (A103) Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	281M-85
1 mL concentrate	281M-86
1 mL predilute	281M-87
7 mL predilute	281M-88

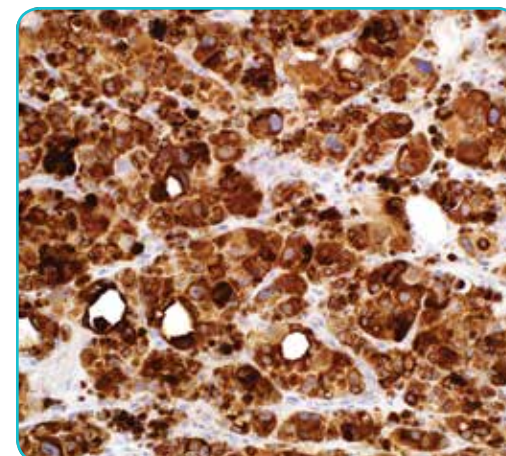
### MART-1 (Melan A) (M2-7C10) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	281M-94
0.5 mL concentrate	281M-95
1 mL concentrate	281M-96
1 mL predilute	281M-97
7 mL predilute	281M-98
25 mL predilute	281M-90

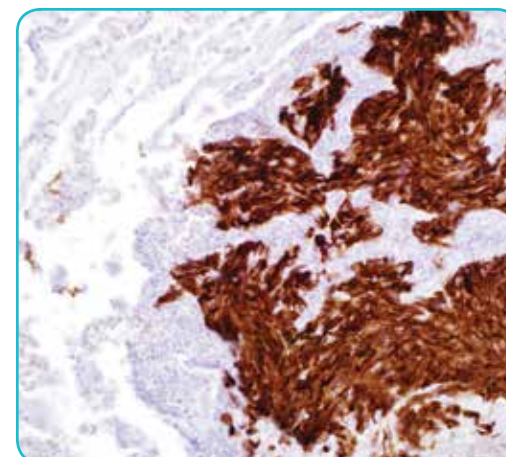
Please contact your distributor for details on product availability and regulatory status in your country.



Melanoma



Melanoma



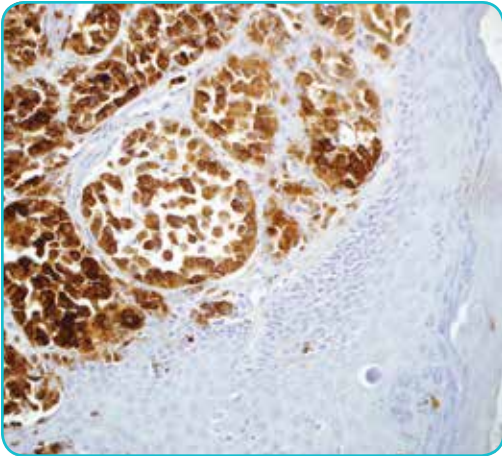
Metastatic melanoma



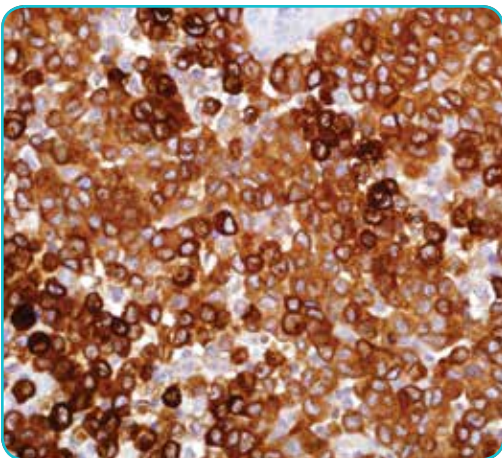
# MART-1 + Tyrosinase



Melanoma



Melanoma



Melanoma

MART-1 (also known as Melan A) is a melanocyte differentiation antigen. It is present in melanocytes of normal skin, retina, nevi and in the majority of melanomas. Tyrosinase is an enzyme integral in the process of melanin synthesis, and found in most malignant melanomas. Therefore, this cocktail is useful for the identification of melanomas and melanocytic lesions.<sup>1-7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** normal skin, melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** M2-7C10: IgG<sub>2b</sub>/k + T311: IgG<sub>2a</sub>

## Associated Specialties

Dermatopathology

## Reference

1. Orchard G. Evaluation of melanocytic neoplasms: application of a pan-melanoma antibody cocktail. *Br J Biomed Sci.* 2002; 59:196-202.
2. Prasad ML, et al. Expression of melanocytic differentiation markers in malignant melanomas of the oral and sinonasal mucosa. *Am J Surg Pathol.* 2001; 25:782-7.
3. de Vries TJ, et al. Expression of gp100, MART-1, tyrosinase, and S100 in paraffin-embedded primary melanomas and locoregional, lymph node, and visceral metastases: implications for diagnosis and immunotherapy. A study conducted by the EORTC Melanoma Cooperative Group. *J Pathol.* 2001; 193:13-20.
4. Yaziji H, et al. Immunohistochemical markers of melanocytic tumors. In *J Surg Pathol.* 2003; 11:11-5.
5. Shidham VB, et al. Improved immunohistochemical evaluation of micrometastases in sentinel lymph nodes of cutaneous melanoma with 'MCW melanoma cocktail'--a mixture of monoclonal antibodies to MART-1, Melan-A, and tyrosinase. *BMC Cancer.* 2003; 3:15.
6. Hoang MP, et al. Recurrent melanocytic nevus: a histologic and immunohistochemical evaluation. *J Cutan Pathol.* 2001; 28:400-6.
7. Ordóñez NG. Value of melanocytic-associated immunohistochemical markers in the diagnosis of malignant melanoma: a review and update. *Hum Pathol.* 2014; 45:191-205.

## Ordering Information

### MART-1 (M2-7C10) + Tyrosinase (T311)

Mouse Monoclonal Antibody

Volume	Part No.
1 mL predilute	903H-07
7 mL predilute	903H-08

*Please contact your distributor for details on product availability and regulatory status in your country.*

# MCM3

MCM3, minichromosome maintenance protein 3, belongs to the MCM family of highly conserved group of DNA-binding proteins known to have a role in the initiation and regulation of DNA replication during the cell cycle.<sup>1-7</sup> MCM3 expression is up-regulated in proliferating cells and absent in terminally differentiated cells. Like Ki-67, MCM3 marks proliferating cells. MCM3 stains proliferating cells like Ki-67, and in addition marks cells present in the intermediate layer of epithelium (which are typically negative for Ki-67). Both Ki-67 and MCM3 are not detectable in differentiated cells.<sup>6</sup> However, unlike Ki-67, MCM3 protein down-regulation is delayed. This suggests that Ki-67 may be expressed during a shorter interval of the cell cycle than MCM3. Anti-MCM3 may be a more reliable proliferation marker than anti-Ki-67.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology  
Head/Neck Pathology

## Associated Grids

Grid	Page No.
Cervix	302
Bladder Urothelium: Dysplasia vs. Reactive Changes	308

## Reference

1. Lee YS, et al. Minichromosome maintenance protein 3 is a candidate proliferation marker in papillary thyroid carcinoma. *Experimental and Molecular Pathology*. 2010; 88:138-42.
2. Gambichler T, et al. Minichromosome maintenance proteins are useful adjuncts to differentiate between benign and malignant melanocytic skin lesions. *J Am Acad Dermatol*. 2009; 60:808-13.
3. Musahl C, et al. Stability of the replicative Mcm3 protein in proliferating and differentiating human cells. *Experimental Cell Research*. 1998; 241:260-64.
4. Das M, et al. MCM paradox: abundance of eukaryotic replicative helicases and genomic integrity. *Hindawi Publishing Corporation*. 2014; 10:1-11.
5. Tye BK, et al. The hexameric eukaryotic MCM helicase: building symmetry from nonidentical parts. *The Journal of Biological Chemistry*. 2000; 275:34833-6.
6. Endl E, et al. The expression of Ki-67, MCM3, and p27 defines distinct subsets of proliferating, resting, and differentiated cells. *Journal of Pathology*. 2001; 195:457-62.
7. Lei M, et al. Initiating DNA synthesis: from recruiting to activating the MCM complex. *Journal of Cell Science*. 2001; 114:1447-54.

## Ordering Information

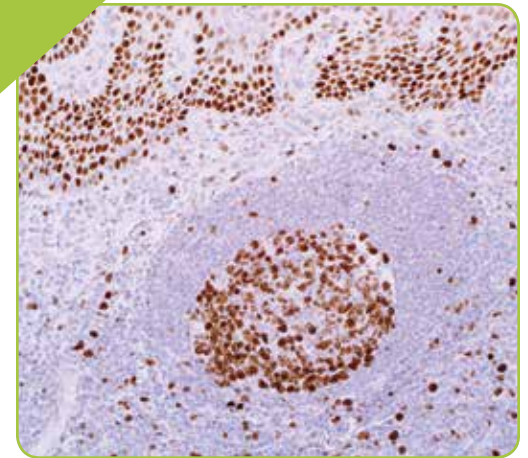
### MCM3 (EP202)

Rabbit Monoclonal  
Primary Antibody

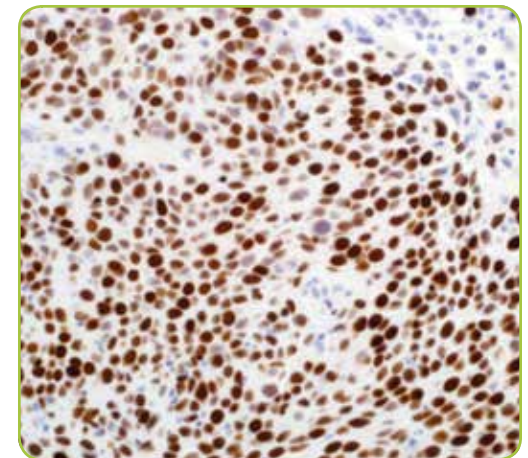


Volume	Part No.
0.1 mL concentrate	435R-14
0.5 mL concentrate	435R-15
1 mL concentrate	435R-16
1 mL predilute	435R-17
7 mL predilute	435R-18

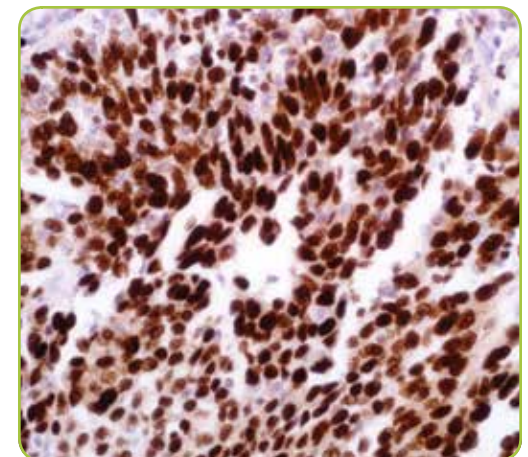
Please contact your distributor for details on product availability and regulatory status in your country.



Tonsil

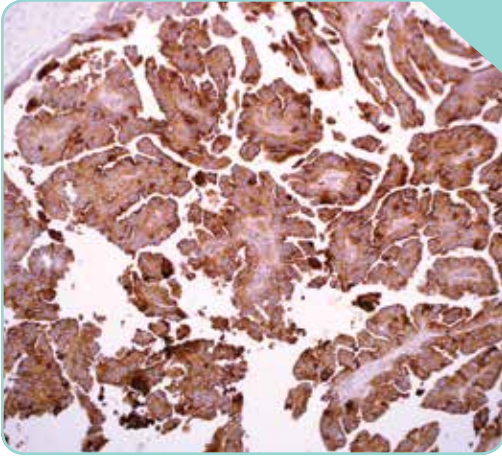


Squamous cell carcinoma

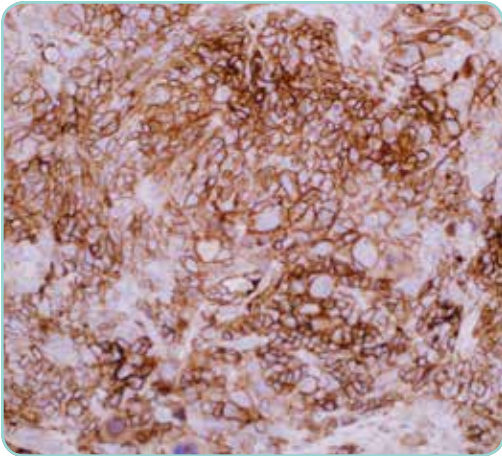


Squamous cell carcinoma

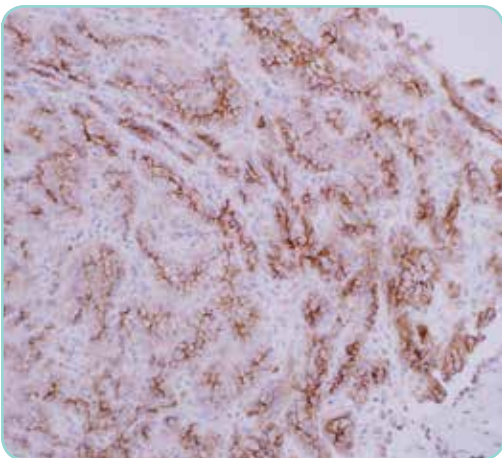
# Mesothelin



Mesothelioma



Mesothelioma



Mesothelioma

Mesothelin is a 40-kD glycosyl-phosphatidylinositol-anchored glycoprotein cleaved from a 71kDa precursor protein encoded by the human mesothelin gene. Mesothelin is present on the surface of normal mesothelial cells.<sup>1</sup> Although the function of mesothelin is unknown, it is overexpressed in a wide variety of cancers including mesothelioma, pancreatic ductal adenocarcinoma, and ovarian carcinoma.<sup>1-6</sup> Mesothelin has proven to be a valuable marker for pancreatic ductal adenocarcinoma due to its strong reactivity in tumor tissue and absence in normal pancreas.<sup>1,3-4</sup> Metastatic renal cell carcinoma can present clinical patterns that mimic primary mesothelioma, pancreatic ductal adenocarcinoma, and ovarian carcinoma.<sup>2,4-6</sup> Mesothelin has demonstrated utility in the differential diagnosis between these primary tumors and corresponding metastatic renal cell carcinoma within the context of an antibody panel.<sup>4-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** mesothelioma, ovarian carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Cytopathology

Pulmonary Pathology

## Reference

1. Hassan R, et al. Mesothelin targeted cancer immunotherapy. *Eur J Cancer*. 2008; 44:46-53
2. Ordóñez NG. Value of mesothelin immunostaining in the diagnosis of mesothelioma. *Mod Pathol*. 2003; 16:192-7.
3. Hassan R, et al. Mesothelin is overexpressed in pancreaticobiliary adenocarcinomas but not in normal pancreas and chronic pancreatitis. *Am J Clin Pathol*. 2005; 124:838-45.
4. Gnemmi V, et al. Pancreatic metastases of renal clear cell carcinoma: a clinicopathological study of 11 cases with special emphasis on the usefulness of PAX2 and mesothelin for the distinction from primary ductal adenocarcinoma of the pancreas. *Anal Quant Cytopathol Histopathol*. 2013; 35:157-62.
5. Ordóñez NG. The diagnostic utility of immunohistochemistry in distinguishing between mesothelioma and renal cell carcinoma: a comparative study. *Hum Pathol*. 2004; 35:697-710.
6. Leroy X, et al. Diagnostic value of cytokeratin 7, CD10 and mesothelin in distinguishing ovarian clear cell carcinoma from metastasis of renal clear cell carcinoma. *Histopathology*. 2007; 51:874-6.

## Ordering Information

**Mesothelin (EP140)**

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	439R-14
0.5 mL concentrate	439R-15
1 mL concentrate	439R-16
1 mL predilute	439R-17
7 mL predilute	439R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Microphthalmia Transcription Factor (MiTF)

MiTF is a transcription factor implicated in pigmentation, bone development and in mast cells. Various forms of MiTF exist ranging from 50-70-kD in size. This antibody targets the 52-56-kD range. This antibody has been useful in identifying malignant melanoma.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** C5: IgG<sub>1</sub> & D5: IgG<sub>1</sub>

## Synonyms and Abbreviations

MiTF

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Melanotic Lesions	305

## Reference

1. Liegl B, et al. Primary cutaneous PEComa: distinctive clear cell lesions of skin. *Am J Surg Pathol.* 2008; 32:608-14.
2. Righi A, et al. PEComa: another member of the MiT tumor family? *Int J Surg Pathol.* 2008; 16:16-20.
3. Weinreb I, et al. Perivascular epithelioid cell neoplasms (PEComas): four malignant cases expanding the histopathological spectrum and a description of a unique finding. *Virchows Arch.* 2007; 450:463-70.
4. Ohsie SJ, et al. Immunohistochemical characteristics of melanoma. *J Cutan Pathol.* 2008; 35:433-44.
5. Hornick JL, et al. Sclerosing PEComa: clinicopathologic analysis of a distinctive variant with a predilection for the retroperitoneum. *Am J Surg Pathol.* 2008; 32:493-501.

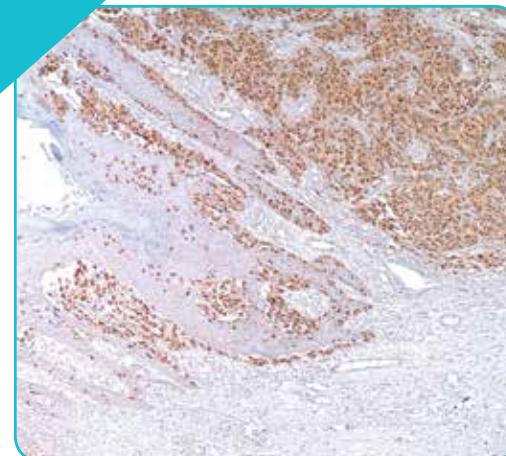
## Ordering Information

### Microphthalmia Transcription Factor (MiTF) (C5/D5)

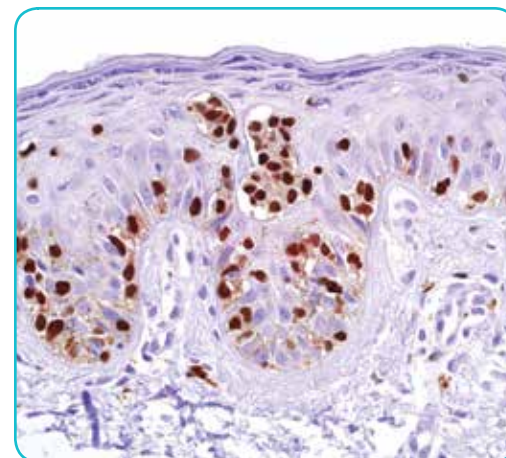
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	284M-94
0.5 mL concentrate	284M-95
1 mL concentrate	284M-96
1 mL predilute	284M-97
7 mL predilute	284M-98
25 mL predilute	284M-90

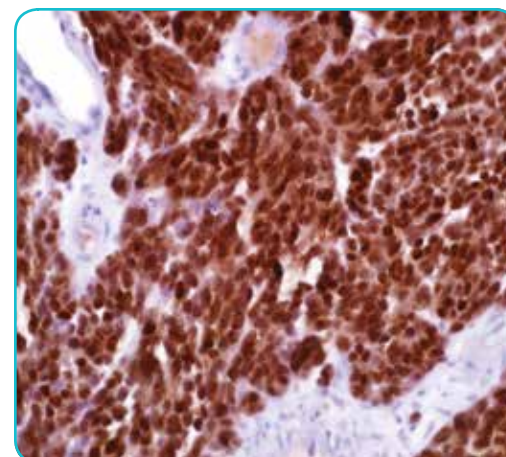
*Please contact your distributor for details on product availability and regulatory status in your country.*



Melanoma

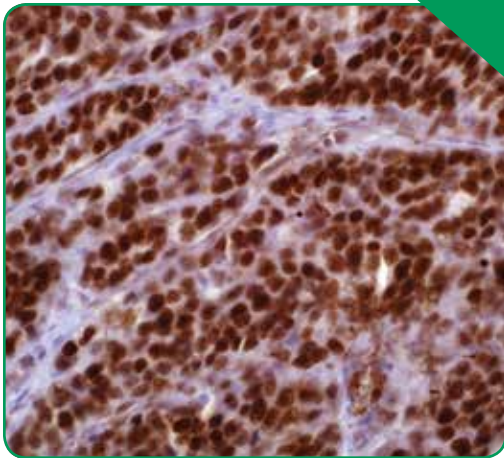


Melanoma

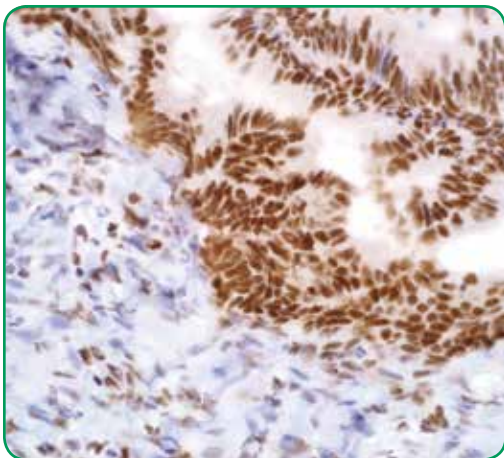


Melanoma

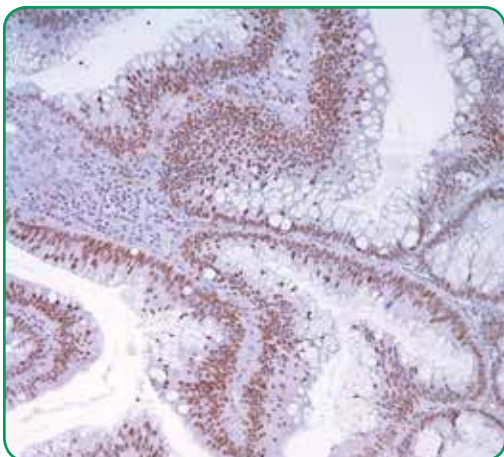
# MLH1



Colorectal carcinoma



Colorectal carcinoma



Colon tubular adenoma

MLH1 is a mismatch repair protein that is deficient in a high proportion of patients with microsatellite instability (MSI-H). It has been suggested that the deficiencies in DNA mismatch repair protein(s) can be seen in some malignancies such as hereditary nonpolyposis colorectal cancer (HNPCC) and endometrial cancer. Anti-MLH1 may be useful in the identification of the MLH1 protein in a variety of normal and neoplastic tissues and the identification of loss of MLH1 in tumors with MSI genotype.<sup>1-8</sup> Anti-MLH1 is best utilized in an IHC panel that includes anti-MSH6, anti-MSH2, and anti-PMS2.

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** colon, colorectal adenocarcinoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Gastrointestinal (GI) Pathology

## Reference

1. Wright CL, et al. Histopathology and mismatch repair status of 458 consecutive colorectal carcinomas. *Am J Surg Pathol.* 2003; 27:1393-406.
2. Brueckl WM, et al. Relationship between microsatellite instability, response and survival in palliative patients with colorectal cancer undergoing first-line chemotherapy. *Anticancer Res.* 2003; 23:1773-8.
3. Rigau V, et al. Microsatellite instability in colorectal carcinoma. The comparison of immunohistochemistry and molecular biology suggests a role for hMSH6 [correction of hMLH6] immunostaining. *Arch Pathol Lab Med.* 2003; 127: 694-700.
4. Renkonen E, et al. Altered expression of MLH1, MSH2, and MSH6 in predisposition to hereditary nonpolyposis colorectal cancer. *J Clin Oncol.* 2003; 21:3629-37.
5. Hoedema R, et al. Genetic testing for hereditary nonpolyposis colorectal cancer. *Am Surg.* 2003; 5:387-91.
6. Christensen M, et al. Antibody-based screening for hereditary nonpolyposis colorectal carcinoma compared with microsatellite analysis and sequencing. *Cancer.* 2002; 95:2422-30.
7. Wahlberg SS, et al. Evaluation of microsatellite instability and immunohistochemistry for the prediction of germ-line MSH2 and MLH1 mutations in hereditary nonpolyposis colon cancer families. *Cancer Res.* 2002; 62:3485-92.
8. Lanza G, et al. Immunohistochemical pattern of MLH1/MSH2 expression is related to clinical and pathological features in colorectal adenocarcinomas with microsatellite instability. *Mod Pathol.* 2002; 15:741-9.

## Ordering Information

**MLH1 (G168-728)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	285M-14
0.5 mL concentrate	285M-15
1 mL concentrate	285M-16
1 mL predilute	285M-17
7 mL predilute	285M-18
25 mL predilute	285M-10

*Please contact your distributor for details on product availability and regulatory status in your country.*

# MSH2

MSH2 is a mismatch repair protein which is deficient in a high proportion of patients with microsatellite instability (MSI-H). It has been suggested that the deficiencies in DNA mismatch repair protein(s) can be seen in some malignancies such as hereditary nonpolyposis colorectal cancer (HNPCC) and endometrial cancer. Anti-MSH2 may be useful in the identification of the the MSH2 protein in a variety of normal and neoplastic tissues and the identification of loss of MSH2 in tumors with MSI genotype.<sup>1-8</sup> Anti-MSH2 is best utilized in an IHC panel that includes anti-MLH1, anti-MSH6, and anti-PMS2.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon carcinoma, colon mucosa

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Gastrointestinal (GI) Pathology

## Reference

1. Wright CL, et al. Histopathology and mismatch repair status of 458 consecutive colorectal carcinomas. *Am J Surg Pathol.* 2003; 27:1393-406.
2. Brueckl WM, et al. Relationship between microsatellite instability, response and survival in palliative patients with colorectal cancer undergoing first-line chemotherapy. *Anticancer Res.* 2003; 23:1773-8.
3. Rigau V, et al. Microsatellite instability in colorectal carcinoma. The comparison of immunohistochemistry and molecular biology suggests a role for hMSH6 [correction of hMLH6] immunostaining. *Arch Pathol Lab Med.* 2003; 127: 694-700.
4. Renkonen E, et al. Altered expression of MLH1, MSH2, and MSH6 in predisposition to hereditary nonpolyposis colorectal cancer. *J Clin Oncol.* 2003; 21:3629-37.
5. Hoedema R, et al. Genetic testing for hereditary nonpolyposis colorectal cancer. *Am Surg.* 2003; 5:387-91.
6. Christensen M, et al. Antibody-based screening for hereditary nonpolyposis colorectal carcinoma compared with microsatellite analysis and sequencing. *Cancer.* 2002; 95:2422-30.
7. Wahlberg SS, et al. Evaluation of microsatellite instability and immunohistochemistry for the prediction of germ-line MSH2 and MLH1 mutations in hereditary nonpolyposis colon cancer families. *Cancer Res.* 2002; 62:3485-92.
8. Lanza G, et al. Immunohistochemical pattern of MLH1/MSH2 expression is related to clinical and pathological features in colorectal adenocarcinomas with microsatellite instability. *Mod Pathol.* 2002; 15:741-9.

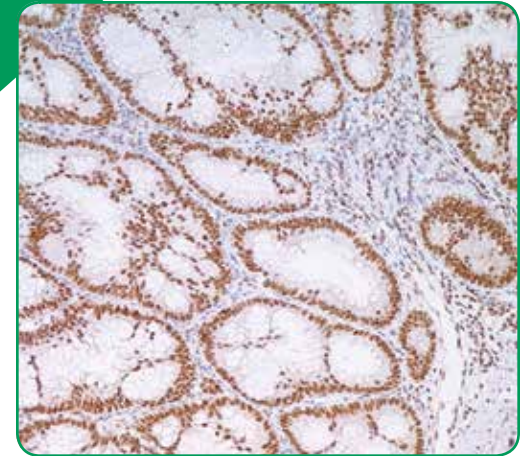
## Ordering Information

### MSH2 (G219-1129)

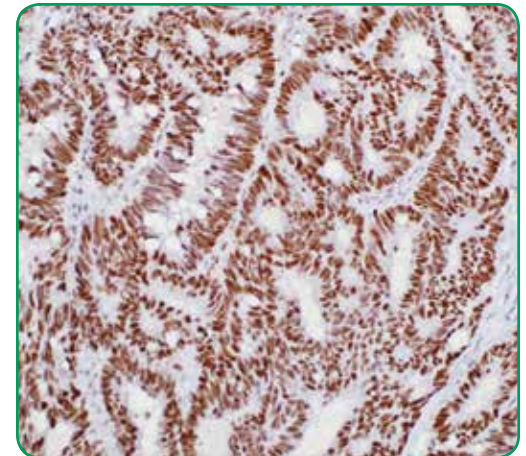
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	286M-14
0.5 mL concentrate	286M-15
1 mL concentrate	286M-16
1 mL predilute	286M-17
7 mL predilute	286M-18
25 mL predilute	286M-10

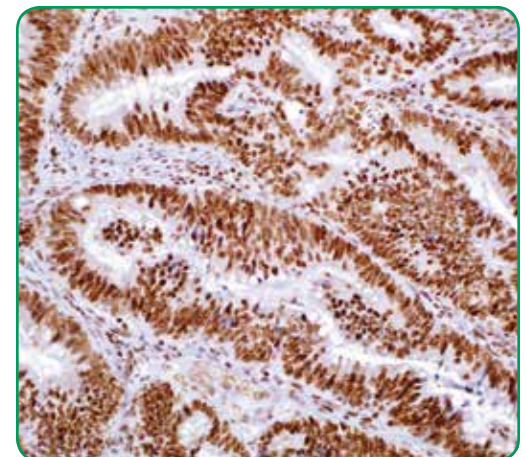
*Please contact your distributor for details on product availability and regulatory status in your country.*



Well differentiated colorectal carcinoma

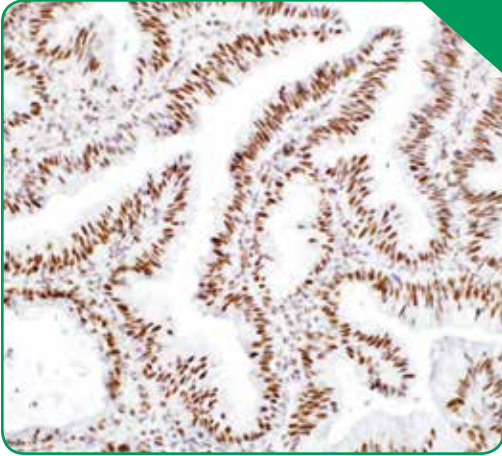


Colorectal carcinoma

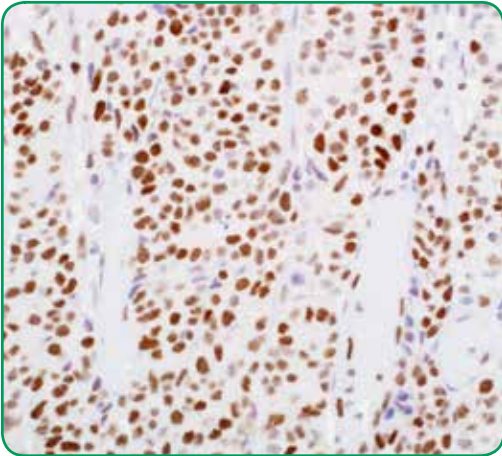


Colorectal carcinoma

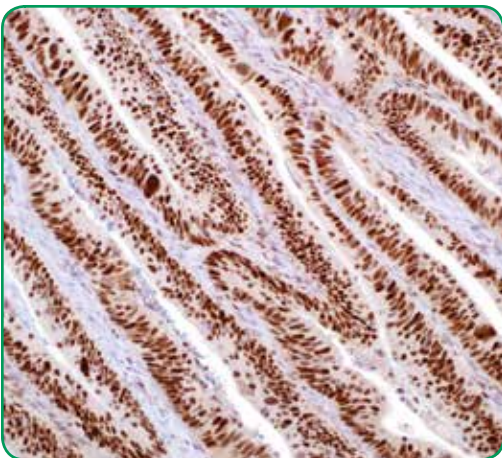
# MSH6



Colon adenoma



Poorly differentiated colorectal carcinoma



Colorectal carcinoma

MSH6 is a mismatch repair protein which is deficient in a high proportion of patients with microsatellite instability (MSI-H). It has been suggested that the deficiencies in DNA mismatch repair protein(s) can be seen in some malignancies such as hereditary nonpolyposis colorectal cancer (HNPCC) and endometrial cancer. Anti-MSH6 may be useful in the identification of the MSH6 protein in a variety of normal and neoplastic tissues and the identification of loss of MSH6 in tumors with MSI genotype.<sup>1-6</sup> Anti-MSH6 is best utilized in an IHC panel that includes anti-MLH1, anti-MSH2, and anti-PMS2.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon, colon carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 44: IgG<sub>1</sub>
- SP93: IgG

## Associated Specialties

Gastrointestinal (GI) Pathology

## Reference

1. Lagerstedt Robinson K, et al. Lynch syndrome (hereditary nonpolyposis colorectal cancer) diagnostics. *J Natl Cancer Inst.* 2007; 99:291-9.
2. Niessen RC, et al. Identification of mismatch repair gene mutations in young patients with colorectal cancer and in patients with multiple tumours associated with hereditary non-polyposis colorectal cancer. *Gut.* 2006; 55:1781-8.
3. Hansen TP, et al. Optimization of antibodies for detection of the mismatch repair proteins MLH1, MSH2, MSH6, and PMS2 using a biotin-free visualization system. *Appl Immunohistochem Mol Morphol.* 2006; 14:115-21.
4. Lawes DA, et al. The role of MLH1, MSH2 and MSH6 in the development of multiple colorectal cancers. *Br J Cancer.* 2005; 93:472-7.
5. Stormorken AT, et al. Immunohistochemistry identifies carriers of mismatch repair gene defects causing hereditary nonpolyposis colorectal cancer. *J Clin Oncol.* 2005; 23:4705-12.
6. Rigau V, et al. Microsatellite instability in colorectal carcinoma. The comparison of immunohistochemistry and molecular biology suggests a role for hMSH6 [correction of hMLH6] immunostaining. *Arch Pathol Lab Med.* 2003; 127:694-700.

## Ordering Information

### MSH6 (44)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	287M-14
0.5 mL concentrate	287M-15
1 mL concentrate	287M-16
1 mL predilute	287M-17
7 mL predilute	287M-18
25 mL predilute	287M-10

### MSH6 (SP93)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	287R-24
0.5 mL concentrate	287R-25
1 mL concentrate	287R-26
1 mL predilute	287R-27
7 mL predilute	287R-28

*Please contact your distributor for details on product availability and regulatory status in your country.*

# MUC1

Mucins are high molecular weight glycoproteins which constitute the major component of the mucus layer that protects the gastric epithelium from chemical and mechanical injury. In humans, at least 14 mucin genes have been identified that code for the mucin proteins. Mucin genes are expressed in a regulated cell- and tissue-specific manner. The stomach provides a good example of such differential expression of mucin genes. MUC1 is detected in mucous cells of the surface epithelium and neck region of the gastric antrum, as well as in pyloric glands and oxyntic glands of the body region. The heterogeneous pattern of mucin expression, including the expression of the intestinal mucin MUC2, may provide new insights into the differentiation pathways of gastric carcinoma.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast, colon, associated adenocarcinomas

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP85: IgG
- MRQ-17: IgG<sub>1</sub>

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Mucin Expression in Neoplasms	298
Mucins Expression in Organs	298
Thymus	301
Ampullary Carcinomas	307

## Reference

1. Chaves P, et al. Gastric and intestinal differentiation in Barrett's metaplasia and associated adenocarcinoma. *Dis Esophagus*. 2005; 18:383-7.
2. Leteurtre E, et al. Relationships between mucinous gastric carcinoma, MUC2 expression and survival. *World J Gastroenterol*. 2006; 12:3324-31.
3. Mino-Kenudson M, et al. Mucin expression in reactive gastropathy: an immunohistochemical analysis. *Arch Pathol Lab Med*. 2007; 131:86-90.
4. Mizoshita T, et al. Loss of MUC2 expression correlates with progression along the adenoma-carcinoma sequence pathway as well as de novo carcinogenesis in the colon. *Histol Histopathol*. 2007; 22:251-60.
5. O'Connell FP, et al. Utility of immunohistochemistry in distinguishing primary adenocarcinomas from metastatic breast carcinomas in the gastrointestinal tract. *Arch Pathol Lab Med*. 2005; 129:338-47.

## Ordering Information

### MUC1 (EP85)

Rabbit Monoclonal  
Primary Antibody



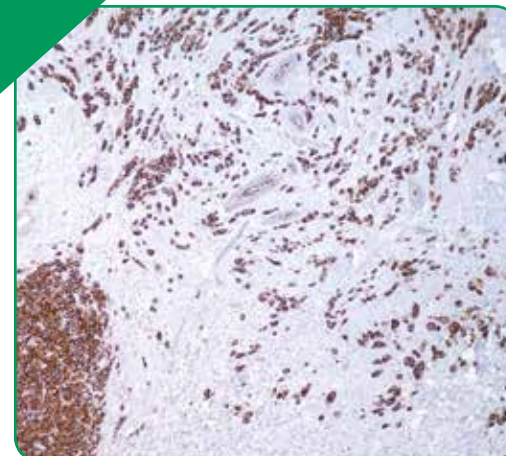
Volume	Part No.
0.1 mL concentrate	290R-14
0.5 mL concentrate	290R-15
1 mL concentrate	290R-16
1 mL predilute	290R-17
7 mL predilute	290R-18

### MUC1 (MRQ-17)

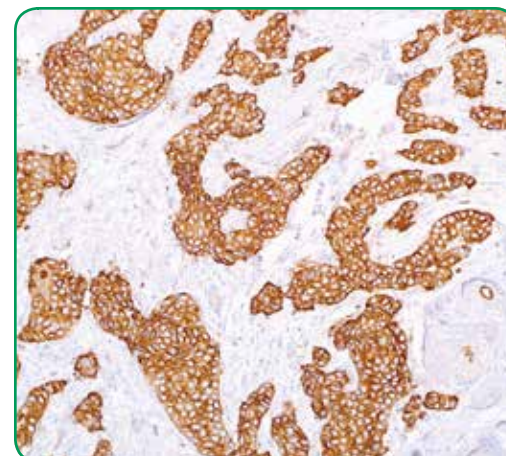
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	290M-14
0.5 mL concentrate	290M-15
1 mL concentrate	290M-16
1 mL predilute	290M-17
7 mL predilute	290M-18

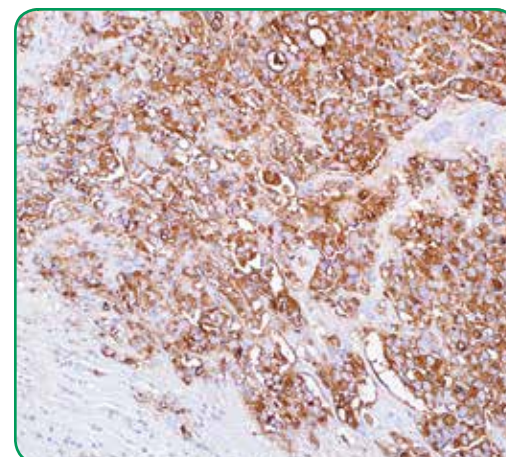
Please contact your distributor for details on product availability and regulatory status in your country.



Breast carcinoma



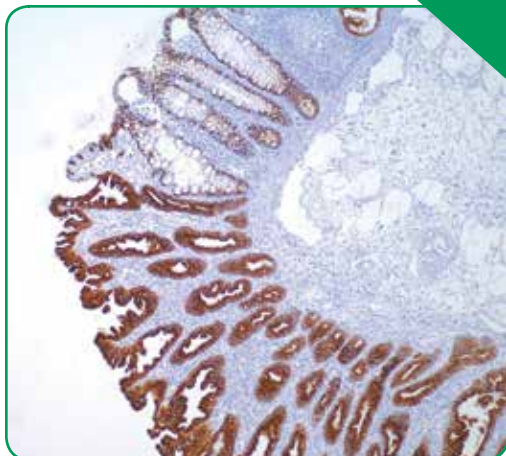
Breast, invasive ductal carcinoma



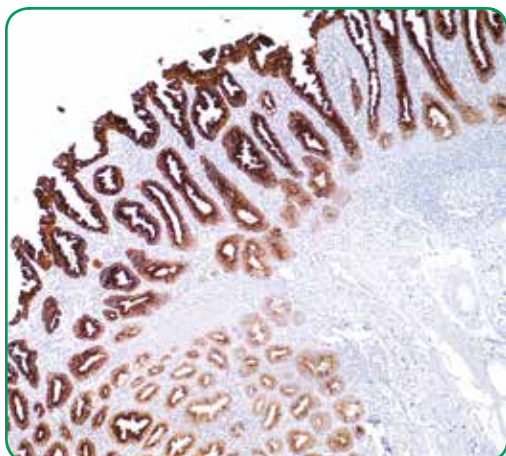
Pancreatic ductal adenocarcinoma



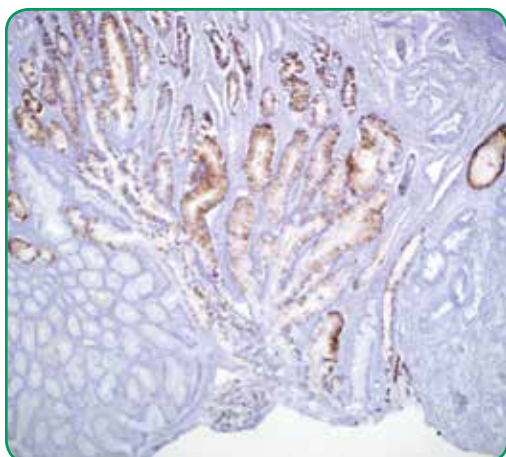
# MUC2



Colon mucosa, hyperplastic polyp



Colon mucosa



Gastric mucosa, intestinal metaplasia

Mucins are high molecular weight glycoproteins which constitute the major component of the mucus layer that protects the gastric epithelium from chemical and mechanical injury.<sup>1</sup> In humans, at least 14 mucin genes have been identified that code for the mucin proteins. Reportedly, mucin expression is associated with tumor type of gastric carcinomas, with MUC2 being associated with mucinous carcinomas.<sup>2-4</sup> Anti-MUC2 reactivity is seen in goblet cells of the small intestine and colon, and it is useful in immunohistochemistry for identifying colonic, gastric and esophageal carcinomas.<sup>5-7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** colon

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Mucin Expression in Neoplasms	298
Mucins Expression in Organs	298
Ampullary Carcinomas	307

## Reference

1. Chaves P, et al. Gastric and intestinal differentiation in Barrett's metaplasia and associated adenocarcinoma. *Dis Esophagus*. 2005; 18:383-7.
2. Leteurtre E, et al. Relationships between mucinous gastric carcinoma, MUC2 expression and survival. *World J Gastroenterol*. 2006; 12:3324-31.
3. Mino-Kenudson M, et al. Mucin expression in reactive gastropathy: an immunohistochemical analysis. *Arch Pathol Lab Med*. 2007; 131:86-90.
4. Mizoshita T, et al. Loss of MUC2 expression correlates with progression along the adenoma-carcinoma sequence pathway as well as de novo carcinogenesis in the colon. *Histol Histopathol*. 2007; 22:251-60.
5. O'Connell FP, et al. Utility of immunohistochemistry in distinguishing primary adenocarcinomas from metastatic breast carcinomas in the gastrointestinal tract. *Arch Pathol Lab Med*. 2005; 129:338-47.
6. Park SY, et al. Panels of immunohistochemical markers help determine primary sites of metastatic adenocarcinoma. *Arch Pathol Lab Med*. 2007; 131:1561-7.
7. Rakha EA, et al. Expression of mucins (MUC1, MUC2, MUC3, MUC4, MUC5AC and MUC6) and their prognostic significance in human breast cancer. *Mod Pathol*. 2005; 18:1295-304.

## Ordering Information

### MUC2 (MRQ-18)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	291M-14
0.5 mL concentrate	291M-15
1 mL concentrate	291M-16
1 mL predilute	291M-17
7 mL predilute	291M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# MUC4

MUC4 (mucin 4) is a large membrane-anchored glycoprotein of the mucin family that is expressed by epithelial cells in various normal tissues including lung, bronchus, stomach, colon, and cervix.<sup>1</sup> MUC4 is generally not detected in normal pancreas, but is expressed in the vast majority of pancreatic neoplasms, such as pancreatic ductal adenocarcinoma.<sup>2</sup> Additionally, expression in various neoplasms has been described, including adenocarcinomas from stomach, colon, lung, and low-grade fibromyxoid sarcoma.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pancreatic ductal adenocarcinoma, colon, colorectal adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Gastrointestinal (GI) Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Mucins Expression in Organs	298
Pancreatic Epithelial Tissues and Tumors	308
Solitary Fibrous Tumor vs. Other Soft Tissue Tumors	323

## Reference

1. Moniaux N, et al. Generation and characterization of anti-MUC4 monoclonal antibodies reactive with normal and cancer cells in humans. *J Histochem Cytochem.* 2004; 52:253-61.
2. Moniaux N, et al. Multiple roles of mucins in pancreatic cancer, a lethal and challenging malignancy. *Br J Cancer.* 2004; 91:1633-8.
3. Linares K, et al. Diagnostic value of MUC4 immunostaining in distinguishing epithelial mesothelioma and lung adenocarcinoma. *Mod Pathol.* 2004; 17:150-7.

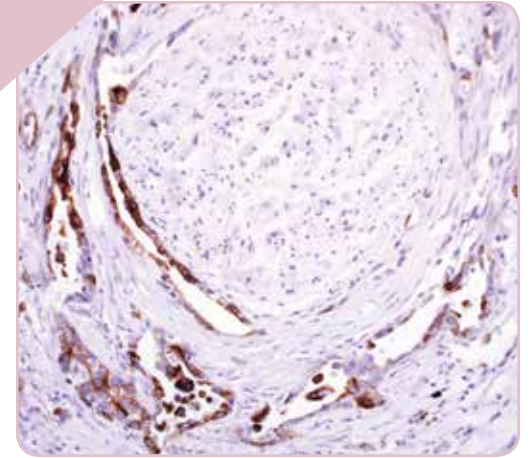
## Ordering Information

### MUC4 (8G7)

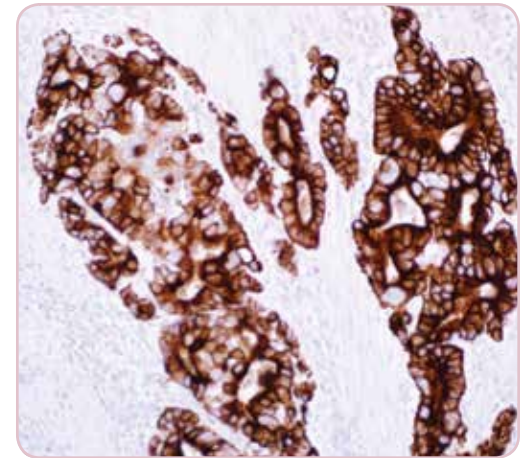
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	406M-15
1 mL concentrate	406M-16
1 mL predilute	406M-17
7 mL predilute	406M-18

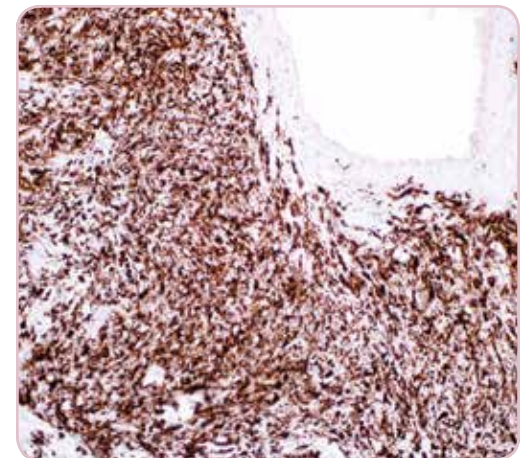
*Please contact your distributor for details on product availability and regulatory status in your country.*



Infiltrating gastric adenocarcinoma surrounding the nerve

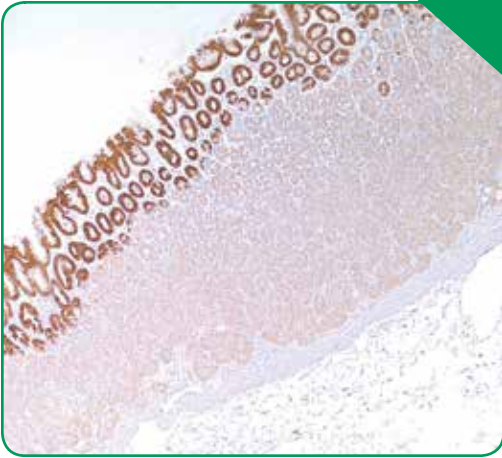


Gastric adenocarcinoma

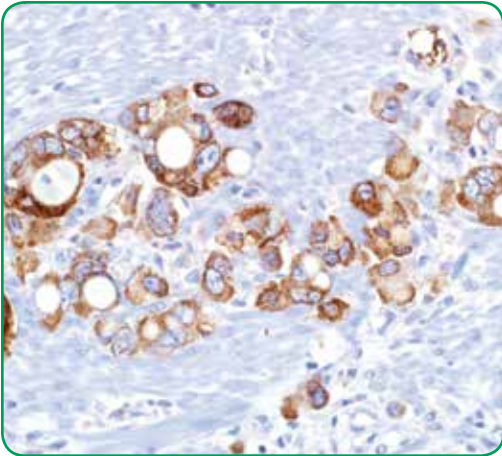


Low-grade fibromyxoid sarcoma

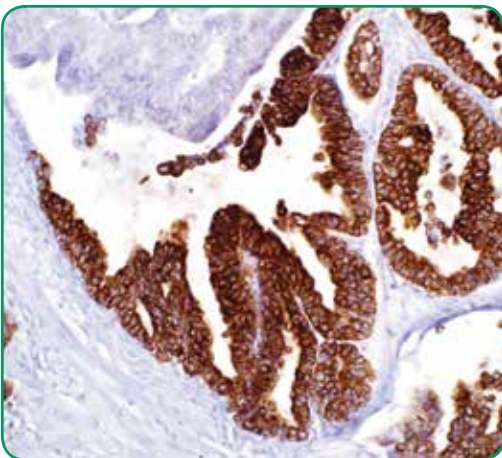
# MUC5AC



Gastric mucosa



Gastric carcinoma



Gastric carcinoma

MUC5AC is a secretory mucin that is part of a family of at least 14 high molecular weight glycoproteins made by many epithelial tissues.<sup>1</sup> MUC5AC is preferentially expressed in non-neoplastic gastric tissue and benign respiratory tract tissue.<sup>1</sup> During neoplastic transformation, mucin expression may be altered within these tissues leading to particular patterns of expression.<sup>1</sup> Cytoplasmic expression of MUC5AC can be seen in carcinomas of the gastrointestinal tract, particularly those of esophagus and stomach, as well as the pancreatobiliary tract including cholangiocarcinomas.<sup>1</sup> Other tumors expressing MUC5AC include carcinomas of the endocervix endometrium and lung.<sup>1</sup> MUC5AC immunoreactivity may also be seen in extramammary Paget's disease but it is not expressed in mammary paget's disease.<sup>2</sup> Use of a panel of mucins including MUC1/MUC2/MUC5AC may be helpful with differential diagnosis in particular neoplastic settings.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** stomach

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Mucin Expression in Neoplasms	298
Mucins Expression in Organs	298

## Reference

1. Lau SK, et al. Differential expression of MUC1, MUC2, and MUC5AC in carcinomas of various sites: an immunohistochemical study. *Am J Clin Pathol.* 2004; 122:61-9.
2. Kuan S, et al. Differential Expression of Mucin Genes in Mammary and Extramammary Paget's Disease. *Am J Surg Pathol.* 2001; 25:1469-77.

## Ordering Information

### MUC5AC (MRQ-19)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	292M-94
0.5 mL concentrate	292M-95
1 mL concentrate	292M-96
1 mL predilute	292M-97
7 mL predilute	292M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# MUC6

MUC6 is a secretory mucin that is part of a family of at least 14 high molecular weight glycoproteins made by many epithelial tissues.<sup>1</sup> MUC6 is preferentially expressed in non-neoplastic gastric tissue, specifically in the pyloric glands.<sup>1,2</sup> During neoplastic transformation, mucin expression may be altered within these tissues leading to particular patterns of expression.<sup>2-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** stomach

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Mucin Expression in Neoplasms	298
Mucins Expression in Organs	298

## Reference

1. Rakha EA, et al. Expression of mucins (MUC1, MUC2, MUC3, MUC4, MUC5AC and MUC6) and their prognostic significance in human breast cancer. *Mod Pathol.* 2005; 18:1295-304.
2. Do SI, et al. Associations between the Expression of Mucins (MUC1, MUC2, MUC5AC, and MUC6) and Clinicopathologic Parameters of Human Breast Ductal Carcinomas. *J of Breast Cancer.* 2013; 16:152-8.
3. Mino-Kenudson M, et al. Mucin expression in Betge J. et al. MUC1, MUC2, MUC5AC and MUC6 in colorectal cancer: expression profiles and clinical significance. *Virchows Arch.* 2016; 469:255-65.

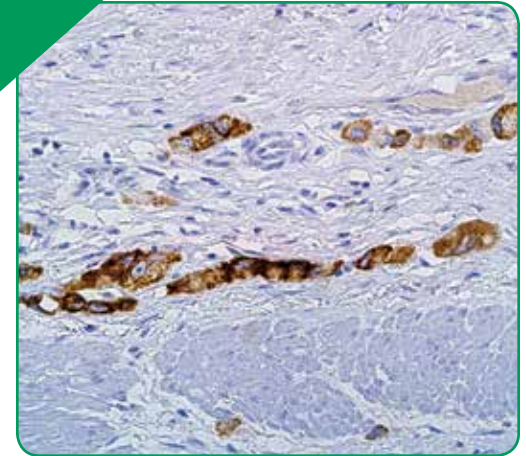
## Ordering Information

### MUC6 (MRQ-20)

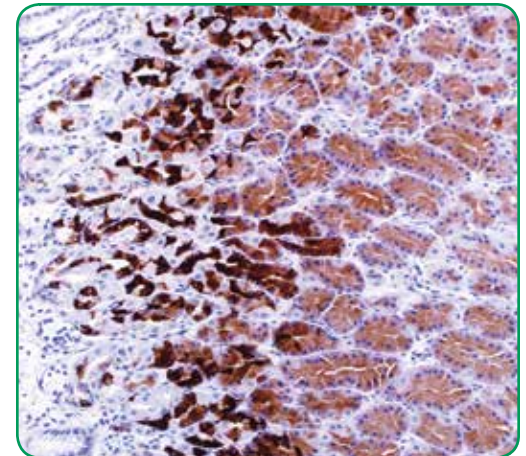
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	293M-94
0.5 mL concentrate	293M-95
1 mL concentrate	293M-96
1 mL predilute	293M-97
7 mL predilute	293M-98

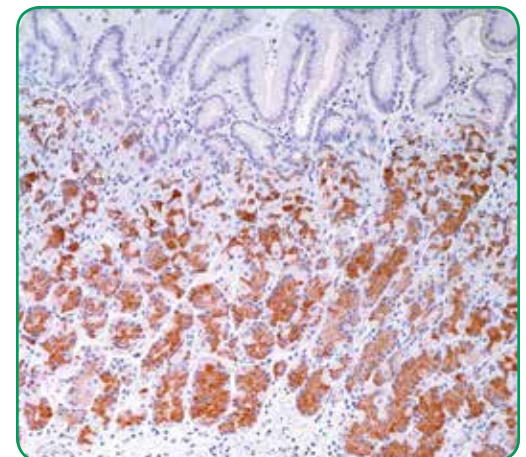
*Please contact your distributor for details on product availability and regulatory status in your country.*



Infiltrating gastric carcinoma

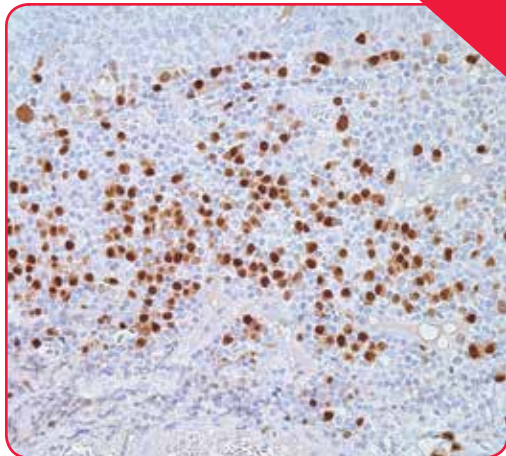


Gastric mucosa

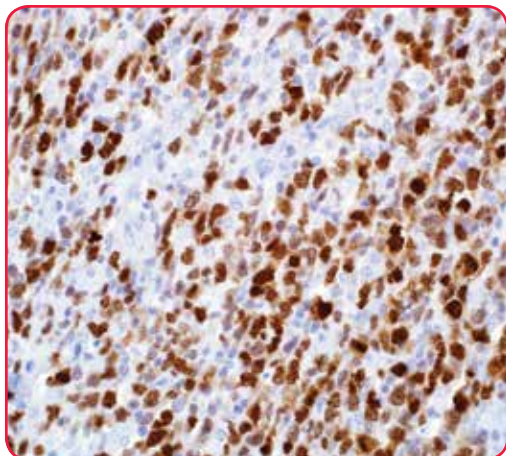


Gastric mucosa

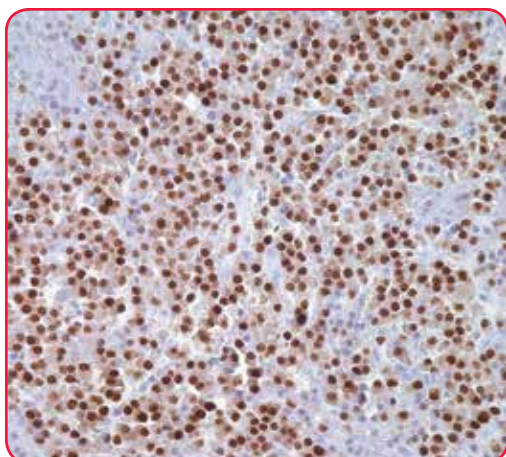
# MUM1



Tonsil



Diffuse large B-cell lymphoma (DLBCL)



Myeloma

Anti-MUM1 antibody labels a 50-kD, multiple myeloma oncogen-1 (MUM1) protein. MUM1 is encoded by the MUM1/IRF-4 gene, which is mapped to 6q23-25 and identified as a myeloma-associated oncogene.<sup>1,2</sup> It is a member of the interferon regulatory factor family of transcription factors and plays an important role in the regulation of gene expression in response to signaling by interferon and other cytokines. MUM1 positive cells express the protein in the nucleus in a diffuse and microgranular pattern. However, some positivity is also observed in the cytoplasm of MUM1-expressing cells. In normal/reactive lymphoid tissues, such as lymph node, this antibody stains plasma cells, some B-cells in the light zone of germinal centers, and a subset of T-cells (T-cells in germinal centers and interfollicular areas).<sup>1,2</sup> MUM1 expression has been described in diffuse large B-cell lymphoma (DLBCL).<sup>4</sup> Anti-MUM1 antibody can stain other B-cell lymphomas such as lymphoplasmacytic lymphoma, chronic lymphocytic leukemia, follicular lymphoma, marginal zone lymphoma, lymphoblastic lymphoma/leukemia, primary effusion lymphoma, DLBCL, Burkitt-like lymphoma, and classical Hodgkin lymphoma.<sup>3-5</sup> However, the tumor cells in nodular lymphocyte predominant Hodgkin lymphoma are negative or only weakly positive.<sup>6</sup> MUM1 is also expressed in plasma cell myeloma.<sup>7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** tonsil, plasma cell tumor, diffuse large B-cell lymphoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP190: IgG
- MRQ-8: IgG<sub>1</sub>/k
- MRQ-43: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
B-cell Lymphomas	311
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314
Hodgkin vs. Non-Hodgkin Lymphomas	314
Mature B-cell Neoplasms with Reduced CD20 Expression	316
Plasma Cell Neoplasm and Lymphoproliferative Neoplasms	316

## Reference

1. Falini B, et al. Blood. 2000; 95:2084-92.
2. Grossman A, et al. Genomics. 1996; 37:229-33.
3. Nereshe KN. Haematologica. 2007; 92:267-8.

For the complete list of references see the product IFU.

## Ordering Information

### MUM1 (EP190)

Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	358R-14
0.5 mL concentrate	358R-15
1 mL concentrate	358R-16
1 mL predilute	358R-17
7 mL predilute	358R-18

### MUM1 (MRQ-8)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	358M-14
0.5 mL concentrate	358M-15
1 mL concentrate	358M-16
1 mL predilute	358M-17
7 mL predilute	358M-18

### MUM1 (MRQ-43)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	358R-74
0.5 mL concentrate	358R-75
1 mL concentrate	358R-76
1 mL predilute	358R-77
7 mL predilute	358R-78

Please contact your distributor for details on product availability and regulatory status in your country.

# Myeloperoxidase

Myeloperoxidase is found in primary granules of cells of myeloid lineage (e.g. granulocytes); neutrophils in particular, demonstrate a strong-diffuse granular staining pattern.<sup>1</sup> Anti-myeloperoxidase may be useful in the diagnosis of myeloid leukemias and granulocytic sarcoma (a.k.a. myeloid sarcoma, chloroma).<sup>2-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** bone marrow

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP151: IgG
- SP72: IgG<sub>1</sub>

## Synonyms and Abbreviations

MPO

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Hematopoietic Neoplasms and Anaplastic Large Cell Lymphoma	313
Histiocytic Lesions	313
Leukemia	314
Splenic Hematopoietic Proliferations in Neoplastic and Benign Disorders	317

## Reference

1. Pinkus GS, et al. Myeloperoxidase: a specific marker for myeloid cells in paraffin sections. *Mod Pathol.* 1991; 4:733-41.
2. Markoc F, et al. Granulocytic sarcomas: difficulties in diagnosis. *Tumori.* 2010; 96:149-53.
3. Alexiev BA, et al. Myeloid sarcomas: a histologic, immunohistochemical, and cytogenetic study. *Diagn Pathol.* 2007; 31:2:42.
4. Saravanan L, et al. Immunohistochemistry is a more sensitive marker for the detection of myeloperoxidase in acute myeloid leukemia compared with flow cytometry and cytochemistry. *Int J Lab Hematol.* 2010; 32:132-6.
5. Manaloor EJ, et al. Immunohistochemistry can be used to subtype acute myeloid leukemia in routinely processed bone marrow biopsy specimens. Comparison with flow cytometry. *Am J Clin Pathol.* 2000; 113:814-22.

## Ordering Information

### Myeloperoxidase (EP151)

Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	289R-24
0.5 mL concentrate	289R-25
1 mL concentrate	289R-26
1 mL predilute	289R-27
7 mL predilute	289R-28

### Myeloperoxidase

Rabbit Polyclonal Antibody

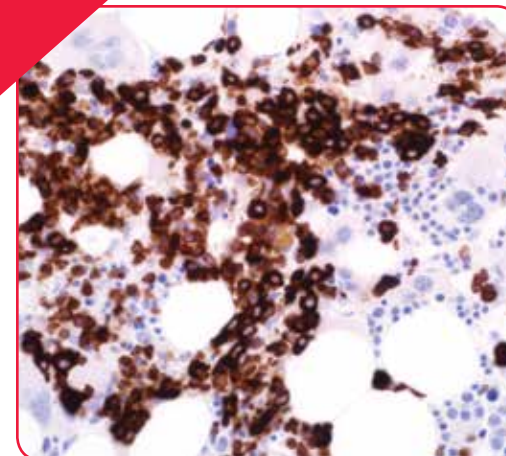
Volume	Part No.
0.1 mL concentrate	289A-74
0.5 mL concentrate	289A-75
1 mL concentrate	289A-76
1 mL predilute	289A-77
7 mL predilute	289A-78

### Myeloperoxidase (SP72)

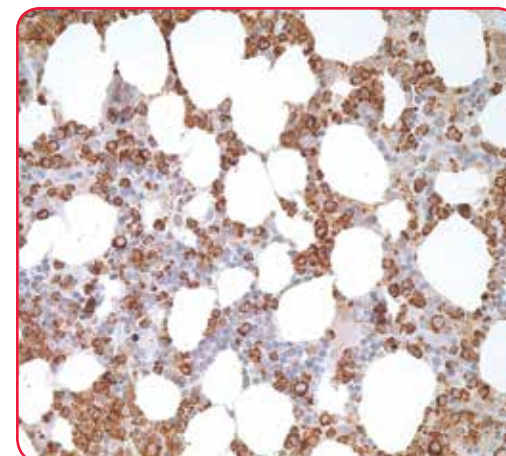
Rabbit Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	289R-15
1 mL concentrate	289R-16
1 mL predilute	289R-17
7 mL predilute	289R-18

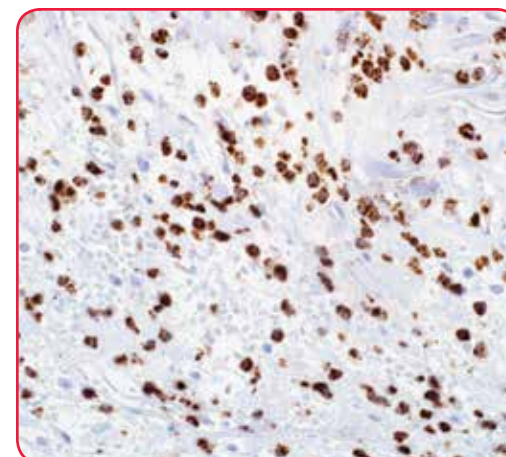
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Please contact your distributor for details on product availability and regulatory status in your country.*



Myeloproliferative neoplasms

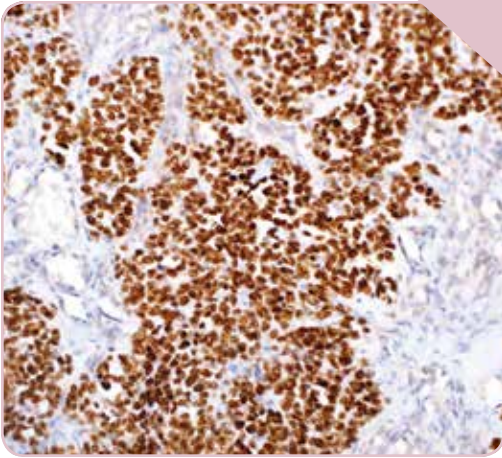


Bone marrow

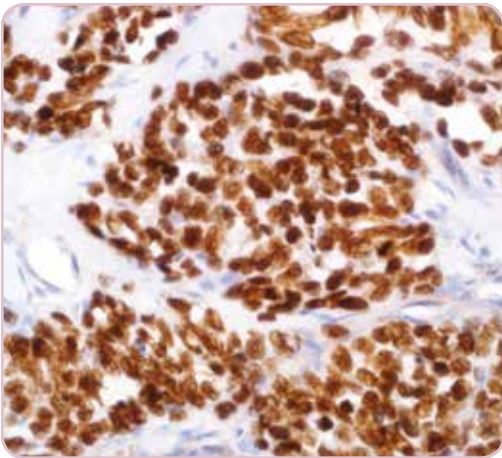


Colon

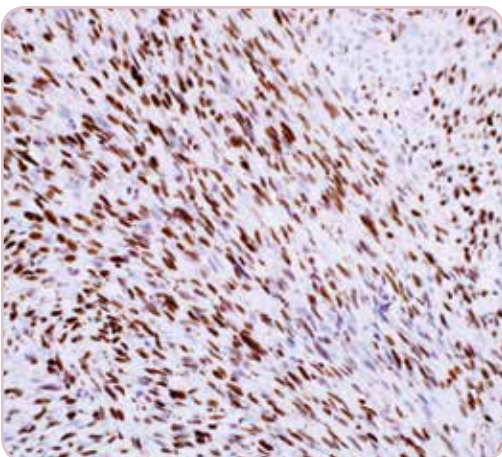
# MyoD1



Rhabdomyosarcoma



Rhabdomyosarcoma



Rhabdomyosarcoma

Rhabdomyosarcomas (RMS) are the most frequent malignant soft tissue neoplasms of childhood.<sup>1</sup> While better differentiated RMS have cross-striations or rhabdomyoblasts that allow for a confident morphologic diagnosis, less differentiated RMS resemble other small round-cell tumors.<sup>1</sup> MyoD1, one of the MyoD family of myogenic helix-loop-helix transcription factors, combined with myogenin, plays a role in coordinating the myogenic differentiation pathway from the determination of mesodermal precursors into myoblasts, the differentiation of myoblasts into myotubes, and finally the maturation of myotubes into skeletal myofibers.<sup>2</sup> Normal mature skeletal muscle does not express MyoD1 protein.<sup>1-2</sup> MyoD1 is expressed in myoblasts before differentiation while myogenin has post-differentiation functions.<sup>2</sup> Anti-MyoD1 immunostaining identifies cells committed to myogenesis in their earliest phase, thus, it is a better biomarker for less differentiated RMS.<sup>2</sup> Studies suggest, anti-MyoD1 may be used together with anti-myogenin and anti-desmin as a panel of markers since any RMS is virtually never negative for all three markers simultaneously.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** rhabdomyosarcoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Pediatric Pathology  
Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Soft Tissue Tumors	322, 323

## Reference

1. Morotti RA, et al. An immunohistochemical algorithm to facilitate diagnosis and subtyping of rhabdomyosarcoma: the Children's Oncology Group experience. *Am J Surg Pathol.* 2006; 30:962-968.
2. Sebire NJ, et al. Myogenin and MyoD1 expression in paediatric rhabdomyosarcomas. *J. Clin. Pathol.* 2003; 56:412-416.

## Ordering Information

**MyoD1 (EP212)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	386R-14
0.5 mL concentrate	386R-15
1 mL concentrate	386R-16
1 mL predilute	386R-17
7 mL predilute	386R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Myogenin

Myogenin also identified as myogenic factor 4 is a muscle specific transcription factor associated with muscle differentiation and cell cycle.<sup>1</sup> Anti-myogenin reactivity is seen in the nuclei of myoblasts in developing muscle tissue. Anti-myogenin is a useful immunohistochemical reagent for identification of rhabdomyosarcoma.<sup>2-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** rhabdomyosarcoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP162: IgG
- F5D: IgG<sub>1</sub>/k

## Associated Specialties

Pediatric Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Spindle Cell Tumors	300
Muscle Malignant Tumors	321
Neuroblastoma vs. Other Small Round Cell Tumors	321
Small Blue Round Cell Tumors	322
Soft Tissue Tumors	322, 323

## Reference

1. Miller JB. Myogenic programs of mouse muscle cell lines: expression of myosin heavy chain isoforms, MyoD1, and myogenin. *J Cell Biol.* 1990; 111:1149-59.
2. Wang NP, et al. Expression of myogenic regulatory proteins (myogenin and MyoD1) in small blue round cell tumors of childhood. *Am J Pathol.* 1995; 147:1799-810.
3. Cui S, et al. Evaluation of new monoclonal anti-MyoD1 and anti-myogenin antibodies for the diagnosis of rhabdomyosarcoma. *Pathol Int.* 1999; 49:62-8.
4. Kaspar P, et al. The expression of c-Myb correlates with the levels of rhabdomyosarcoma-specific marker myogenin. *Sci Rep.* 2015; 5:15090.
5. Rudzinski ER, et al. Myogenin, AP 2 Beta, NOS-1 and HMGA2 are surrogate markers of fusion status in rhabdomyosarcoma. *Am J Surg Pathol.* 2014; 38:654-9.

## Ordering Information

### Myogenin (EP162)

Rabbit Monoclonal  
Primary Antibody



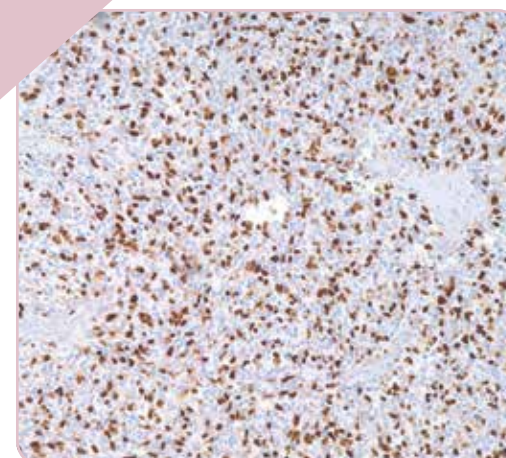
Volume	Part No.
0.1 mL concentrate	296R-14
0.5 mL concentrate	296R-15
1 mL concentrate	296R-16
1 mL predilute	296R-17
7 mL predilute	296R-18

### Myogenin (F5D)

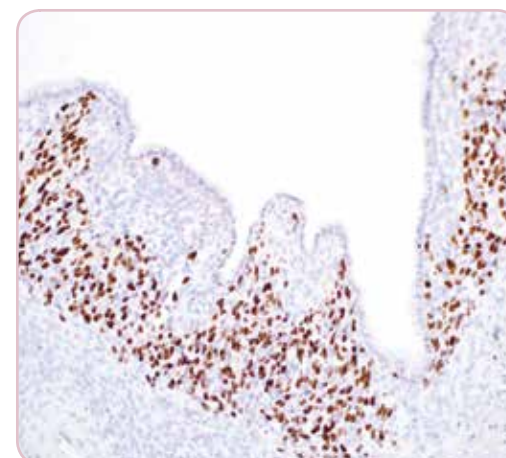
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	296M-14
0.5 mL concentrate	296M-15
1 mL concentrate	296M-16
1 mL predilute	296M-17
7 mL predilute	296M-18

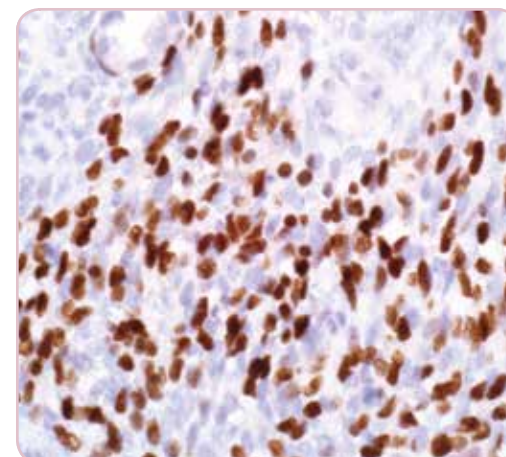
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Rhabdomyosarcoma



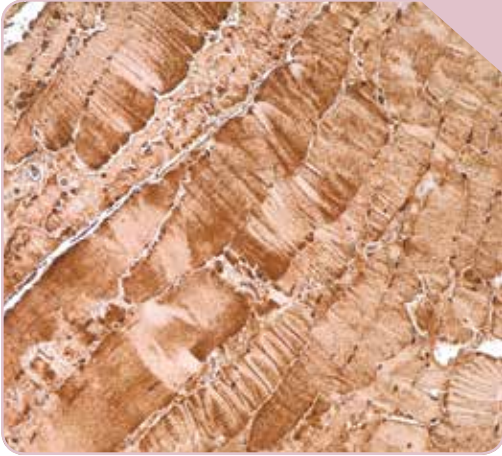
Rhabdomyosarcoma



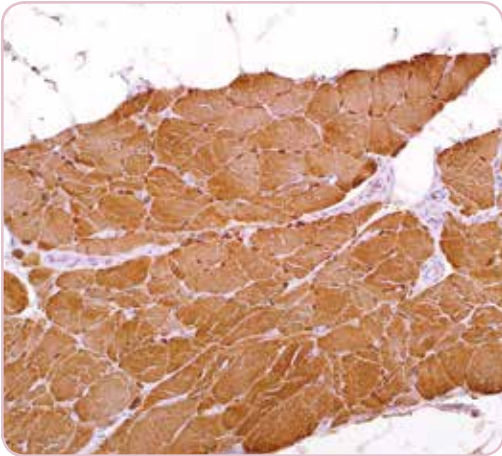
Rhabdomyosarcoma



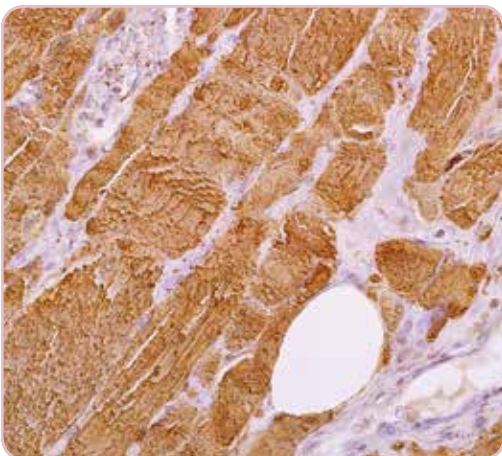
# Myoglobin



Skeletal muscle



Skeletal muscle



Skeletal muscle

Immunostaining with anti-myoglobin provides a specific, sensitive, and practical procedure for the identification of tumors of muscle origin. Since myoglobin is found exclusively in skeletal and cardiac muscle and is not present in any other cells of the human body, it may be used to distinguish rhabdomyosarcoma from other soft tissue tumors.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** skeletal muscle

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Muscle Malignant Tumors	321
Small Blue Round Cell Tumors	322

## Reference

1. Mukai K, et al. Localization of myoglobin in normal and neoplastic human skeletal muscle cells using an immunoperoxidase method. *Am J Surg Pathol.* 1979; 3:373-6.
2. Corson JM, et al. Intracellular myoglobin--a specific marker for skeletal muscle differentiation in soft tissue sarcomas. An immunoperoxidase study. *Am J Pathol.* 1981; 103:384-9.
3. Brooks JJ. Immunohistochemistry of soft tissue tumors. Myoglobin as a tumor marker for rhabdomyosarcoma. *Cancer.* 1982; 50:1757-63.
4. Kahn HJ, et al. Immunohistochemical and electron microscopic assessment of childhood rhabdomyosarcoma. Increased frequency of diagnosis over routine histologic methods. *Cancer.* 1983; 51:1897-903.
5. Furlong MA, et al. Pleomorphic rhabdomyosarcoma in children: four cases in the pediatric age group. *Ann Diagn Pathol.* 2001; 5:199-206.
6. Furlong MA, et al. Pleomorphic rhabdomyosarcoma in adults: a clinicopathologic study of 38 cases with emphasis on morphologic variants and recent skeletal muscle-specific markers. *Mod Pathol.* 2001; 14:595-603.

## Ordering Information

### Myoglobin

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	297A-74
0.5 mL concentrate	297A-75
1 mL concentrate	297A-76
1 mL predilute	297A-77
7 mL predilute	297A-78

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Myosin, Smooth Muscle

Smooth Muscle Myosin, heavy chain (SMMS-1) is a cytoplasmic structural protein that is a major component of the contractile apparatus of the smooth muscle cells. SMMS-1 is also a myoepithelium-associated protein. Anti-SMMS-1 is a mouse monoclonal antibody to smooth muscle myosin, heavy chain that reacts with human visceral and vascular smooth muscle cells. The antibody also reacts with human myoepithelial cells. It is very helpful in distinguishing between benign sclerosing breast lesions and infiltrating carcinomas in difficult cases since it strongly stains the myoepithelial layer in the benign lesions while it is negative in the infiltrating carcinomas.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP166: IgG
- SMMS-1: IgG<sub>1</sub>/k

## Synonyms and Abbreviations

SMMS-1

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Spindle Cell Tumors	300
Non-Invasive Breast Lesions vs. Invasive Ductal Carcinoma	303

## Reference

1. Werling RW, et al. Immunohistochemical distinction of invasive from noninvasive breast lesions: a comparative study of p63 versus calponin and smooth muscle myosin heavy chain. *Am J Surg Pathol.* 2003; 27:82-90.
2. Agoff SN, et al. Immunohistochemical distinction of endometrial stromal sarcoma and cellular leiomyoma. *Appl Immunohistochem Mol Morphol.* 2001; 9:164-9.
3. Popnikolov NK, et al. Benign myoepithelial tumors of the breast have immunophenotypic characteristics similar to metaplastic matrix-producing and spindle cell carcinomas. *Am J Clin Pathol.* 2003; 120:161-7.
4. Lazard D, et al. Expression of smooth muscle-specific proteins in myoepithelium and stromal myofibroblasts of normal and malignant human breast tissue. *Proc Natl Acad Sci U S A.* 1993; 90:999-1003.

## Ordering Information

### Myosin, Smooth Muscle (EP166)

Rabbit Monoclonal Primary Antibody

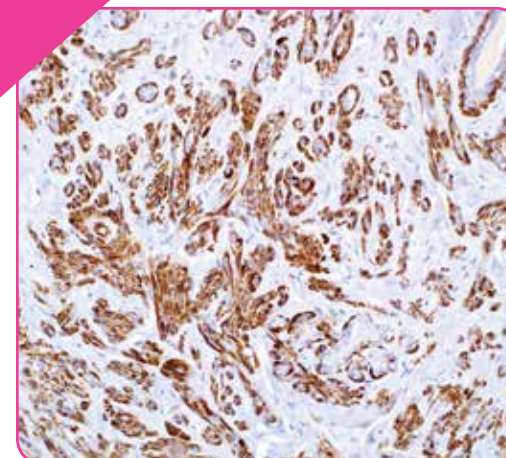
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0.5 mL concentrate	298R-15
1 mL concentrate	298R-16
1 mL predilute	298R-17
7 mL predilute	298R-18

### Myosin, Smooth Muscle (SMMS-1)

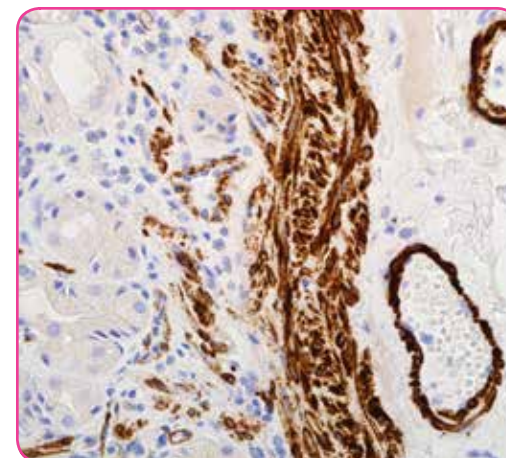
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	298M-14
0.5 mL concentrate	298M-15
1 mL concentrate	298M-16
1 mL predilute	298M-17
7 mL predilute	298M-18

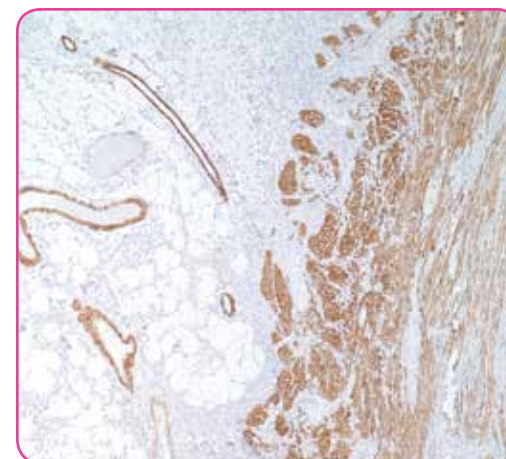
Please contact your distributor for details on product availability and regulatory status in your country.



Breast, sclerosing adenosis

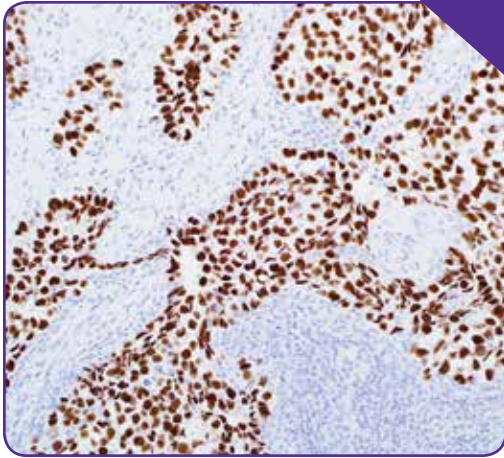


Stomach

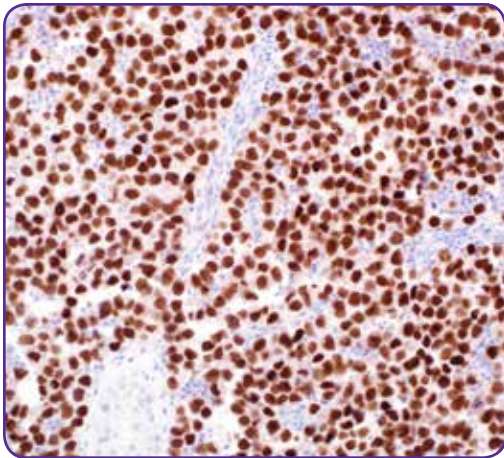


Smooth muscle

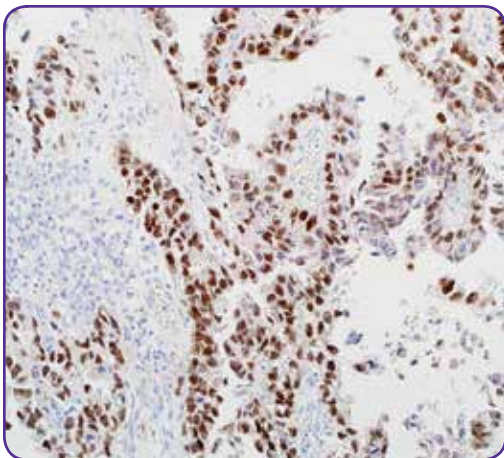
# Nanog



Seminoma



Seminoma



Embryonal carcinoma

Nanog is a transcription factor homeoprotein that is involved in maintaining embryonic stem cell pluripotency and self-renewal.<sup>1-3</sup> Embryonic stem cells with a deleted Nanog gene lose pluripotency. Conversely, embryonic stem cells that are forced to differentiate will downregulate Nanog expression.<sup>1-2</sup> Nanog expression has been shown to be absent in normal adult organ tissues, but positive expression in undifferentiated germ cell tumors such as seminoma, dysgerminoma and embryonal carcinoma has been noted.<sup>1,2,4,5</sup> Therefore, Nanog may be used as an aid in the determination of undifferentiated tumors of germ cell origin from non-germ cell tumors.<sup>4,5</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** seminoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Anatomic Pathology  
Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301

## Reference

1. Mitsu K, et al. The homeoprotein Nanog is required for maintenance of pluripotency in mouse epiblast and ES cells. *Cell*. 2003; 113:631-42.
2. Chambers I, et al. Functional expression cloning of Nanog, a pluripotency sustaining factor in embryonic stem cells. *Cell*. 2003; 113:643-55.
3. Pan G, et al. Nanog and transcriptional networks in embryonic stem cell pluripotency. *Cell Research*. 2007; 17:42-9.
4. Hart AH, et al. The pluripotency homeobox gene NANOG is expressed in human germ cell tumors. *Cancer*. 2005; 104:2092-98.
5. Chang MC, et al. Embryonistem cell transcription factors and D2-40 (podoplanin) as diagnostic immunohistochemical markers in ovarian germ cell tumors. *Int J Gynecol Pathol*. 2009; 28:347-55.

## Ordering Information

**Nanog (EP225)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	443R-14
0.5 mL concentrate	443R-15
1 mL concentrate	443R-16
1 mL predilute	443R-17
7 mL predilute	443R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Napsin A

Napsin is a pepsin-like aspartic proteinase in the A1 clan of the AA clade of proteinases.<sup>1-3</sup> There are two closely related napsins, napsin A (NAPSA) and napsin B (NAPSB).<sup>1-3</sup> Napsin A is involved in processing propeptide pulmonary surfactant protein B (proSP-B) in the lung.<sup>4</sup> In normal tissue, Napsin A is expressed in type II pneumocytes of the lung and proximal tubules of the kidney.<sup>1-3</sup> Napsin A is a useful marker for lung adenocarcinoma.<sup>1-3, 5-8</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** lung adenocarcinoma, kidney, renal cell carcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP205: IgG
- MRQ-60: IgG<sub>1</sub>/k

## Associated Specialties

Cytopathology

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Differential Diagnosis of Metastatic Adenocarcinomas	295
Epithelioid Mesothelioma vs. Carcinoma	319
Lung Squamous Cell Carcinoma vs. Adenocarcinoma	320
Pleura: Adenocarcinoma vs. Mesothelioma	320
Thoracic Solitary Fibrous Tumor vs. Potential Mimics	320

## Reference

1. Jagirdar J. Application of immunohistochemistry to the diagnosis of primary and metastatic carcinoma to the lung. Arch Pathol Lab Med. 2008; 132:384-96.
2. Bishop JA, et al. Napsin A and thyroid transcription factor-1 expression in carcinomas of the lung, breast, pancreas, colon, kidney, thyroid, and malignant mesothelioma. Hum Pathol. 2010; 41:20-5.
3. Rawlings ND and Salvesen GS. Handbook of Proteolytic Enzymes Volume 1. 3rd Edition. Academic Press. 2013; p.69-71.

For the complete list of references see the product IFU.

## Ordering Information

### Napsin A (EP205)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	352R-14
0.5 mL concentrate	352R-15
1 mL concentrate	352R-16
1 mL predilute	352R-17
7 mL predilute	352R-18

### Napsin A (MRQ-60)

Mouse Monoclonal Antibody

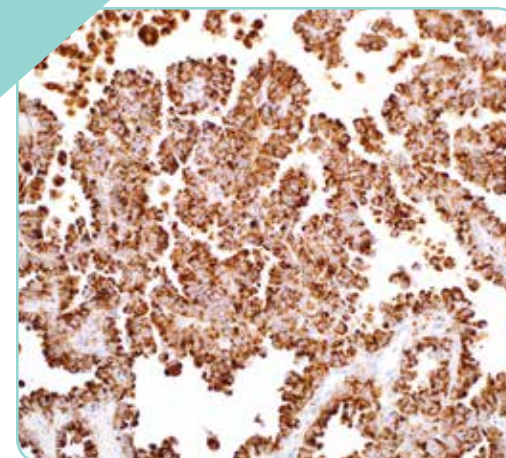
Volume	Part No.
0.1 mL concentrate	352M-94
0.5 mL concentrate	352M-95
1 mL concentrate	352M-96
1 mL predilute	352M-97
7 mL predilute	352M-98
25 mL predilute	352M-90

### Napsin A

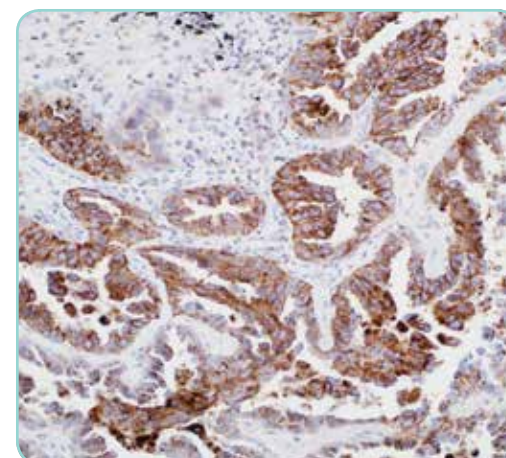
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	352A-74
0.5 mL concentrate	352A-75
1 mL concentrate	352A-76
1 mL predilute	352A-77
7 mL predilute	352A-78

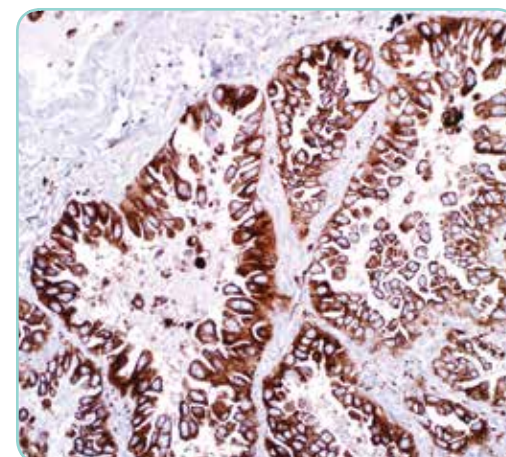
Please contact your distributor for details on product availability and regulatory status in your country.



Lung adenocarcinoma

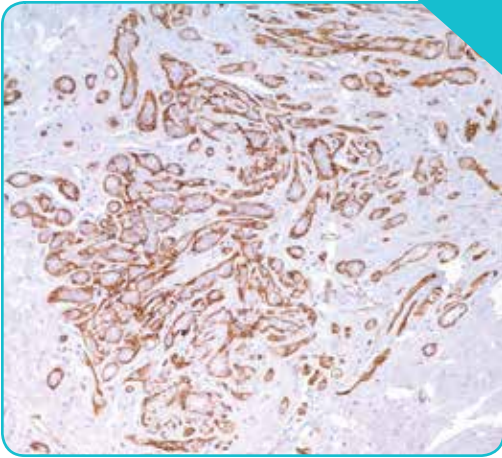


Lung adenocarcinoma

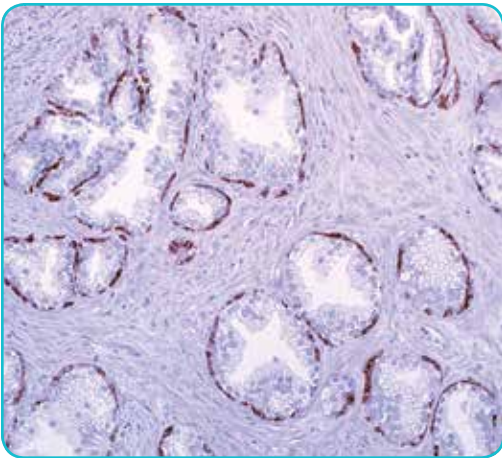


Lung adenocarcinoma

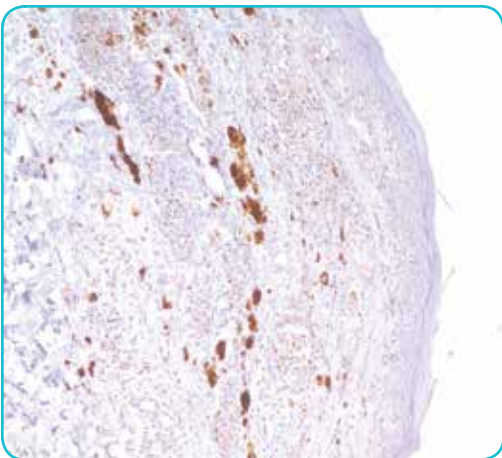
# Nerve Growth Factor Receptor (NGFR)



Breast, sclerosing adenosis



Prostate



Skin

Nerve growth factor receptor (NGFR), also known as p75NTR, is a 75-kD glycoprotein member of the tumor necrosis factor (TNF) receptor family essential for embryonic development of the peripheral nervous system.<sup>1,2</sup> In normal tissue, NGFR is expressed in neural crest derived cells, lymphoid follicular dendritic cells seen in lymph nodes and tonsils, and myoepithelial cells of the breast and salivary gland as well as basal cells at the prostate gland and bronchial epithelium.<sup>1,2</sup> NGFR has been shown to be a reliable adjunct marker for melanoma, specifically desmoplastic and spindle cell variants.<sup>3-4</sup> Anti-NGFR labels myoepithelial cells of the breast and may aid in the differentiation between benign conditions, pre-invasive neoplastic lesions and invasive malignancies of the breast.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** breast

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

NGFR

p75NTR

## Associated Specialties

Anatomic Pathology

Dermatopathology

## Associated Grids

Grid	Page No.
Spindle Cell Melanoma vs. Epithelioid Peripheral Nerve Sheath Tumor	300
Melanotic Lesions	305
Skin: Dermatofibrosarcoma Protuberans (DFSP) vs. Dermatofibroma Fibrous Histiocytoma (DF-FH)	306
Skin: Spindle Cell Tissues and Tumors	306, 307
Brain: CNS Tumors	318
Meningeal Solitary Fibrous Tumor (SFT)	318
Thoracic Solitary Fibrous Tumor vs. Potential Mimics	320
Solitary Fibrous Tumor vs. Other Soft Tissue Tumors	323
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324

## Ordering Information

### Nerve Growth Factor Receptor (NGFR) (MRQ-21) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	304M-14
0.5 mL concentrate	304M-15
1 mL concentrate	304M-16
1 mL predilute	304M-17
7 mL predilute	304M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

## Reference

1. Thompson SJ. A monoclonal antibody against nerve growth factor receptor. Immunohistochemical analysis of normal and neoplastic human tissue. *Am J Clin Pathol.* 1989; 92:415-23.
2. Reis-Filho JS, et al. Distribution and significance of nerve growth factor receptor (NGFR/p75NTR) in normal, benign and malignant breast tissue. *Mod Pathol.* 2006; 19:307-19.
3. Lazova R, et al. P75 nerve growth factor receptor staining is superior to S100 in identifying spindle cell and desmoplastic melanoma. *J Am Acad Dermatol.* 2010; 63:852-8.
4. Kanik AB, et al. p75 nerve growth factor receptor staining helps identify desmoplastic and neurotropic melanoma. *J Cutan Pathol.* 1996; 23:205-10.

# Nestin

Nestin is a class VI intermediate filament (IF) protein. Nestin is expressed in neural progenitor cells during development of the central nervous system and peripheral nervous system. Cytoplasmic anti-nestin staining mostly occurs under pathological conditions. It has been reported that nestin expression is significantly increased in melanoma and correlated with more advanced stages of the disease.<sup>1</sup> Nestin immunoreactivity is also reported in melanoma cells of HMB-45-negative amelanotic and melanotic, non-desmoplastic melanoma.<sup>2</sup> Nestin is also useful in subclassifying breast carcinoma.<sup>3</sup> Only cytoplasmic staining is considered positive, whereas any nuclear staining is considered as background artifact.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Melanomas	305

## Reference

1. Brychtova S, et al. Nestin expression in cutaneous melanomas and melanocytic nevi. *J Cutan Pathol.* 2007; 34:370-5.
2. Kanoh M, et al. Nestin is expressed in HMB-45 negative melanoma cells in dermal parts of nodular melanoma. *Journal of Dermatology.* 2010; 37:505-11.
3. Li H, et al. Nestin is expressed in the basal/myoepithelial layer of the mammary gland and is a selective marker of basal epithelial breast tumors. *Cancer Res.* 2007; 67:501-10.

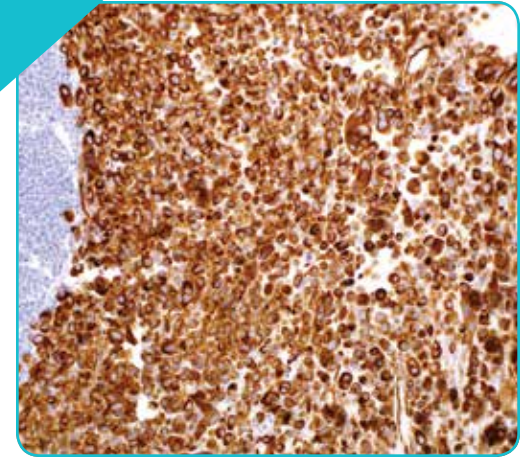
## Ordering Information

### Nestin (10C2)

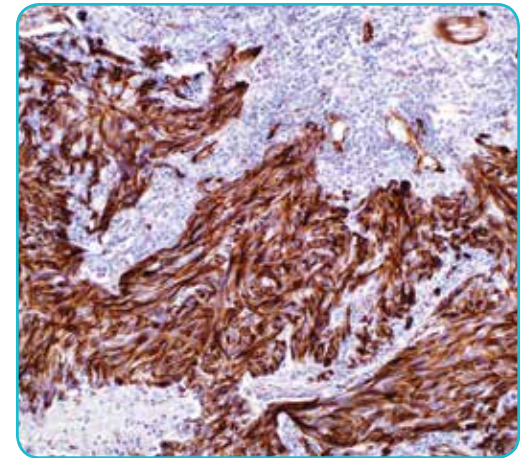
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	388M-14
0.5 mL concentrate	388M-15
1 mL concentrate	388M-16
1 mL predilute	388M-17
7 mL predilute	388M-18

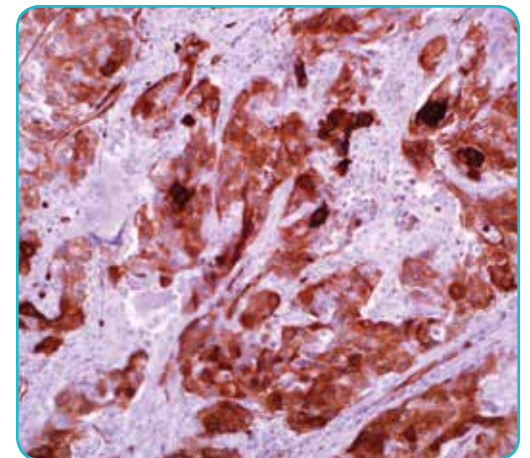
*Please contact your distributor for details on product availability and regulatory status in your country.*



Lymph node, metastatic melanoma

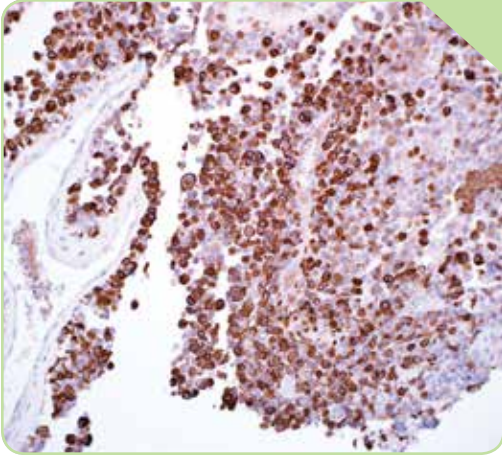


Lung, metastatic melanoma

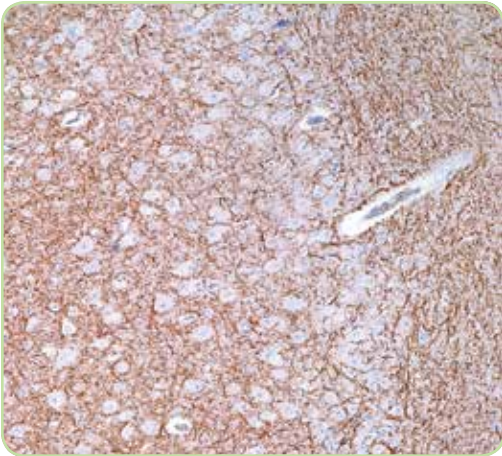


Triple negative breast carcinoma

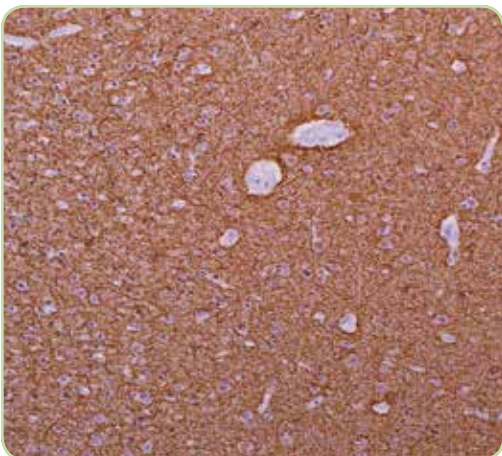
# Neurofilament



Glioblastoma



Brain



Brain

Immunolabelling of neurofilaments (NF) is employed for study of nerve distribution of normal and abnormal tissues, and neuronal differentiation of neoplasms. NF are found in neuromas, ganglioneuromas, gangliogliomas, ganglioneuroblastomas, neuroblastomas, and retinoblastomas. Neurofilaments are also present in paragangliomas, as well as, adrenal and extra-adrenal pheochromocytomas. Carcinoids, neuroendocrine carcinomas of the skin, and lung small cell carcinoma also express neurofilament.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** brain

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 2F11: IgG<sub>1</sub>/k
- EP79: IgG

## Associated Specialties

Neuropathology

## Associated Grids

Grid	Page No.
Adrenal Neoplasms	292
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Lung Small Cell Carcinoma vs. Merkel Cell Carcinoma	297
Neuroendocrine Neoplasms	298
Retroperitoneal Lesions	299, 319
Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors	305
Brain: CNS Tumors	318
Retroperitoneal Neoplasms	318
Neuroblastoma vs. Other Small Round Cell Tumors	321

## Ordering Information

### Neurofilament (2F11)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	302M-14
0.5 mL concentrate	302M-15
1 mL concentrate	302M-16
1 mL predilute	302M-17
7 mL predilute	302M-18

### Neurofilament (EP79)

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	302R-14
0.5 mL concentrate	302R-15
1 mL concentrate	302R-16
1 mL predilute	302R-17
7 mL predilute	302R-18

Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

1. Leong AS-Y, et al. Manual of Diagnostic antibodies for Immunohistochemistry. London: Greenwich Medical Media Ltd. 1999. Print. p162-168.
2. Miettinen M, et al. Varying expression of cytokeratin and neurofilaments in neuroendocrine tumors of human gastrointestinal tract. Lab Invest. 1985; 52:429-36.
3. van Muijen GN, et al. Cytokeratin and neurofilament in lung carcinomas. Am J Pathol. 1984; 116:363-9.
4. Trojanowski JQ, et al. Expression of neurofilament antigens by normal and neoplastic human adrenal chromaffin cells. N Engl J Med. 1985; 313:101-4.
5. Morrison CD, et al. Immunohistochemistry in the diagnosis of neoplasms of the central nervous system. Semin Diagn Pathol. 2000; 17:204-15.

# NKX2.2

NKX2.2 is a homeodomain transcription factor that plays a role in neuroendocrine and glial differentiation.<sup>1</sup> NKX2.2 is upregulated in Ewing sarcoma as a result of the oncogenic EWS-FLI1 fusion protein.<sup>2,3</sup> As one of many small round blue cell tumors, Ewing sarcoma can be difficult to diagnose due to the characteristic undifferentiated morphology.<sup>4</sup> NKX2.2 has proven its utility as a sensitive maker for distinguishing Ewing sarcoma from other round blue cell tumors when used in a panel.<sup>1,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** Ewing sarcoma, pancreas

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Pediatric Pathology

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Neuroendocrine Tumors from Different Anatomical Locations	299

## Reference

1. Yoshida A, et al. NKX2.2 is a useful immunohistochemical marker for Ewing sarcoma. *Am J Surg Pathol.* 2012; 36:993-9.
2. Yamamoto Y, et al. Upregulation of NKX2.2, a target of EWSR1/FLI1 fusion transcript, in primary renal Ewing sarcoma. *J Cytol.* 2015; 32:30-32.
3. Smith R, et al. Expression profiling of EWS/FLI identifies NKX2.2 as a critical target gene in Ewing's sarcoma. *Cancer Cell.* 2006; 9:405-16.
4. Rajwanshi A, et al. Malignant small round cell tumors. *J Cytol.* 2009; 26:1-10.
5. Hung Y, et al. Evaluation of NKX2-2 expression in round cell sarcomas and other tumors with EWSR1 rearrangement: imperfect specificity for Ewing sarcoma. *Mod Pathol.* 2016; 29:370-80.

## Ordering Information

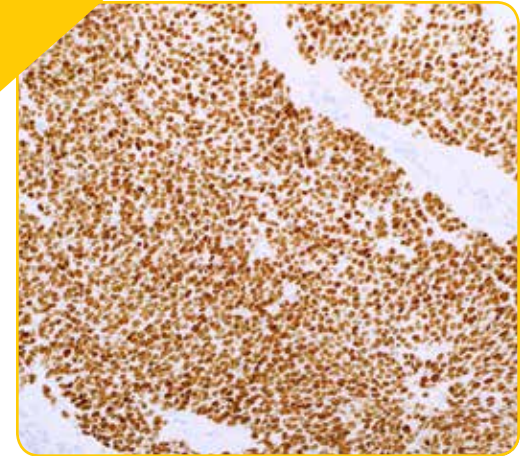
### NKX2.2 (EP336)

Rabbit Monoclonal  
Primary Antibody

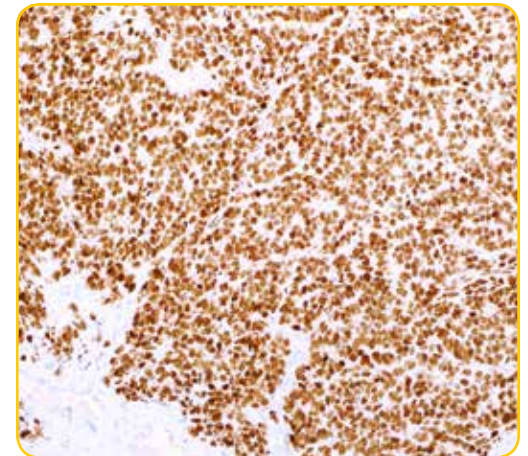


Volume	Part No.
0.1 mL concentrate	445R-14
0.5 mL concentrate	445R-15
1 mL concentrate	445R-16
1 mL predilute	445R-17
7 mL predilute	445R-18

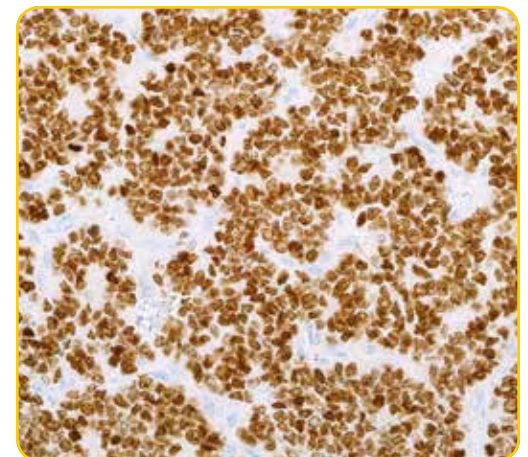
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Ewing sarcoma



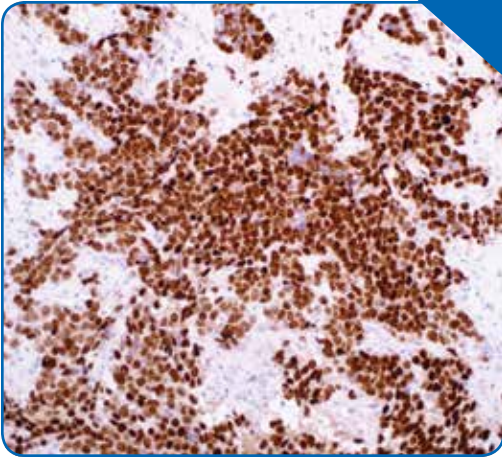
Ewing sarcoma



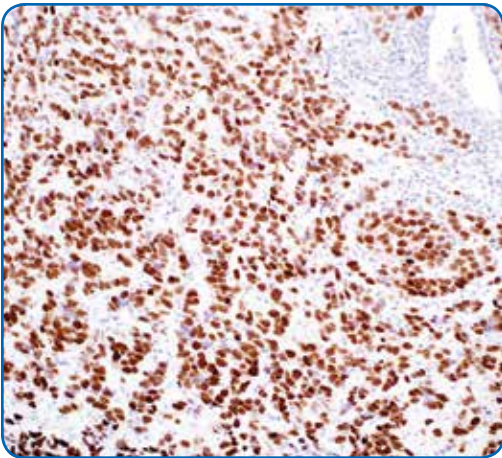
Ewing sarcoma



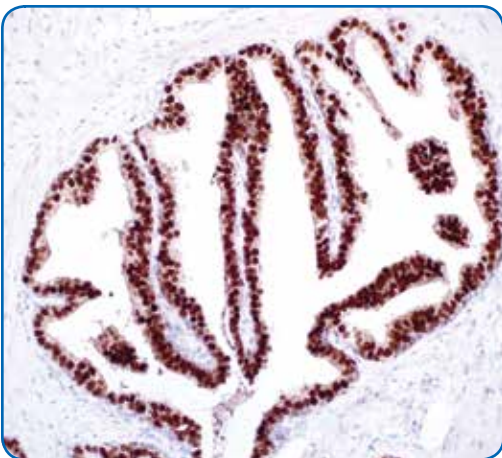
# NKX3.1



High-grade prostate carcinoma



High-grade prostate carcinoma



Prostate

NKX3.1 is a prostate specific androgen-regulated homeobox gene located on chromosome 8p.<sup>1-2</sup> It is difficult to distinguish between high grade prostate adenocarcinoma and high grade infiltrating urothelial carcinoma using hematoxylin and eosin stained specimens.<sup>2</sup> Current prostate adenocarcinoma markers such as prostate specific antigen (PSA) and prostate specific acid phosphatase (PSAP) are very useful in determining prostate origin of prostate cancer in other sites, but have lower sensitivity when identifying poorly differentiated compared to well differentiated cases.<sup>2</sup> NKX3.1 is a sensitive and specific tissue marker of prostate adenocarcinoma and can be used to help distinguish it from urothelial carcinomas.<sup>1</sup> Currently, thrombomodulin and uroplakin are used to identify tumors of urothelial origin; however, their sensitivities are suboptimal.<sup>2</sup> NKX3.1 is a sensitive and specific tissue marker of prostate adenocarcinoma and can be used to help distinguish it from urothelial carcinomas as well as tumors of unknown primary.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** prostate adenocarcinoma, prostate

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Colon vs. Prostate Adenocarcinoma	294
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299

## Reference

1. Gurel B, et al. NKX3.1 as a marker of prostatic origin in metastatic tumors. *Am J Surg Pathol.* 2010; 34:1097-105.
2. Chuang AY, et al. Immunohistochemical differentiation of high-grade prostate carcinoma from urothelial carcinoma. *Am J Surg Pathol.* 2007; 31:1246-55.

## Ordering Information

### NKX3.1 (EP356)

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	441R-14
0.5 mL concentrate	441R-15
1 mL concentrate	441R-16
1 mL predilute	441R-17
7 mL predilute	441R-18
25 mL predilute	441R-10

*Please contact your distributor for details on product availability and regulatory status in your country.*

# NSE

Neuron-specific enolase (NSE) is the glycolytic isoenzyme of the enolase gamma-gamma dimer specifically detected in neurons of neuroendocrine cells, and their corresponding tumors.<sup>1,2</sup> In addition, NSE has been demonstrated immunohistochemically in the non-neoplastic cells of the pituitary, peptide secreting tissues, pinealocytes, neuroendocrine cells of the lung, thyroid, parafollicular cells, adrenal medulla, islets of Langerhans, Merkel cells of the skin<sup>3</sup>, and melanocytes. Anti-NSE immunostaining is also positive in normal striated muscle, hepatocytes and, to a lesser extent, smooth muscle.<sup>4</sup> Anti-NSE is a useful marker to identify peripheral nerves.<sup>5</sup> When used for the identification of neuroendocrine differentiation, it is suggested that it be employed in a panel with more specific markers such as anti-synaptophysin, anti-chromogranin, and anti-neurofilament.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pancreas, carcinoid tumor

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Retroperitoneal Lesions	299, 319
Retroperitoneal Neoplasms	318

## Reference

1. Wick MR, et al. Neuron-specific enolase in neuroendocrine tumors of the thymus, bronchus and skin. *Am J Clin Pathol.* 1983; 79:703-7.
2. Vinos SA, et al. Immunohistochemical demonstration of neuron-specific enolase in neoplasms of the CNS and other tissues. *Arch Pathol Lab Med.* 1984; 108:536-40.
3. Leong AS, et al. Criteria for the diagnosis of primary endocrine carcinoma of the skin (Merkel cell carcinoma). A histological, immunohistochemical and ultrastructural study of 13 cases. *Pathology.* 1986; 18:393-9.
4. Cooper EH. Neuron-specific enolase. *Int J Biol Markers.* 1994; 9:205-10.
5. Loenard N, et al. Neuroproliferation in the mucosa is a feature of coeliac disease and Crohn's disease. *Gut.* 1995; 37:763-5.

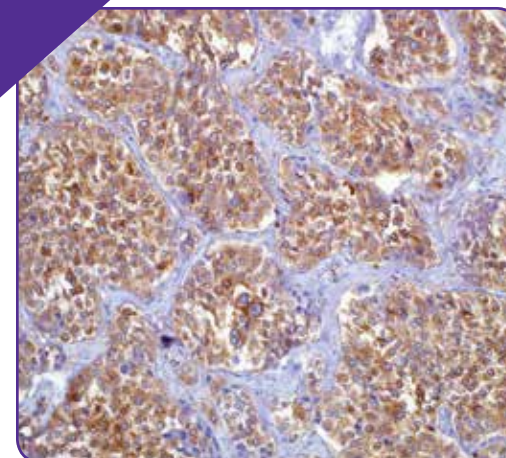
## Ordering Information

### NSE (MRQ-55)

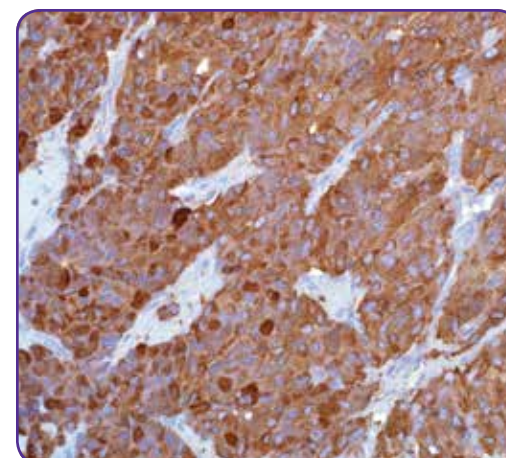
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	306M-24
0.5 mL concentrate	306M-25
1 mL concentrate	306M-26
1 mL predilute	306M-27
7 mL predilute	306M-28

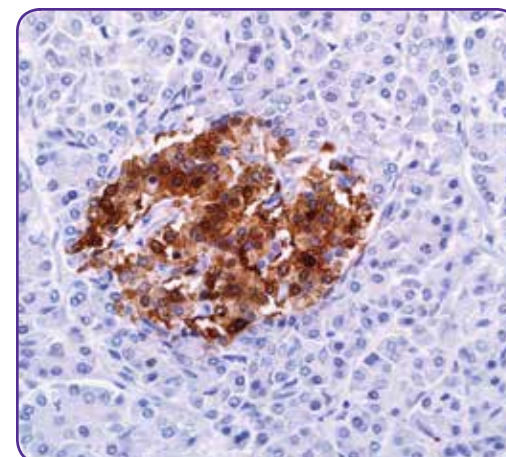
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreatic neuroendocrine tumor

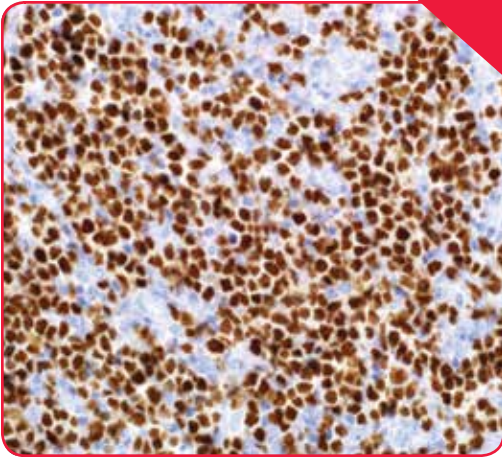


Pancreatic neuroendocrine tumor

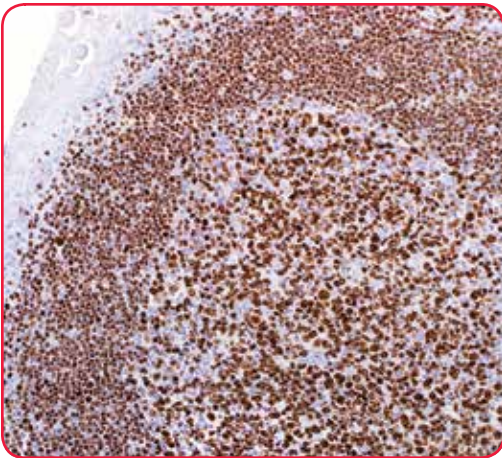


Pancreas

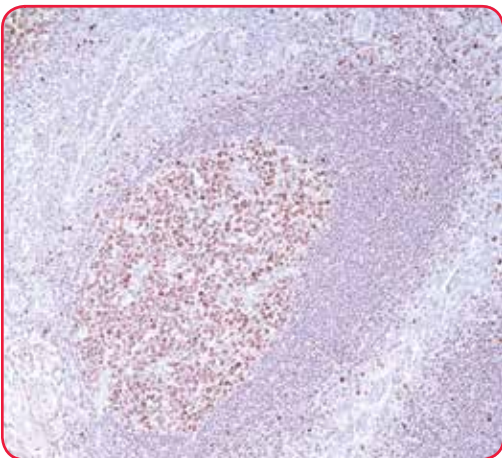
# Oct-2



Diffuse large B-cell lymphoma (DLBCL)



Tonsil



Tonsil

Oct-2 is a transcription factor of the POU homeo-domain family that binds to the Ig gene octamer sites, regulating B-cell-specific genes. These are involved in proliferation and differentiation and, despite the scarce evidence for Oct-2 expression in T cells, it has been shown that this factor participates in transcriptional regulation during T-cell activation. Oct-2 activity is dependent on phosphorylation and alternative splicing. Various lymphomas are also positive for this marker including the following: B-chronic lymphocytic leukemia, mantle cell lymphoma, follicular lymphoma, marginal zone lymphoma, plasmacytoma, Burkitt lymphoma, diffuse large cell lymphoma, diffuse large B-cell lymphoma, T-cell rich B-cell lymphoma, nodular lymphocyte predominant Hodgkin lymphoma, and classic Hodgkin lymphoma.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil, lymph node

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Hodgkin vs. Non-Hodgkin Lymphomas	314

## Reference

1. Browne P, et al. The B-cell transcription factors BSAP, Oct-2, and BOB.1 and the pan-B-cell markers CD20, CD22, and CD79a are useful in the differential diagnosis of classic Hodgkin lymphoma. *Am J Clin Pathol.* 2003; 120:767-77.
2. García-Cosío M, et al. Analysis of transcription factor OCT.1, OCT.2 and BOB.1 expression using tissue arrays in classical Hodgkin lymphoma. *Mod Pathol.* 2004; 17:1531-8.
3. Gibson SE, et al. Expression of the B cell-associated transcription factors PAX5, OCT-2, and BOB.1 in acute myeloid leukemia: associations with B-cell antigen expression and myelomonocytic maturation. *Am J Clin Pathol.* 2006; 126:916-24.

## Ordering Information

### Oct-2 (MRQ-2)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	308M-14
0.5 mL concentrate	308M-15
1 mL concentrate	308M-16
1 mL predilute	308M-17
7 mL predilute	308M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Oct-4

Oct-4 is a transcription factor that functions in the regulation and maintenance of pluripotency in embryonic stem and primordial germ cells.<sup>1</sup> Oct-4 immunoreactivity has been demonstrated in gonadal and extra-gonadal seminomas, dysgerminomas and embryonal carcinomas.<sup>1,2</sup> In addition, the immunohistochemical detection of Oct-4 assists in the evaluation of intratubular germ cell neoplasia (IGCN).<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** seminoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

Oct 3/4

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309

## Reference

1. Cheng L, et al. OCT4: biological functions and clinical applications as a marker of germ cell neoplasia. *J Pathol.* 2007; 211:1-9.
2. Weissferdt A, et al. Primary mediastinal seminomas: a comprehensive immunohistochemical study with a focus on novel markers. *Hum Pathol.* 2015; 46:376-83.

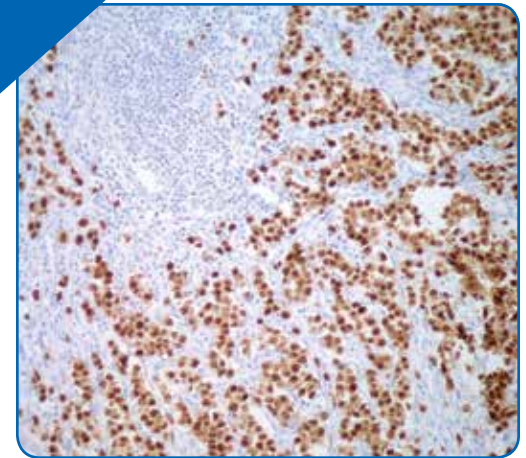
## Ordering Information

### Oct-4 (MRQ-10)

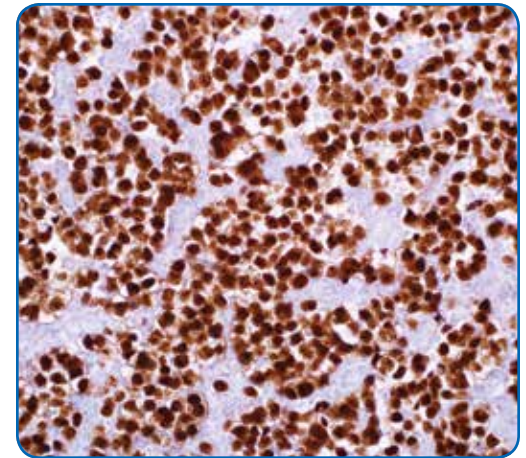
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	309M-14
0.5 mL concentrate	309M-15
1 mL concentrate	309M-16
1 mL predilute	309M-17
7 mL predilute	309M-18

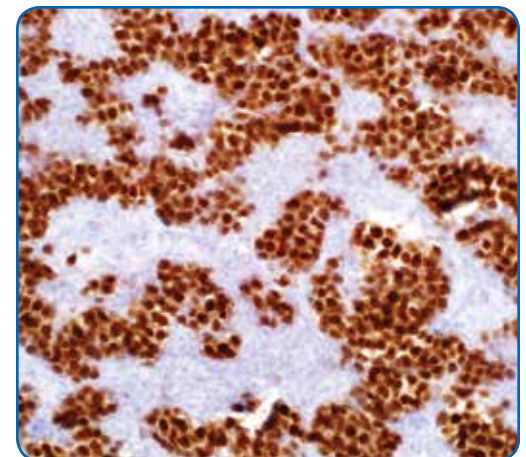
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Seminoma

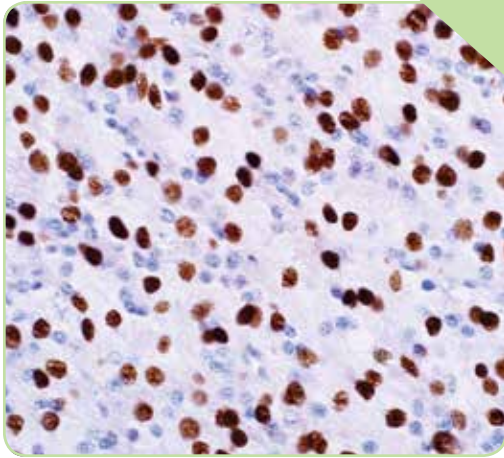


Seminoma

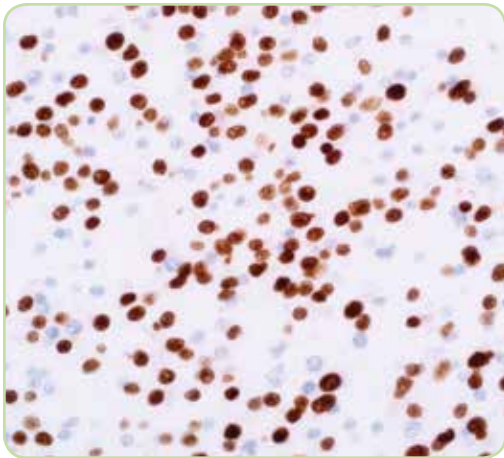


Seminoma

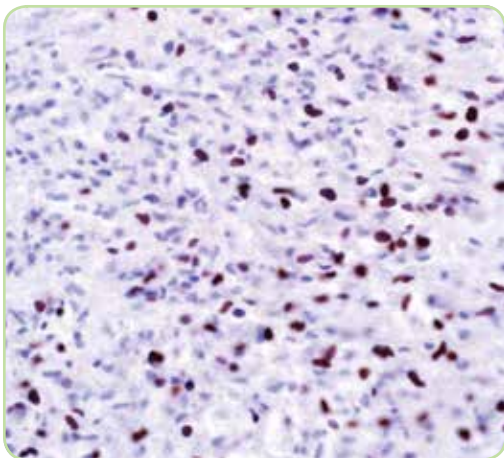
# Olig2



Oligodendroglioma



Oligodendroglioma



Schwannoma

Olig2, a basic helix-loop-helix transcription factor, is involved in oligodendroglial specification. Olig2 expression has been reported in most glial tumors, such as oligodendrogliomas and astrocytomas.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** astrocytoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 211F1.1: IgG<sub>2a</sub>/k
- EP112: IgG

## Associated Specialties

Neuropathology

## Associated Grids

Grid	Page No.
Brain: CNS Tumors	318

## Reference

1. Mokhtari K, et al. Olig2 expression, GFAP, p53 and 1p loss analysis contribute to glioma subclassification. *Neuropathol Appl Neurobiol.* 2005; 31:62-9.
2. Otero JJ, et al. OLIG2 is differentially expressed in pediatric astrocytic and in ependymal neoplasms. *J Neurooncol.* 2011; 104:423-38.

## Ordering Information

### Olig2 (211F1.1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	387M-14
0.5 mL concentrate	387M-15
1 mL concentrate	387M-16
1 mL predilute	387M-17
7 mL predilute	387M-18

### Olig2 (EP112)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	387R-14
0.5 mL concentrate	387R-15
1 mL concentrate	387R-16
1 mL predilute	387R-17
7 mL predilute	387R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# p21<sup>WAF1</sup>

p21<sup>WAF1</sup>/CIP1 is a cyclin-dependent kinase (CDK) inhibitor that plays a role in cell cycle control. In humans, p21 is a 21-kD protein of the cyclin dependent kinase inhibitor 1A (CDKN1A) gene. p21 acts as an inhibitor of cell cycle progression at the G1 phase and is tightly controlled by p53. It is expressed in normal human tissue and a wide array of tumors.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Anatomic Pathology

## Reference

1. DiGiuseppe JA, et al. p53-independent expression of cyclin-dependent kinase inhibitor p21 in pancreatic carcinoma. *Am J Pathol.* 1995; 147:884-8.
2. Xie HL, et al. Expression of p21(WAF1) and p53 and polymorphism of p21(WAF1) gene in gastric carcinoma. *World J Gastroenterol.* 2004; 10:1125-31.
3. Stein JP, et al. Effect of p21WAF1/CIP1 expression on tumor progression in bladder cancer. *J of Natl Cancer Inst.* 1998; 90:1072-8.

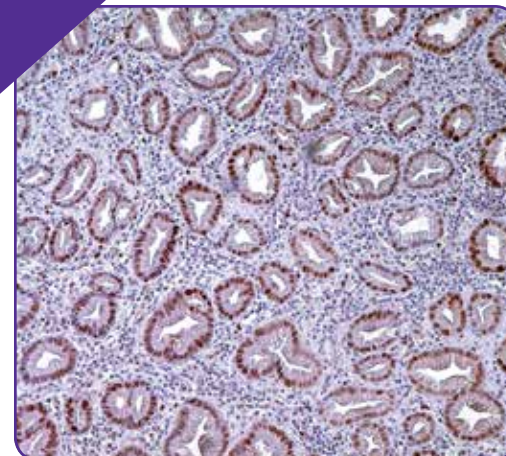
## Ordering Information

**p21<sup>WAF1</sup> (DCS-60.2)**

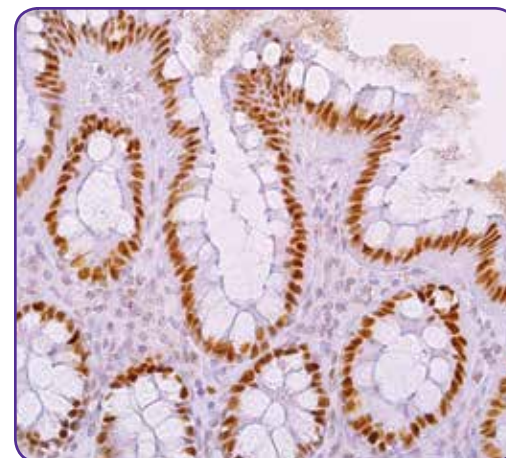
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	421M-14
0.5 mL concentrate	421M-15
1 mL concentrate	421M-16
1 mL predilute	421M-17
7 mL predilute	421M-18

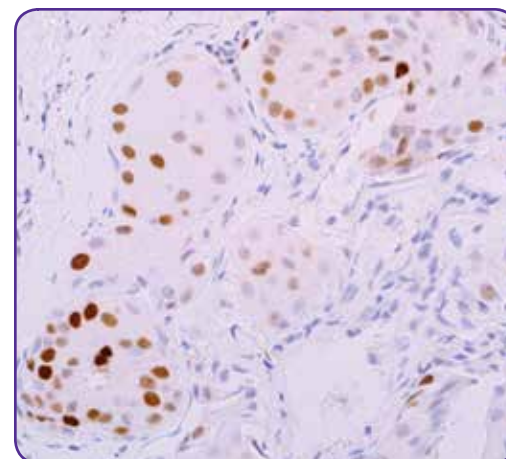
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Colon mucosa

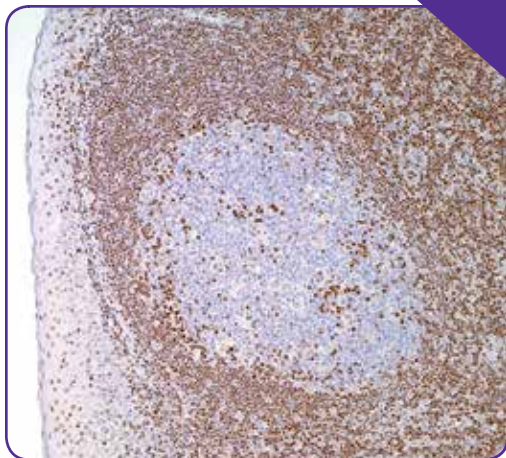


Colon mucosa

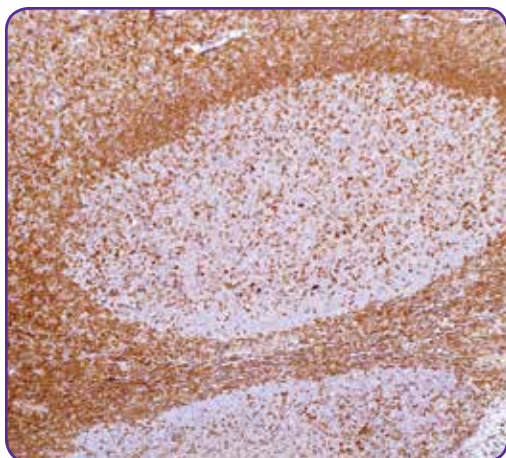


Breast carcinoma

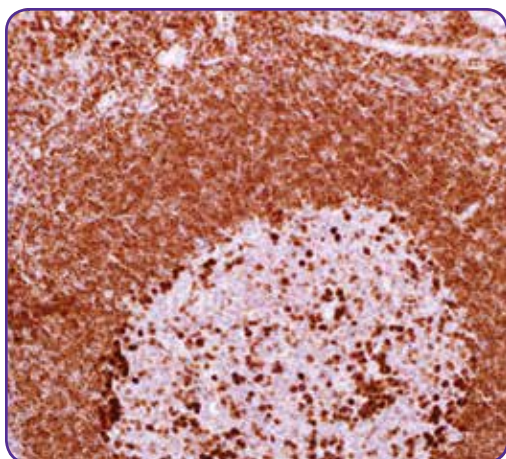
# p27<sup>Kip1</sup>



Tonsil



Tonsil



Tonsil

p27<sup>Kip1</sup>, also known as cyclin-dependent kinase inhibitor 1B (CDKN1B), is a kinase inhibitor that controls cell cycle progression.<sup>1-4</sup> p27<sup>Kip1</sup> is involved in G1 phase arrest and obstructs cell entry into the S phase by binding to and inhibiting cyclin E-CDK2, effectively slowing or stopping the cell division cycle.<sup>1-4</sup> p27<sup>Kip1</sup> is broadly expressed in normal tissue but can be dysfunctional in neoplastic tissue and, therefore, not expressed.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Thyroid: Malignant vs. Benign	301
Cervical Epithelial Neoplastic Lesions	302
B-cell Lymphomas	311

## Reference

1. Polyak K, et al. Cloning of p27Kip1, a cyclin-dependent kinase inhibitor and a potential mediator of extracellular antimitogenic signals. *Cell*. 1994; 78:59-66.
2. Sun C, et al. Regulation of p27Kip1 phosphorylation and G1 cell cycle progression by protein phosphatase PPM1G. *AM J Cancer Res*. 2016; 6:2207-20.
3. Sangfelt O, et al. Molecular mechanisms underlying interferon-alpha-induced G0/G1 arrest: CKI-mediated regulation of G1 Cdk-complexes and activation of pocket proteins. *Oncogene*. 1999; 18:2798-810.
4. Hsieh FF, et al. Cell cycle exit during terminal erythroid differentiation is associated with accumulation of p27(Kip1) and inactivation of cdk2 kinase. *Blood*. 2000; 96:2746-54.

## Ordering Information

### p27<sup>Kip1</sup> (SX53G8)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	427M-94
0.5 mL concentrate	427M-95
1 mL concentrate	427M-96
1 mL predilute	427M-97
7 mL predilute	427M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# p53

Anti-p53 tumor suppressor protein antibody recognizes a 53-kD phosphoprotein, identified as p53 suppressor gene product. It reacts with the mutant as well as wild type p53.<sup>1</sup> Positive nuclear staining with this antibody has been shown to be a factor in breast carcinoma, lung carcinoma, colorectal carcinoma, urothelial carcinoma, and ependymoma.<sup>2-8</sup> Anti-p53 positivity has also been used to differentiate uterine serous carcinoma from endometrioid carcinoma, as well as a marker for intratubular germ cell neoplasia.<sup>9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon carcinoma, breast carcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- DO7: IgG<sub>2b</sub>/k
- SP5: IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Liver: Malignant vs. Benign	297
Neuroendocrine Tumors from Different Anatomical Locations	299
Bladder Urothelium: Dysplasia vs. Reactive Changes	308

## Reference

1. Dabbs DJ. Diagnostic Immunohistochemistry. Third Edition. Saunders. 2006.
2. Mayall FG, et al. P-53 immunostaining in the distinction between benign and malignant mesothelial proliferations using formalin-fixed paraffin sections. J Pathol. 1992; 168:377-81.
3. Caffo O, et al. Prognostic value of p21(WAF1) and p53 expression in breast carcinoma: an immunohistochemical study in 261 patients with long-term follow-up. Clin Cancer Res. 1996; 2:1591-9.
4. Bebenek M, et al. Prospective studies of p53 and c-erbB-2 expression in relation to clinicopathological parameters of human ductal breast cancer in the second stage of clinical advancement. Anticancer Res. 1998; 18:619-23.
5. Midulla C, et al. Immunohistochemical expression of p53, nm23-H1, Ki67 and DNA ploidy: correlation with lymph node status and other clinical pathologic parameters in breast cancer. Anticancer Res. 1999; 19:4033-7.
6. van den Berg FM, et al. Detection of p-53 overexpression in routinely paraffin-embedded tissue of human carcinomas using a novel target unmasking fluid. Am J Pathol. 1993; 142:381-5.

For the complete list of references see the product IFU.

## Ordering Information

### p53 (DO7)

Mouse Monoclonal Antibody

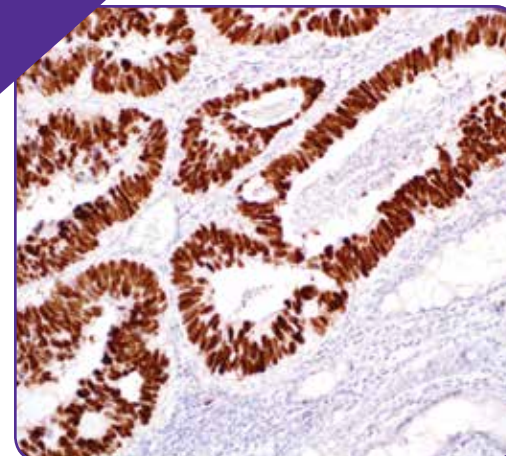
Volume	Part No.
0.1 mL concentrate	453M-94
0.5 mL concentrate	453M-95
1 mL concentrate	453M-96
1 mL predilute	453M-97
7 mL predilute	453M-98

### p53 (SP5)

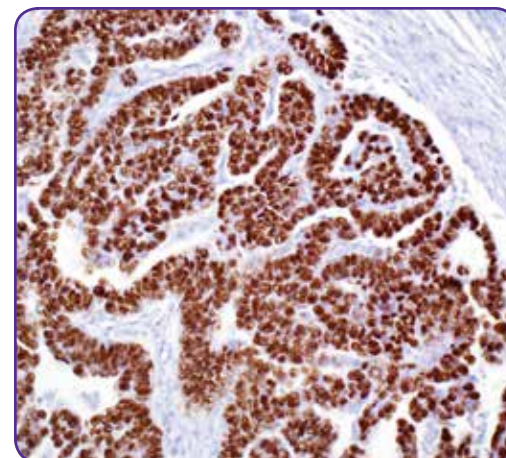
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	453R-14
0.5 mL concentrate	453R-15
1 mL concentrate	453R-16
1 mL predilute	453R-17
7 mL predilute	453R-18

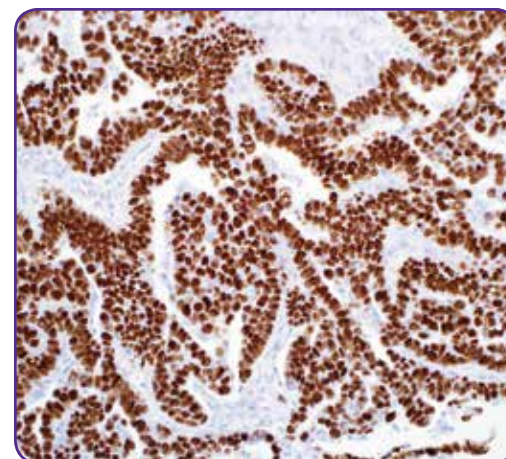
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Colorectal carcinoma

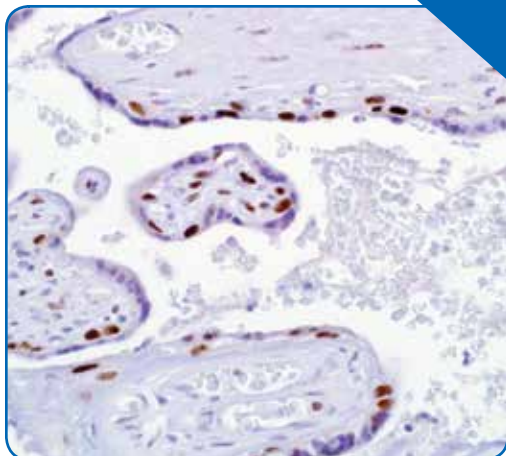


Lung adenocarcinoma

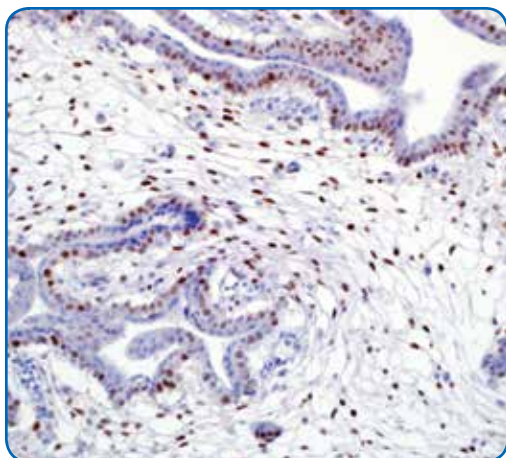


Ovarian carcinoma

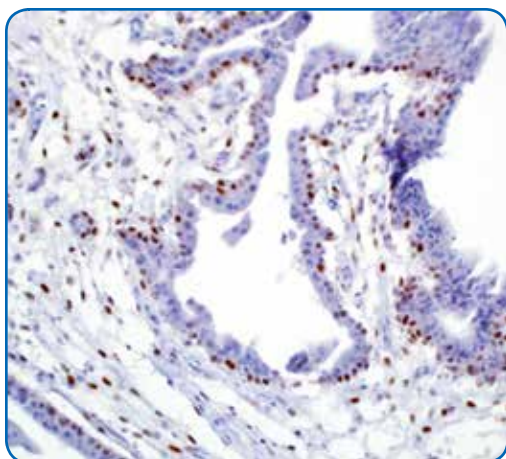




Placenta



Partial mole



Partial mole

Anti-p57 has been used as an aid in discriminating complete hydatidiform mole (CHM) (no nuclear labeling of cytotrophoblasts or stromal cells) from partial hydatidiform mole (PHM) (nuclear staining of both cytotrophoblasts and stromal cells) and hydropic abortion. In normal placenta, cytotrophoblast, syncytiotrophoblast, and stromal cells are labeled with this antibody. Intervillous trophoblastic islands demonstrate nuclear labeling in all entities and serve as an internal control.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** placenta

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>/k

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Placental Trophoblastic Proliferations	303
Uterus: Trophoblastic Proliferations	304

## Reference

1. Kihara M, et al. Genetic origin and imprinting in hydatidiform moles. Comparison between DNA polymorphism analysis and immunoreactivity of p57Kip2. *J Reprod Med.* 2005; 50:307-12.
2. Romaguera RL, et al. Molar gestations and hydropic abortions differentiated by p57 immunostaining. *Fetal Pediatr Pathol.* 2004; 23:181-90.
3. Marjoniemi VM. Immunohistochemistry in gynaecological pathology: a review. *Pathology.* 2004; 36:109-19.
4. Jun SY, et al. p57Kip2 is useful in the classification and differential diagnosis of complete and partial hydatidiform moles. *Histopathology.* 2003; 43:17-25.

## Ordering Information

### p57<sup>Kip2</sup> (Kp10)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	457M-94
0.5 mL concentrate	457M-95
1 mL concentrate	457M-96
1 mL predilute	457M-97
7 mL predilute	457M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# p120 Catenin

p120 catenin is encoded on chromosome 11q11. Alpha-catenin and beta-catenin bind to the intracellular domain of E-cadherin while p120 catenin binds E-cadherin at a juxta-membrane site.<sup>1</sup> The complex stabilizes tight junctions. In the cell, p120 catenin localized to the E-cadherin/catenins cell adhesion complex, directly associates with cytoplasmic C-terminus of E-cadherin and may similarly interact with other cadherins.<sup>2</sup> A deficiency of E-cadherin results in the mislocalization of p120 catenin from the cell membrane to the cytoplasm. Lobular carcinoma of the breast shows loss of the membranous stain for p120 catenin with its intracytoplasmic accumulation while ductal carcinoma shows membranous p120 catenin without cytoplasmic accumulation.<sup>3,4</sup> In gastric and colonic carcinoma, strong cytoplasmic p120 catenin is associated with discohesive infiltrative morphology.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** breast lobular carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Breast Lesion	302

## Reference

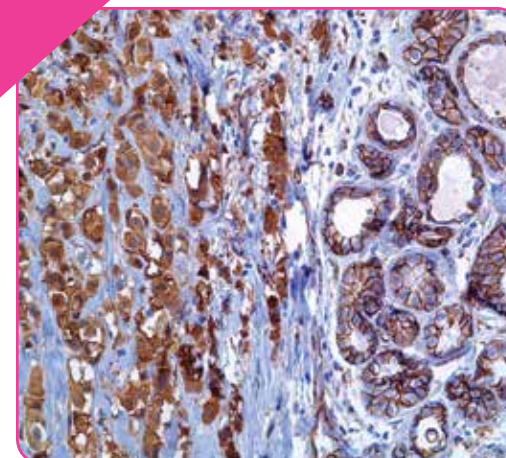
1. Reynolds AB, et al. p120, a novel substrate of protein tyrosine kinase receptors and of p60v-src, is related to cadherin-binding factors beta-catenin, plakoglobin and armadillo. *Oncogene*. 1992; 7:2439-45.
2. Thoreson MA, et al. Selective uncoupling of p120(ctn) from E-cadherin disrupts strong adhesion. *J Cell Biol*. 2000; 148:189-202.
3. Sarrio D, et al. Cytoplasmic localization of p120ctn and E-cadherin loss characterize lobular breast carcinoma from preinvasive to metastatic lesions. *Oncogene*. 2004; 23:3272-83.
4. Dabbs DJ, et al. Lobular versus ductal breast neoplasms: the diagnostic utility of p120 catenin. *Am J Surg Pathol*. 2007; 31:427-37.
5. Jawhari AU, et al. Up-regulated cytoplasmic expression, with reduced membranous distribution, of the src substrate p120 (ctn) in gastric carcinoma. *J Pathol*. 1999; 189:180-5.

## Ordering Information

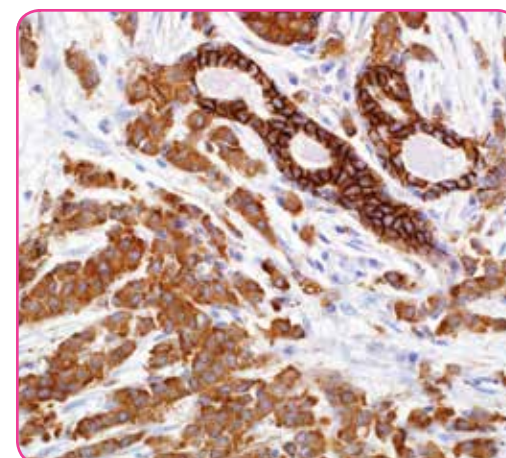
### p120 Catenin (MRQ-5) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	420M-14
0.5 mL concentrate	420M-15
1 mL concentrate	420M-16
1 mL predilute	420M-17
7 mL predilute	420M-18
25 mL predilute	420M-10

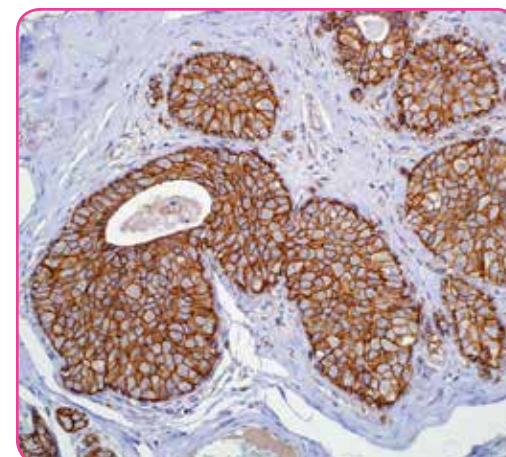
Please contact your distributor for details on product availability and regulatory status in your country.



Left: invasive lobular carcinoma, cytoplasmic  
Right: proliferating ducts, membranous



Breast, invasive lobular carcinoma



Breast, ductal carcinoma *in situ*

# P504s

FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

AMACR

Racemase

## Associated Specialties

Genitourinary (GU) Pathology

## Ordering Information

### P504s (13H4)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	504R-14-RUO
0.5 mL concentrate	504R-15-RUO
1 mL concentrate	504R-16-RUO
1 mL predilute	504R-17-RUO
7 mL predilute	504R-18-RUO
25 mL predilute	504R-10-RUO

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Parathyroid Hormone (PTH)

The parathyroid glands function within the endocrine system to promote blood calcium homeostasis through controlled release of parathyroid hormone (PTH). This process involves the synthesis and secretion of PTH by activated parathyroid chief cells during conditions of hypocalcemia.<sup>1</sup> With the anatomical proximity to the thyroid and capacity of associated neoplasms of the parathyroid to mimic thyroid tumors, challenges can arise in distinguishing between these types of abnormalities. In cases where there is uncertainty about a tumor being of parathyroid origin, immunohistochemical evaluation using anti-PTH can be of value.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** parathyroid tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Synonyms and Abbreviations

PTH

## Associated Specialties

Head/Neck Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Thyroid and Parathyroid Tumors	295, 311

## Reference

1. Abate EG, et al. Review of Hypoparathyroidism. *Front Endocrinol (Lausanne)*. 2017; 7:172.
2. Chang TC, et al. Immunoperoxidase staining in the differential diagnosis of parathyroid from thyroid origin in fine needle aspirates of suspected parathyroid lesions. *Acta Cytol*. 1998; 42:619-624.
3. Duan K, et al. Parathyroid Carcinoma: Diagnosis and Clinical Implications. *Turk Patoloji Derg*. 2015; 31 Suppl 1:80-97.

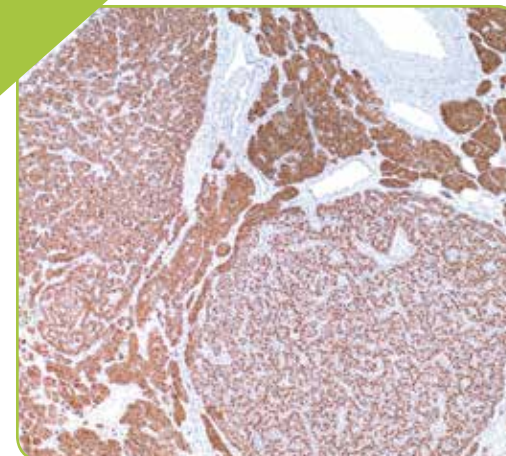
## Ordering Information

### Parathyroid Hormone (PTH) (MRQ-31)

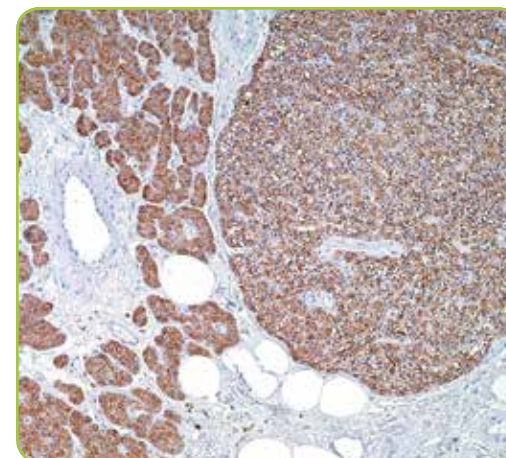
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	310M-24
0.5 mL concentrate	310M-25
1 mL concentrate	310M-26
1 mL predilute	310M-27
7 mL predilute	310M-28

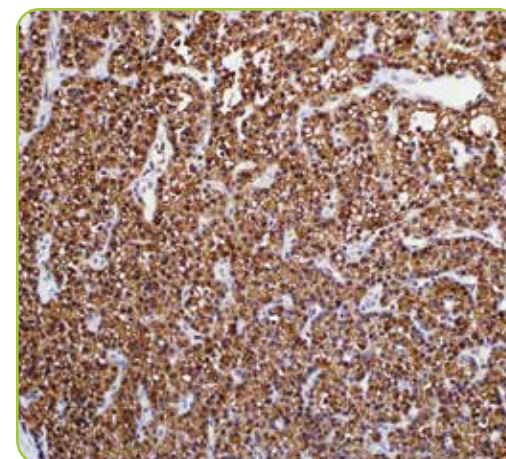
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Hyperplastic parathyroid gland

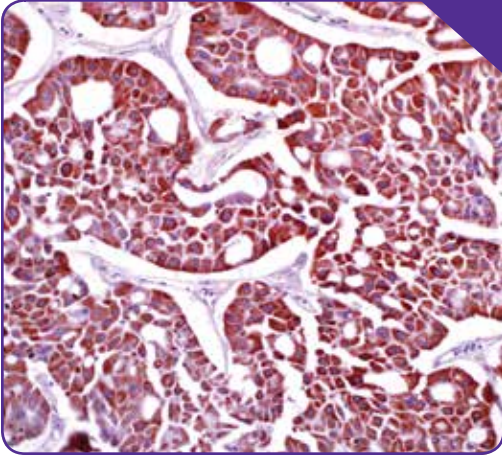


Hyperplastic parathyroid gland

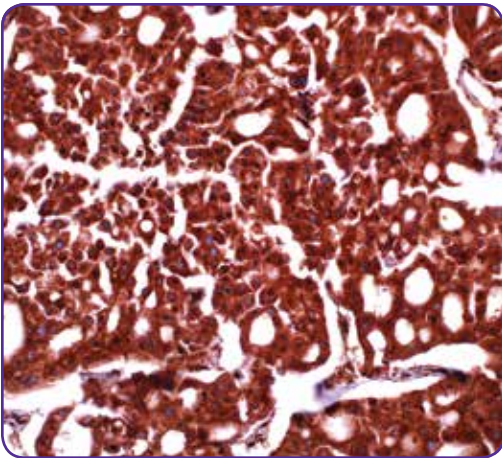


Hyperplastic parathyroid gland

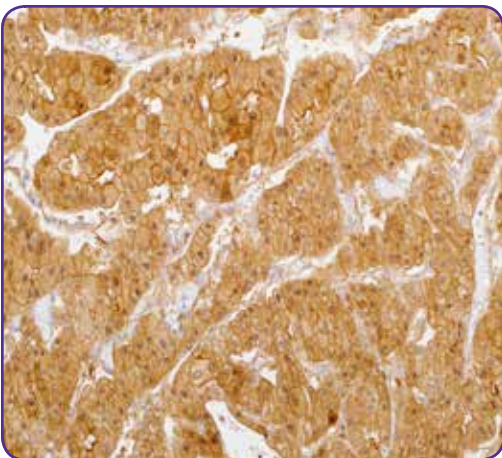
# Parvalbumin



Chromophobe renal cell carcinoma (RCC)



Chromophobe renal cell carcinoma (RCC)



Chromophobe renal cell carcinoma (RCC)

Parvalbumin is a calcium-binding protein that regulates cytosolic calcium homeostasis.<sup>1-2</sup> Tissue types that express this protein have been reported in the muscle, brain, neuroendocrine organs, and kidney.<sup>1-2</sup> In normal kidney, parvalbumin has been shown to be limited to the distal tubular and collecting duct cells (the intercalated cells).<sup>1-3</sup> Parvalbumin is expressed in most all of primary, as well as metastatic, chromophobe renal cell carcinoma (RCC) and oncocytoma, but is rarely expressed in other types of RCCs, such as clear cell RCC and papillary RCC.<sup>1-4</sup> This limited expression has been considered in keeping with the putative histogenesis of chromophobe RCC and oncocytoma from the distal portion of the nephron and may facilitate in their differential diagnoses.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** chromophobe renal cell carcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- 2E11: IgG<sub>1</sub>
- EP300: IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Kidney Neoplasms	310

## Reference

1. Adley BP, et al. Diagnostic value of cytokeratin 7 and parvalbumin in differentiating chromophobe renal cell carcinoma from renal oncocytoma. *Anal Quant Cytol Histol.* 2006; 28:228-36.
2. Young AN, et al. Beta defensin-1, parvalbumin, and vimentin: a panel of diagnostic immunohistochemical markers for renal tumors derived from gene expression profiling studies using cDNA microarrays. *Am J Surg Pathol.* 2003; 27:199-205.
3. Martignoni G, et al. Parvalbumin is constantly expressed in chromophobe renal carcinoma. *Mod Pathol.* 2001; 1:760-7.
4. Teresa P, et al. Malignant effusion of chromophobe renal-cell carcinoma: cytological and immunohistochemical findings. *Diagn Cytopathol.* 2012; 40:56-61.

## Ordering Information

### Parvalbumin (2E11)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	396M-14
0.5 mL concentrate	396M-15
1 mL concentrate	396M-16
1 mL predilute	396M-17
7 mL predilute	396M-18

### Parvalbumin (EP300)

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	396R-14
0.5 mL concentrate	396R-15
1 mL concentrate	396R-16
1 mL predilute	396R-17
7 mL predilute	396R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Parvovirus B19

Anti-parvovirus targets the capsid proteins VP1 and VP2 on human parvovirus. Parvovirus B19 infection has been implicated as a cause in spontaneous abortion in humans. Parvovirus B19 is also associated with erythema infectiosum (fifth disease) in children and acute arthritis in adults, as well as chronic hemolytic anemia, with some patients experiencing aplastic crisis.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** parvovirus infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

## Reference

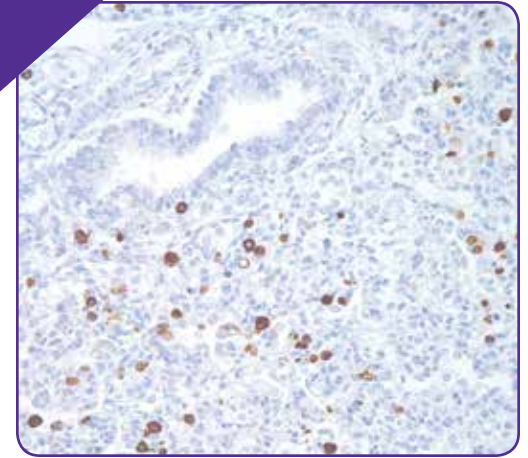
1. Loughrey AC, et al. Identification and use of a neutralising epitope of parvovirus B19 for the rapid detection of virus infection. *J Med Virol.* 1993; 39:97-100.
2. Moore L, et al. A report of human parvovirus B19 infection in hydrops fetalis. First Australian cases confirmed by serology and immunohistology. *Med J Aust.* 1993; 159:344-5.
3. Morey AL, et al. Immunohistological detection of human parvovirus B19 in formalin-fixed, paraffin-embedded tissues. *J Pathol.* 1992; 166:105-8.

## Ordering Information

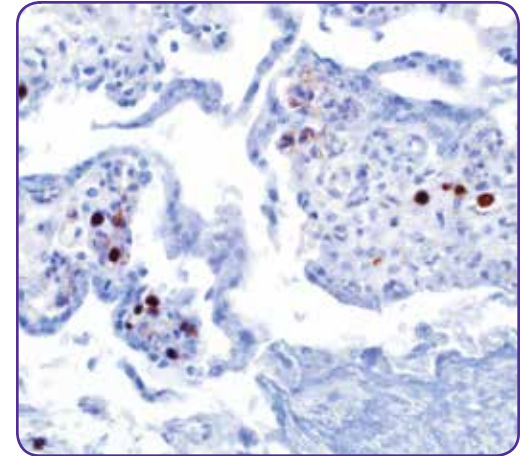
**Parvovirus B19 (R92F6)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	218M-14
0.5 mL concentrate	218M-15
1 mL concentrate	218M-16
1 mL predilute	218M-17
7 mL predilute	218M-18

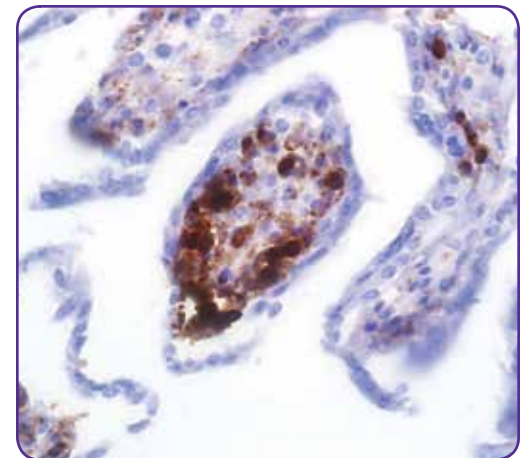
*Please contact your distributor for details on product availability and regulatory status in your country.*



Fetal lung

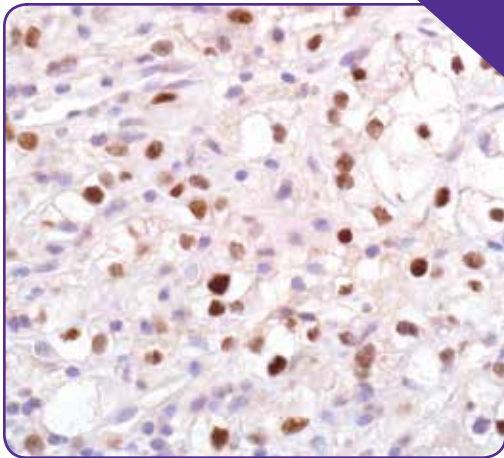


Placenta

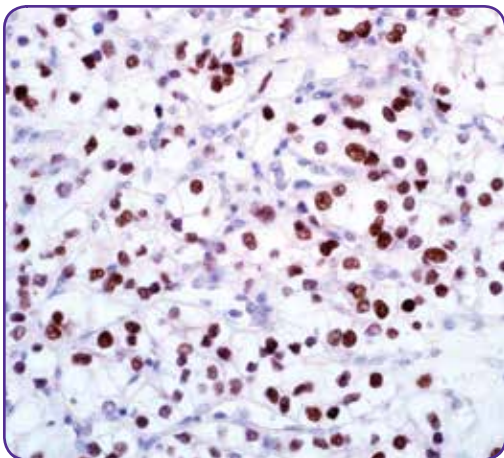


Infected placenta

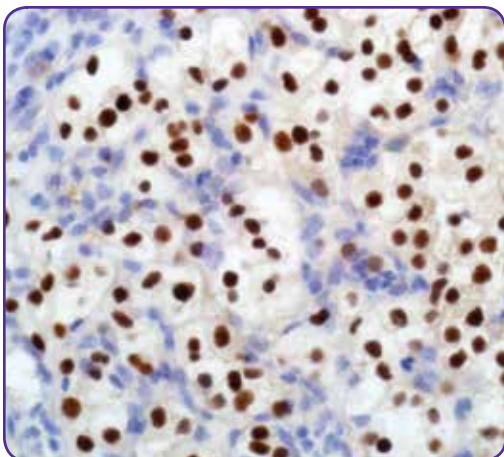
# PAX-2



Renal cell carcinoma



Renal cell carcinoma



Renal cell carcinoma

PAX-2 is a homeogene strongly expressed during kidney development. PAX-2 gene is expressed in the metanephric mesenchyma after ureter bud induction and is a key factor for the mesenchyma-epithelium conversion. Animals transgenic for PAX-2 have severe renal abnormalities and cysts but no solid tumoral features. The oncogenic potential of the PAX gene family has been reported *in vitro* with transformation of cell cultures and *in vivo* with cell injections in nude mice. Gnarra et al. showed PAX-2 expression in renal carcinoma cell lines and underlined its potential role in cell proliferation in these lines.<sup>1</sup> Mazal et al. demonstrated PAX-2 nuclear expression in 88% of clear cell renal cell carcinomas as well as 18% of papillary renal cell carcinomas, and 13% of chromophobe renal cell carcinomas.<sup>2</sup> More recently, Chivukula et al. demonstrated utility in distinguishing ovarian serous papillary carcinoma (anti-PAX-2 positive) from breast carcinoma (anti-PAX-2 negative).<sup>3</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** renal cell carcinoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Kidney Neoplasms	310
Prostate Lesions	310
RCC vs. Hemangioblastoma	310

## Reference

1. Gnarra JR, et al. Expression of Pax-2 in human renal cell carcinoma and growth inhibition by antisense oligonucleotides. *Cancer Res.* 1995; 55:4092-8.
2. Mazal PR, et al. Expression of aquaporins and PAX-2 compared to CD10 and cytokeratin 7 in renal neoplasms: a tissue microarray study. *Mod Pathol.* 2005; 4:535-40.
3. Chivukula M, et al. PAX 2: a novel M&#252;llerian marker for serous papillary carcinomas to differentiate from micropapillary breast carcinoma. *Int J Gynecol Pathol.* 2009; 28:570-8.

## Ordering Information

**PAX-2 (EP235)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	311R-14
0.5 mL concentrate	311R-15
1 mL concentrate	311R-16
1 mL predilute	311R-17
7 mL predilute	311R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# PAX-5

PAX-5 encodes for B-cell-specific activator protein (BSAP), a marker for B-cells, including B-lymphoblastic neoplasms and maturation stage. It is found in most cases of mature and precursor B-cell non-Hodgkin lymphomas/leukemias. In approximately 97% of cases of classic Hodgkin lymphoma, Reed-Sternberg cells express PAX-5.<sup>4</sup> PAX-5 is not detected in multiple myeloma and solitary plasmacytoma, making it useful for such differentiation.<sup>1,3</sup> Diffuse large B-cell lymphomas do express PAX-5, save for those with terminal B-cell differentiation. T-cell neoplasms do not stain with anti-PAX-5. There is a strong association with CD20 expression.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- 24: IgG<sub>1</sub>
- EP156: IgG
- SP34: IgG

## Synonyms and Abbreviations

BSAP

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Mature B-cell Neoplasms with Reduced CD20 Expression	316
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314
Lymphomas and Myeloid Sarcoma	315

## Reference

1. Torlakovic E, et al. The value of anti-pax-5 immunostaining in routinely fixed and paraffin-embedded sections: a novel pan pre-B and B-cell marker. *Am J Surg Pathol.* 2002; 26:1343-50.
2. Willenbrock K, et al. T-cell variant of classical Hodgkin's lymphoma with nodal and cutaneous manifestations demonstrated by single-cell polymerase chain reaction. *Lab Invest.* 2002; 82:1103-9.
3. Falini B, et al. Proteins encoded by genes involved in chromosomal alterations in lymphoma and leukemia: clinical value of their detection by immunocytochemistry. *Blood.* 2002; 99:409-26.
4. Schwering I, et al. Loss of the B-lineage-specific gene expression program in Hodgkin and Reed-Sternberg cells of Hodgkin lymphoma. *Blood.* 2003; 101:1505-12.

## Ordering Information

### PAX-5 (24)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	312M-14
0.5 mL concentrate	312M-15
1 mL concentrate	312M-16
1 mL predilute	312M-17
7 mL predilute	312M-18

### PAX-5 (EP156)

Rabbit Monoclonal Primary Antibody



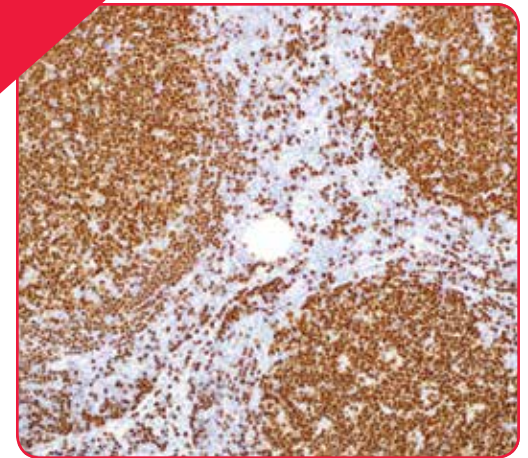
Volume	Part No.
0.1 mL concentrate	312R-24
0.5 mL concentrate	312R-25
1 mL concentrate	312R-26
1 mL predilute	312R-27
7 mL predilute	312R-28
25 mL predilute	312R-20

### PAX-5 (SP34)

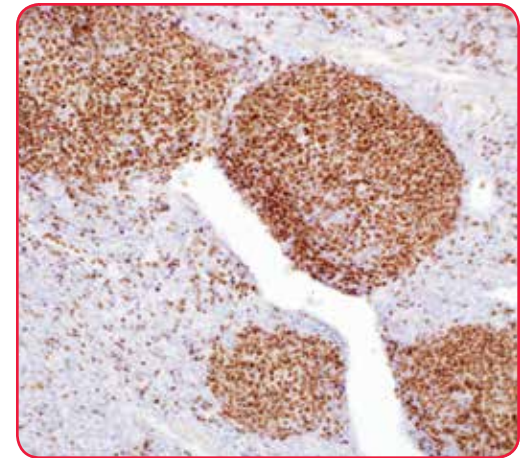
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	312R-14
0.5 mL concentrate	312R-15
1 mL concentrate	312R-16
1 mL predilute	312R-17
7 mL predilute	312R-18

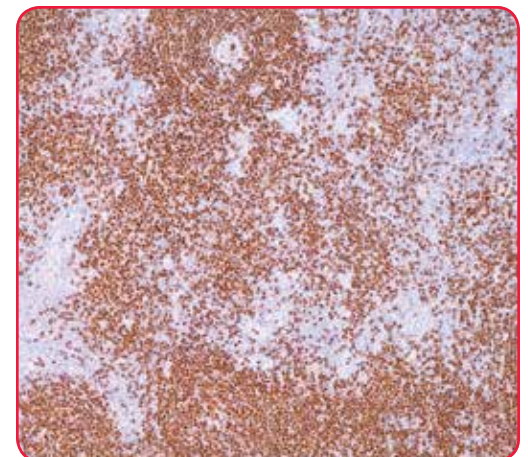
Please contact your distributor for details on product availability and regulatory status in your country.



Lymph node



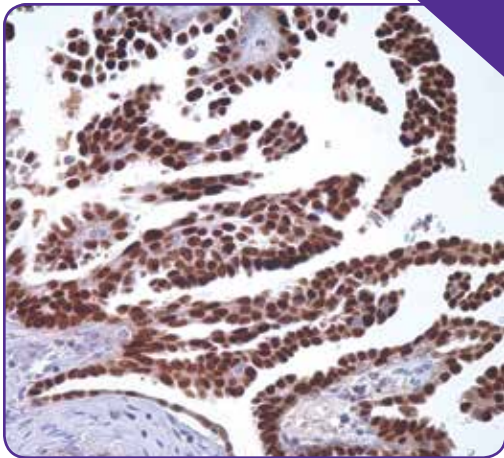
Follicular lymphoma



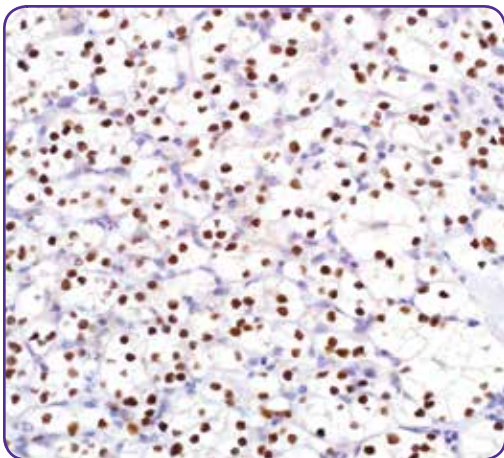
MALT lymphoma



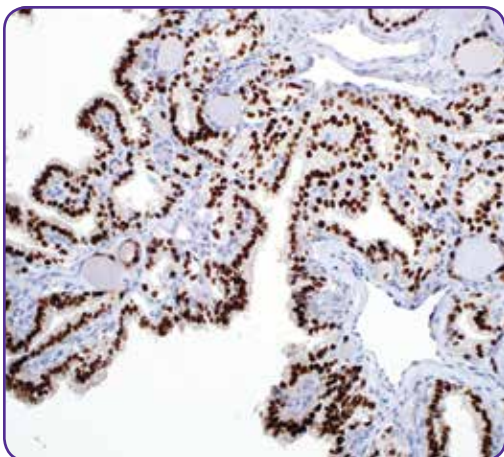
# PAX-8



Ovarian carcinoma



Clear cell renal cell carcinoma



Papillary thyroid carcinoma

PAX-8 is a transcription factor expressed during embryonic development of Müllerian organs, kidney, and thyroid, with continued expression in some epithelial cell types of these mature tissues.<sup>1</sup> It can be useful for marking several types of carcinoma including ovarian serous carcinoma, clear cell renal cell carcinoma, and papillary thyroid carcinoma.<sup>1-5</sup> Additionally, PAX-8 is not found in the epithelial cells of the breast, lung, mesothelium, stomach, colon, pancreas and other sites.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** ovarian carcinoma (non-mucinous carcinoma), thyroid carcinoma, renal cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** MRQ-50: IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Carcinomas and Sarcomas with Epithelioid Morphology (Features)	293
Carcinomas from Thyroid and Other Sites	294
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Differential Diagnosis of Metastatic Adenocarcinomas	295
Differential Diagnosis of Thyroid and Parathyroid Tumors	295, 311
Micropapillary Carcinomas	297
Neuroendocrine Neoplasms	298
Ovarian Carcinomas	303

## Reference

1. Ozcan A, et al. PAX 8 expression in non-neoplastic tissues, primary tumors, and metastatic tumors: a comprehensive immunohistochemical study. *Mod Pathol.* 2011; 24:751-64.
2. Laury AR, et al. A comprehensive analysis of PAX8 expression in human epithelial tumors. *Am J Surg Pathol.* 2011; 35:816-26.
3. Nonaka D, et al. Expression of pax8 as a useful marker in distinguishing ovarian carcinomas from mammary carcinomas. *Am J Surg Pathol.* 2008; 32:1566-71.
4. Nonaka D, et al. Diagnostic utility of thyroid transcription factors Pax8 and TTF-2 (Fox E1) in thyroid epithelial neoplasms. *Mod Pathol.* 2008; 21:192-200.
5. Tong GX, et al. Expression of PAX8 in normal and neoplastic renal tissues: an immunohistochemical study. *Mod Pathol.* 2009; 22:1218-27.

## Ordering Information

### PAX-8 (MRQ-50)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	363M-14
0.5 mL concentrate	363M-15
1 mL concentrate	363M-16
1 mL predilute	363M-17
7 mL predilute	363M-18
25 mL predilute	363M-10

### PAX-8

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	363A-14
0.5 mL concentrate	363A-15
1 mL predilute	363A-17
7 mL predilute	363A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# PD-1

Programmed death-1 (PD-1) is expressed on activated T-cells, B-cells, and myeloid cells. Anti-PD-1 is a marker of angioimmunoblastic lymphoma and suggests a unique cell of origin for this neoplasm. Unlike CD10 and BCL6, PD-1 is expressed by few B-cells, so anti-PD-1 may be a more specific and useful marker in the identification of angioimmunoblastic lymphoma. In addition, PD-1 expression provides evidence that angioimmunoblastic lymphoma is a neoplasm derived from germinal center-associated T-cells. PD-1 expression in angioimmunoblastic lymphoma lends further support to this model of T-cell oncogenesis, in which specific subtypes of T-cells may undergo neoplastic transformation and result in specific distinct histologic, immunophenotypic, and clinical subtypes of T-cell neoplasia.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** lymph node, tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP239: IgG
- NAT105: IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymph Node	297
B-cell Lymphomas	311
Histiocytic and Dendritic Cell Neoplasms	313
T-cell Lymphomas	317

## Reference

1. Bolstad AI, et al. Increased salivary gland tissue expression of Fas, Fas ligand, cytotoxic T lymphocyte-associated antigen 4, and programmed cell death 1 in primary Sjögren's syndrome. *Arthritis Rheum.* 2003; 48:174-85.
2. Kobayashi M, et al. Enhanced expression of programmed death-1 (PD-1)/PD-L1 in salivary glands of patients with Sjögren's syndrome. *J Rheumatol.* 2005; 32:2156-63.
3. Hamanishi J, et al. Programmed cell death 1 ligand 1 and tumor-infiltrating CD8+ T lymphocytes are prognostic factors of human ovarian cancer. *Proc Natl Acad Sci U S A.* 2007; 104:3360-5.
4. Iwai Y, et al. Microanatomical localization of PD-1 in human tonsils. *Immunol Lett.* 2002; 83:215-20.
5. Dorfman DM, et al. Programmed death-1 (PD-1) is a marker of germinal center-associated T cells and angioimmunoblastic T-cell lymphoma. *Am J Surg Pathol.* 2006; 30:802-10.
6. Konishi J, et al. B7-H1 expression on non-small cell lung cancer cells and its relationship with tumor-infiltrating lymphocytes and their PD-1 expression. *Clin Cancer Res.* 2004; 10:5094-100.

## Ordering Information

### PD-1 (EP239)

Rabbit Monoclonal  
Primary Antibody



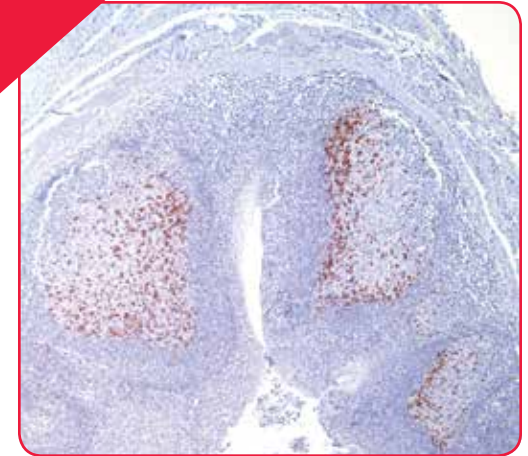
Volume	Part No.
0.1 mL concentrate	315R-14
0.5 mL concentrate	315R-15
1 mL concentrate	315R-16
1 mL predilute	315R-17
7 mL predilute	315R-18

### PD-1 (NAT105)

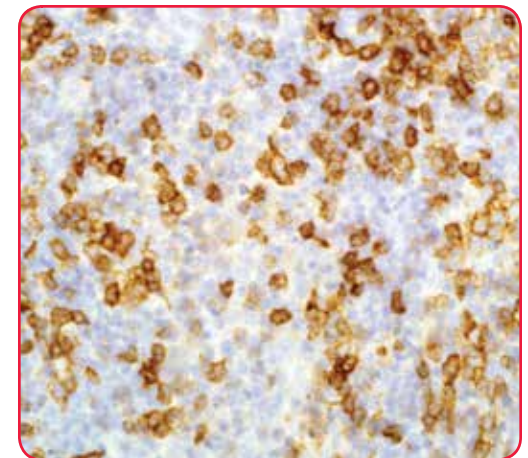
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	315M-94
0.5 mL concentrate	315M-95
1 mL concentrate	315M-96
1 mL predilute	315M-97
7 mL predilute	315M-98

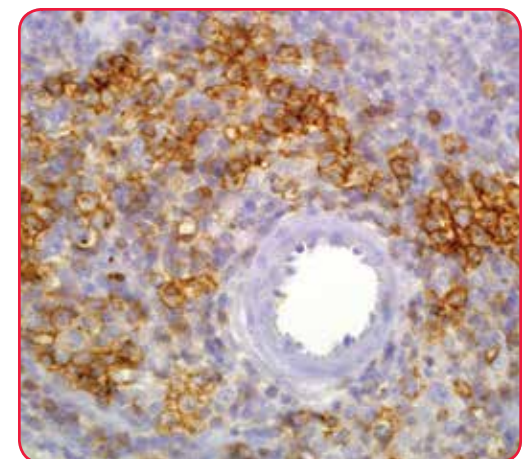
Please contact your distributor for details on product availability and regulatory status in your country.



Tonsil, scattered germinal center cells

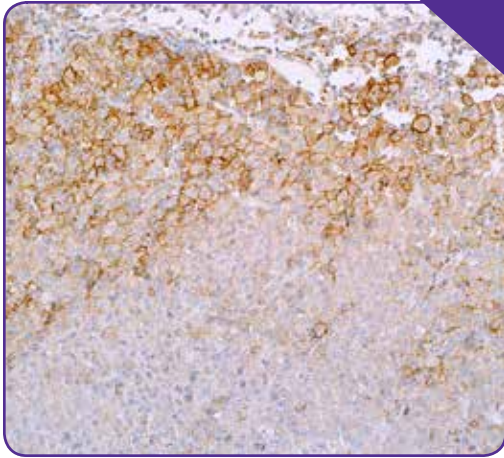


Lymph node, angioimmunoblastic T-cell lymphoma

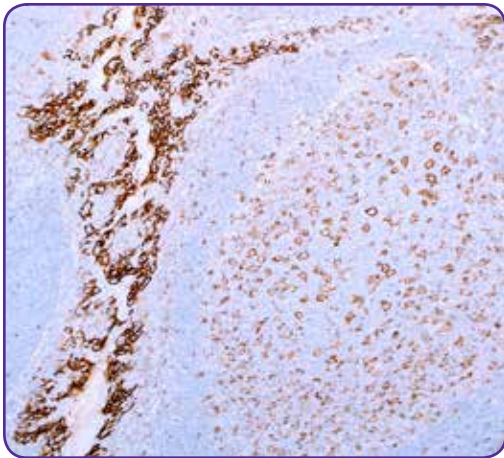


Angioimmunoblastic T-cell lymphoma

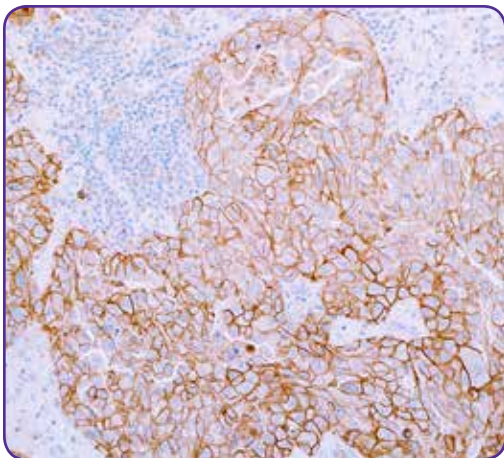
# PD-L1



Melanoma



Tonsil



Lung adenocarcinoma

Programmed death ligand 1 (PD-L1), also known as B7-H1 and CD274, is a transmembrane glycoprotein that plays a role in T-cell regulation and immune tolerance.<sup>1,2</sup> In normal tissue, PD-L1 binds to programmed death receptor 1 (PD-1) to inhibit self-reactive T-cell function and proliferation, thus avoiding autoimmunity.<sup>1,2</sup> Many tumors express PD-L1 as a mechanism to evade immune response.<sup>3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** melanoma, non-small cell lung carcinoma, tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 28-8: IgG
- ZR3: IgG

## Synonyms and Abbreviations

B7-H1  
CD274

## Associated Specialties

Anatomic Pathology  
Hematopathology

## Reference

1. Francisco L, et al. The PD-1 pathway in tolerance and autoimmunity. *Immunol.* 2010; 236:219-42.
2. Park J, et al. B7-H1/CD80 interaction is required for the induction and maintenance of peripheral T-cell tolerance. *Blood.* 2010; 116:1291-8.
3. Jin HT, et al. Role of PD-1 in regulating T-cell immunity. *Curr Top Microbiol Immunol.* 2011; 350:17-37.
4. Mino-Kenudson M. Programmed cell death-ligand 1 (PD-L1) expression by immunohistochemistry: could it be predictive and/or prognostic in non-small cell lung cancer? *Cancer Biol Med.* 2016; 13:157-70.

## Ordering Information

### PD-L1 (28-8)

Rabbit Monoclonal  
Primary Antibody

Volume	Part No.
0.1 mL concentrate	438R-14
0.5 mL concentrate	438R-15
1 mL concentrate	438R-16
1 mL predilute	438R-17
7 mL predilute	438R-18

### PD-L1 (ZR3)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	438R-24
0.5 mL concentrate	438R-25
1 mL concentrate	438R-26
1 mL predilute	438R-27
7 mL predilute	438R-28

*Please contact your distributor for details on product availability and regulatory status in your country.*



# Perforin

Perforin is a pore-forming protein that leads to osmotic lysis of the target cells and subsequently enables granzymes to enter the target cells and activate apoptosis, the cell death program. The expression of perforin is reportedly upregulated in activated CD8+ T-cells, natural killer cells and some CD4+ T-cells.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** spleen

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Cytotoxic Molecules in Mature T- and NK-cell Neoplasms	312
NK Cell Leukemia/Lymphoma	316
T-cell Lymphomas	317

## Reference

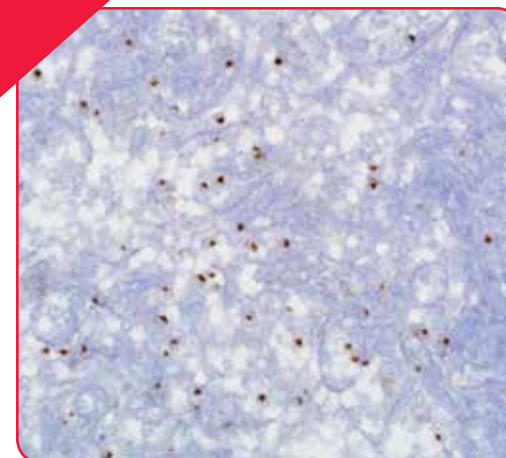
1. Chu PG, et al. Practical applications of immunohistochemistry in hematolymphoid neoplasms. *Ann Diagn Pathol.* 1999; 3:104-33.
2. Bittmann I, et al. Fas/FasL and perforin/granzyme pathway in acute rejection and diffuse alveolar damage after allogeneic lung transplantation- a human biopsy study. *Virchows Arch.* 2004; 445:375-81.
3. d'Amore ES, et al. Anaplastic large cell lymphomas: a study of 75 pediatric patients. *Pediatr Dev Pathol.* 2007; 10:181-91.

## Ordering Information

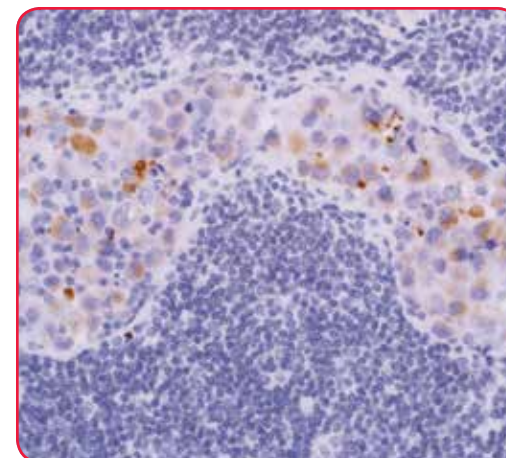
**Perforin (MRQ-23)**  
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	316M-14
0.5 mL concentrate	316M-15
1 mL concentrate	316M-16
1 mL predilute	316M-17
7 mL predilute	316M-18

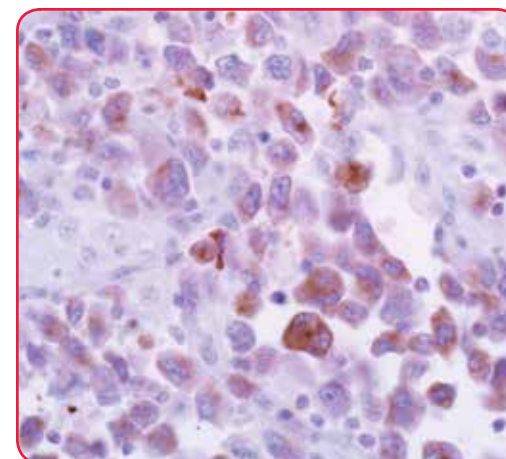
*Please contact your distributor for details on product availability and regulatory status in your country.*



Spleen

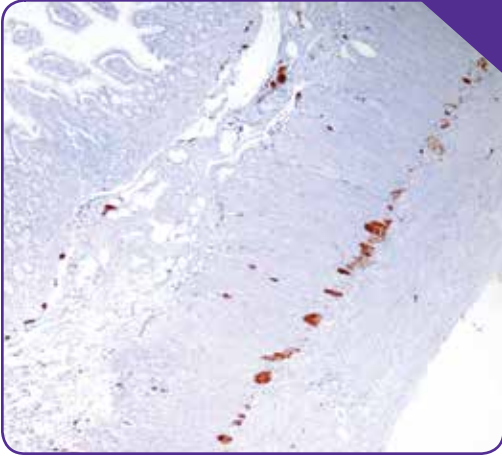


Lymph node, anaplastic large cell lymphoma

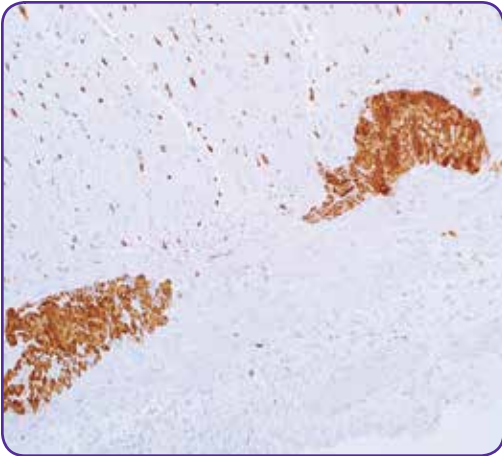


Lymph node, anaplastic large cell lymphoma

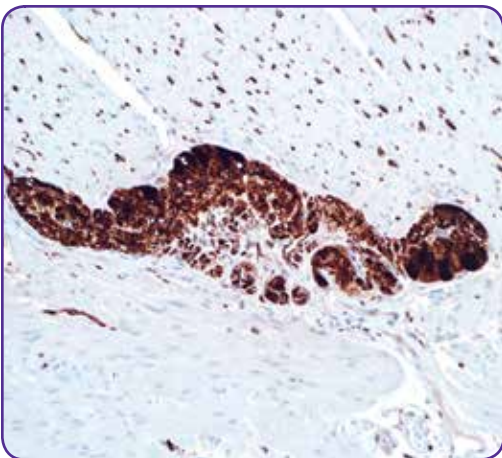
# PGP 9.5



Small intestine wall



Colon wall



Auerbach's plexus

Protein gene product 9.5 (PGP 9.5), also known as ubiquitin carboxyl-terminal hydrolase-1 (UCHL-1), is a 27-kD protein originally isolated from whole brain extracts.<sup>1</sup> Although PGP 9.5 expression in normal tissues was originally felt to be strictly confined to neurons and neuroendocrine cells,<sup>2</sup> it has been subsequently documented in distal renal tubular epithelium, spermatogonia, Leydig cells, oocytes, melanocytes, prostatic secretory epithelium, ejaculatory duct cells, epididymis, mammary epithelial cells, Merkel cells, and dermal fibroblasts.<sup>1</sup> A plethora of mesenchymal neoplasms have demonstrated PGP 9.5 expression.<sup>1,3,4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** nerve tissue

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

UCHL-1

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Retroperitoneal Lesions	299, 319
Spindle Cell Tumors	300
Retroperitoneal Neoplasms	318
Muscle Malignant Tumors	321
Small Blue Round Cell Tumors	322

## Reference

1. Campbell LK, et al. Protein gene product 9.5 (PGP 9.5) is not a specific marker of neural and nerve sheath tumors: an immunohistochemical study of 95 mesenchymal neoplasms. *Mod Pathol.* 2003; 16:963-9.
2. Bassotti G, et al. Interstitial cells of Cajal, enteric nerves, and glial cells in colonic diverticular disease. *J Clin Pathol.* 2005; 58:973-7.
3. Mahalingam M, et al. Expression of PGP 9.5 in granular cell nerve sheath tumors: and immunohistochemical study of six cases. *J Cutan Pathol.* 2001; 28:282-6.
4. Mahalingam M, et al. Multiple cellular neurothekeomas—a case report and review on the role of immunohistochemistry as a histo-logic adjunct. *J Cutan Pathol.* 2006; 33:51-6.

## Ordering Information

### PGP 9.5

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	318A-14
0.5 mL concentrate	318A-15
1 mL concentrate	318A-16
1 mL predilute	318A-17
7 mL predilute	318A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Phosphohistone H3 (PHH3)

Phosphohistone H3 (PHH3) is a core histone protein, which together with other histones, forms the major protein constituents of the chromatin in eukaryotic cells. In mammalian cells, PHH3 is negligible during interphase but reaches a maximum for chromatin condensation during mitosis.<sup>1</sup> Immunohistochemical studies showed anti-PHH3 specifically detected the core protein histone H3 only when phosphorylated at serine 10 or serine 28. Studies have also revealed no phosphorylation on the histone H3 during apoptosis.<sup>2</sup> PHH3 can serve as a mitotic marker to separate mitotic figures from apoptotic bodies and karyorrhectic debris, which may be a very useful tool in diagnosis of tumor grades, especially in CNS, skin, gyn., soft tissue, and GIST.<sup>3,4,5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

PHH3

## Associated Specialties

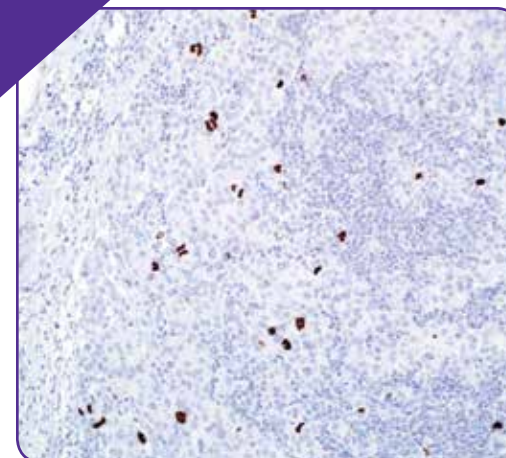
Anatomic Pathology

## Associated Grids

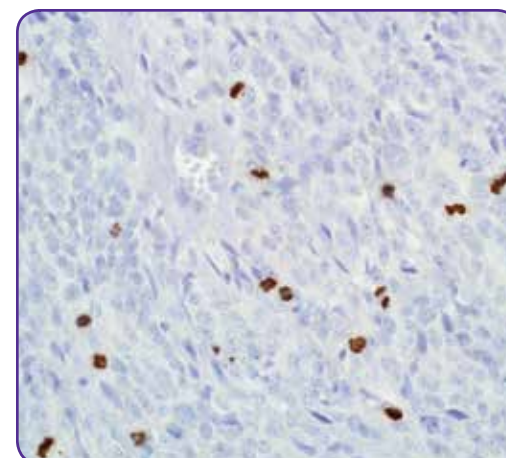
Grid	Page No.
Comparison of Immunoreactivity of PHH3 and Ki-67 in the Cell Cycle	294

## Reference

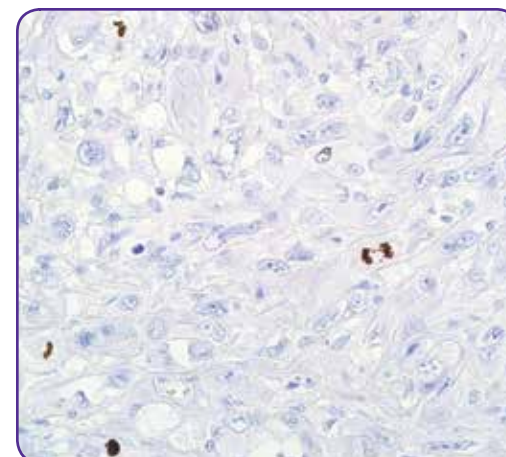
1. Gurley LR, et al. Histone phosphorylation and chromatin structure during mitosis in Chinese hamster cells. *Eur J Biochem.* 1978; 84:1-15.
2. Hendzel MJ, et al. Chromatin condensation is not associated with apoptosis. *J Biol Chem.* 1998; 273:24470-8.
3. Colman H, et al. Assessment and prognostic significance of mitotic index using the mitosis marker phospho-histone H3 in low and intermediate-grade infiltrating astrocytomas. *Am J Surg Pathol.* 2006; 30:657-64.
4. Nasr MR, et al. Comparison of pHH3, Ki-67, and survivin immunoreactivity in benign and malignant melanocytic lesions. *Am J Dermatopathol.* 2008; 30:117-22.
5. Kim YJ, et al. Prognostic significance of the mitotic index using the mitosis marker anti-phosphohistone H3 in meningiomas. *Am J Clin Pathol.* 2007; 128:118-25.



Metastatic carcinoma with mitotic figures



Melanoma



Meningioma

## Ordering Information

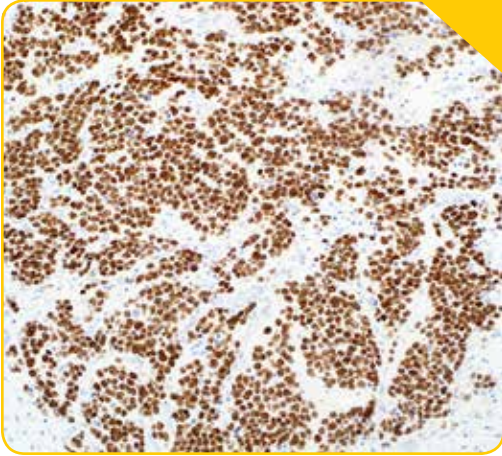
### Phosphohistone H3 (PHH3)

Rabbit Polyclonal Antibody

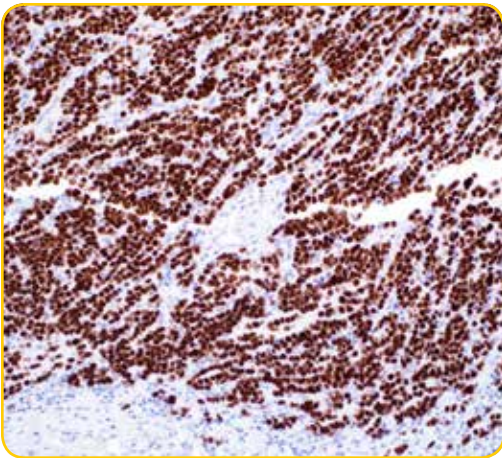
Volume	Part No.
0.1 mL concentrate	369A-14
0.5 mL concentrate	369A-15
1 mL concentrate	369A-16
1 mL predilute	369A-17
7 mL predilute	369A-18
25 mL predilute	369A-10

*Please contact your distributor for details on product availability and regulatory status in your country.*

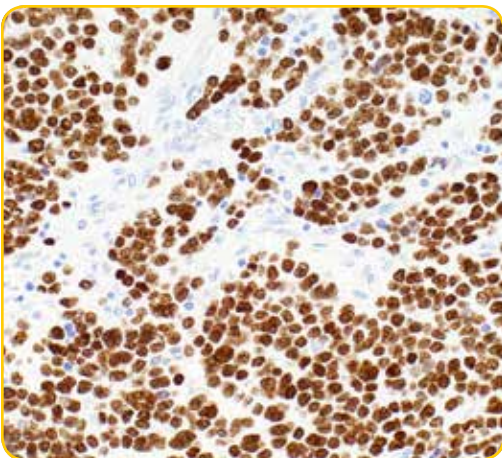
# PHOX2B



Neuroblastoma



Neuroblastoma



Neuroblastoma

Paired-like homeobox 2B (PHOX2B) is a transcription factor located on chromosome 4p13<sup>5</sup> which is crucial to the formation of autonomic ganglia in the autonomic nervous system (ANS). PHOX2B gene is strictly expressed in neural crest derivatives committed to the noradrenergic phenotype.<sup>2</sup> The PHOX2B gene encodes a paired-like homeo-domain transcription factor with an extra-axial expression pattern restricted to the ANS.<sup>1,3-4</sup> Neuroblasts of peripheral neuroblastic tumors are derived from the sympathoadrenal lineage, a division of the ANS. PHOX2B has been observed in peripheral neuroblastic tumors, neuroblastomas, paragangliomas, ganglioneuroblastomas, ganglioneuromas and pheochromocytomas.<sup>3,5</sup> PHOX2B has been reported to be negative in other small round blue cell tumors.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** neuroblastoma  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Neuropathology  
Pediatric Pathology  
Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Neuroblastoma vs. Other Small Round Cell Tumors	321

## Reference

1. Bourdeaut F, et al. Germline mutations of the paired-like homeobox 2B (PHOX2B) gene in neuroblastoma. *Cancer Lett.* 2005; 228:51-58.
2. Pattyn A, et al. The homeobox gene Phox2b is essential for the development of autonomic neural crest derivatives. *Nature.* 1999; 399:366-70.
3. Bielle F, et al. PHOX2B immunolabeling: a novel tool for the diagnosis of undifferentiated neuroblastomas among childhood small round blue-cell tumors. *Am J Surg Pathol.* 2012; 36:1141-49.
4. Longo L, et al. PHOX2A and PHOX2B genes are highly co-expressed in human neuroblastoma. *Int J Oncol.* 2008; 33:985-91.
5. Nonaka D, et al. A study of gata3 and phox2b expression in tumors of the autonomic nervous system. *Am J Surg Pathol.* 2013; 37:1236-41.

## Ordering Information

**PHOX2B (EP312)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	422R-14
0.5 mL concentrate	422R-15
1 mL concentrate	422R-16
1 mL predilute	422R-17
7 mL predilute	422R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# PLAP

Placental alkaline phosphatase (PLAP) is normally produced by primordial germ cells and syncytiotrophoblasts, and the detection of its expression has been useful in identifying germ cell tumors.<sup>1</sup> Anti-PLAP immunoreacts with germ cell tumors and can discriminate between these and other neoplasms. Somatic neoplasms e.g. breast, gastrointestinal, prostatic and urinary tract cancers may also immunoreact with antibodies to PLAP. The PLAP positivity in conjunction with keratin negativity favors seminoma over carcinoma. Germ cell tumors are usually keratin positive, but they regularly fail to stain with anti-EMA, whereas most carcinomas stain with anti-EMA.<sup>2-7</sup> Anti-PLAP has been useful in the diagnosis of gestational trophoblastic disease. Complete hydatidiform mole shows strong expression of hCG and weak expression of PLAP. Weak hCG and strong PLAP expression is found in partial hydatidiform mole. Choriocarcinoma presents strong expression of hCG and weak expression of hPL and PLAP.<sup>8</sup> In addition to its role as a germ cell marker, PLAP may also be used as a myogenic marker in identifying soft tissue tumors.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** placenta

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP194: IgG
- NB10: IgG/k
- SP15: IgG

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Placental Trophoblastic Proliferations	303
Uterus: Trophoblastic Proliferations	304
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309

## Reference

1. Goldsmith JD, et al. Detection and diagnostic utilization of placental alkaline phosphatase in muscular tissue and tumors with myogenic differentiation. *Am J Surg Pathol.* 2002; 26:1627-33.
2. Gao Y, et al. Clinicopathological and immunohistochemical features of primary central nervous system germ cell tumors: a 24-years experience. *Int J Clin Exp Pathol.* 2014; 7:6965-72.
3. Burke AP, et al. Placental alkaline phosphatase immunohistochemistry of intratubular malignant germ cells and associated testicular germ cell tumors. *Hum Pathol.* 1988; 19:663-70.

For the complete list of references see the product IFU.

## Ordering Information

### PLAP (EP194)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	321R-24
0.5 mL concentrate	321R-25
1 mL concentrate	321R-26
1 mL predilute	321R-27
7 mL predilute	321R-28

### PLAP (NB10)

Mouse Monoclonal Antibody

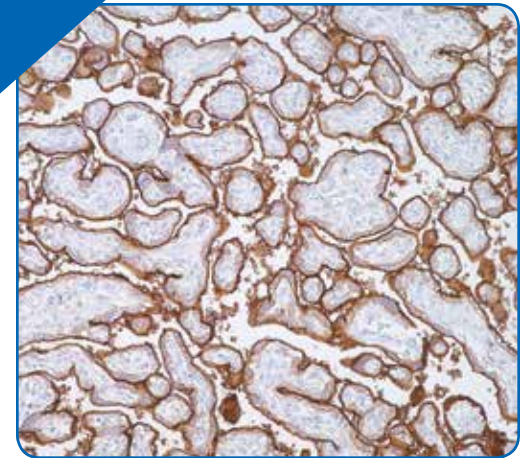
Volume	Part No.
0.1 mL concentrate	321M-14
0.5 mL concentrate	321M-15
1 mL concentrate	321M-16
1 mL predilute	321M-17
7 mL predilute	321M-18

### PLAP (SP15)

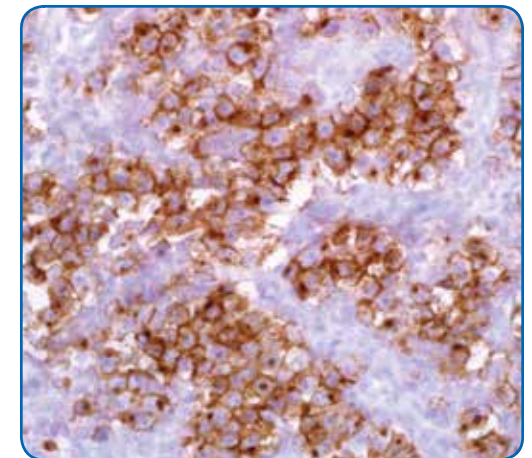
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	321R-14
0.5 mL concentrate	321R-15
1 mL concentrate	321R-16
1 mL predilute	321R-17
7 mL predilute	321R-18

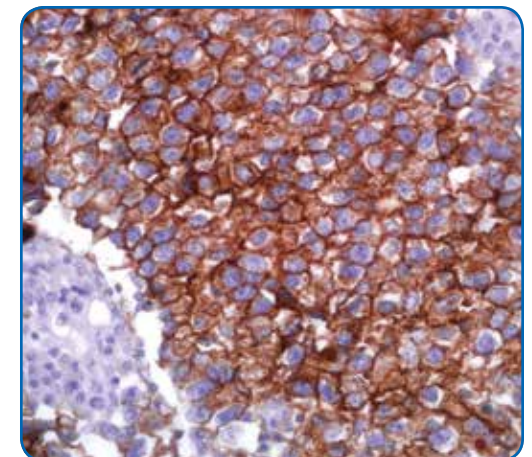
Please contact your distributor for details on product availability and regulatory status in your country.



Placenta



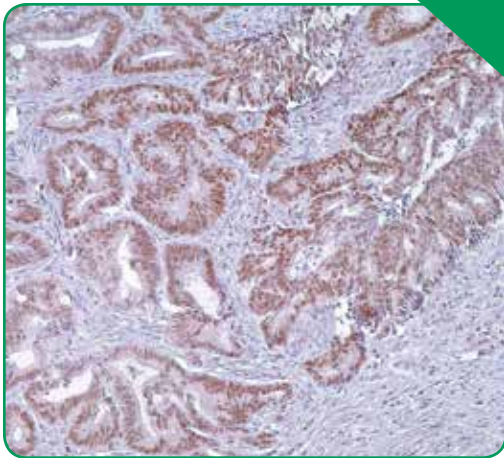
Classical seminoma



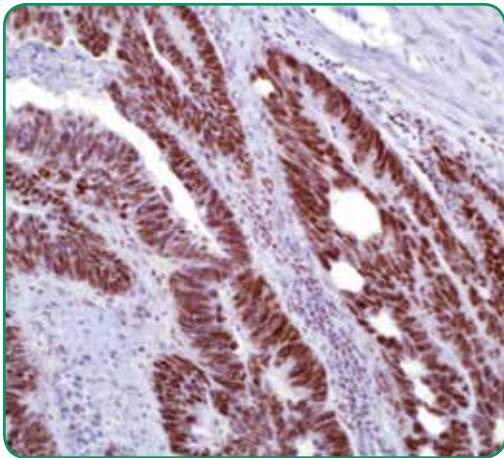
Seminoma



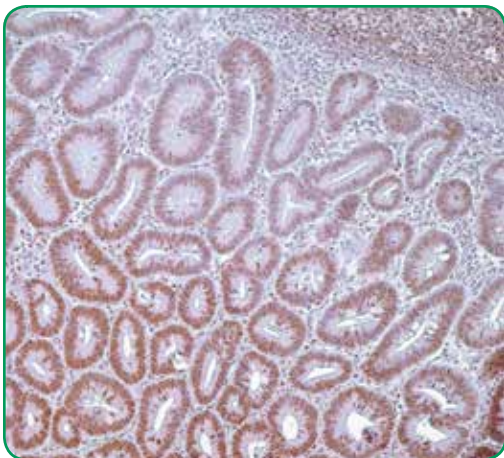
# PMS2



Colon adenocarcinoma



Colon adenocarcinoma



Colon adenoma

PMS2 is a mismatch repair protein that is deficient in a high proportion of patients with microsatellite instability (MSI-H). It has been suggested that the deficiencies in DNA mismatch repair protein(s) can be seen in some malignancies such as hereditary nonpolyposis colorectal cancer (HNPCC) and endometrial cancer. Anti-PMS2 may be useful in the identification of the PMS2 protein in a variety of normal and neoplastic tissues and the identification of loss of MLH1 in tumors with MSI genotype.<sup>1-7</sup> Anti-PMS2 is best utilized in an IHC panel that includes anti-MSH6, anti-MSH2, and anti-MLH1.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EPR3947: IgG
- MRQ-28: IgG<sub>1</sub>

## Associated Specialties

Gastrointestinal (GI) Pathology

## Reference

1. Gologan A, et al. Microsatellite instability and DNA mismatch repair deficiency testing in hereditary and sporadic gastrointestinal cancers. *Clin Lab Med.* 2005; 25:179-96.
2. Lagerstedt Robinson K, et al. Lynch syndrome (hereditary nonpolyposis colorectal cancer) diagnostics. *J Natl Cancer Inst.* 2007; 99:291-9.
3. Hendriks YM, et al. Heterozygous mutations in PMS2 cause hereditary nonpolyposis colorectal carcinoma (Lynch syndrome). *Gastroenterology.* 2006; 130:312-22.
4. Truninger K, et al. Immunohistochemical analysis reveals high frequency of PMS2 defects in colorectal cancer. *Gastroenterology.* 2005; 128:1160-71.
5. Hampel H, et al. Screening for the Lynch syndrome (hereditary nonpolyposis colorectal cancer). *N Engl J Med.* 2005; 352:1851-60.
6. Warusavitarne J, et al. The role of chemotherapy in microsatellite unstable (MSI-H) colorectal cancer. *Int J Colorectal Dis.* 2007; 22:739-48.
7. Gill S, et al. Isolated loss of PMS2 expression in colorectal cancers: frequency, patient age, and familial aggregation. *Clin Cancer Res.* 2005; 11:6466-71.

## Ordering Information

**PMS2 (EPR3947)**

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
1 mL predilute	288R-17
7 mL predilute	288R-18
25 mL predilute	288R-10

**PMS2 (MRQ-28)**

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	288M-14
0.5 mL concentrate	288M-15
1 mL concentrate	288M-16
1 mL predilute	288M-17
7 mL predilute	288M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Pneumocystis jiroveci (carinii)

*Pneumocystis jiroveci* (*carinii*) is a fungal organism which is detected in human tissues (typically in lung in immunocompromised patients) in the trophozoite stage. Anti-*Pneumocystis jiroveci* (*carinii*) reacts with an epitope on the organism which is resistant to formalin, picric acid, paraffin, as well as alcohol and xylene. No cross-reactivity has been demonstrated with other fungi or parasitic organisms.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** *Pneumocystis jiroveci* infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgM/k

## Associated Specialties

Anatomic Pathology

Cytopathology

## Reference

1. Silverberg SG, et al. Principles and Practice of Surgical Pathology and Cytopathology, 3rd edition. 1997; p.182-5.
2. Linder E, et al. Detection of *Pneumocystis carinii* in lung-derived samples using monoclonal antibodies to an 82-kD parasite component. *J Immunol Methods*. 1987; 98:57-62.
3. Elvin KM, et al. *Pneumocystis carinii* pneumonia: detection of parasites in sputum and bronchoalveolar lavage fluid by monoclonal antibodies. *BMJ*. 1988; 297:381-4.
4. Radio SJ, et al. Immunohistochemistry of *Pneumocystis carinii* infection. *Mod Pathol*. 1990; 3:462-9.

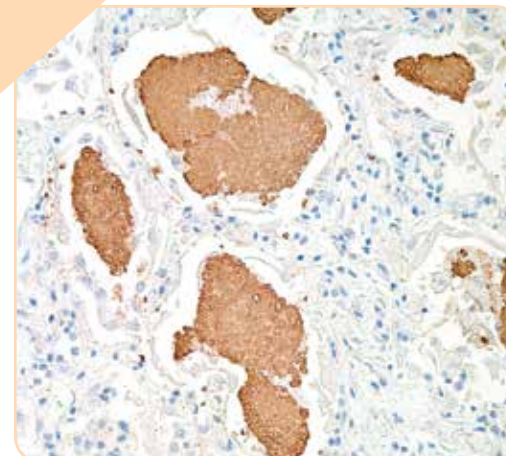
## Ordering Information

### **Pneumocystis jiroveci (carinii)** **(3F6)**

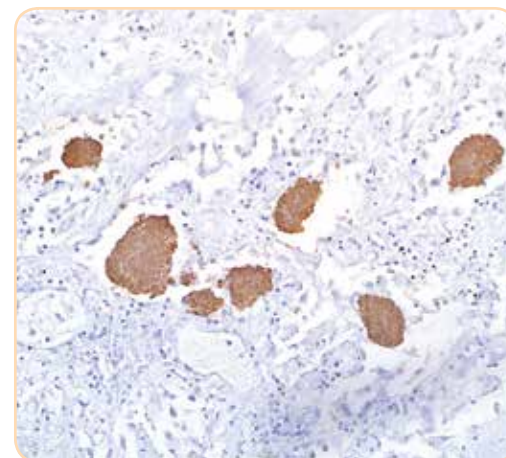
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	219M-14
0.5 mL concentrate	219M-15
1 mL concentrate	219M-16
1 mL predilute	219M-17
7 mL predilute	219M-18

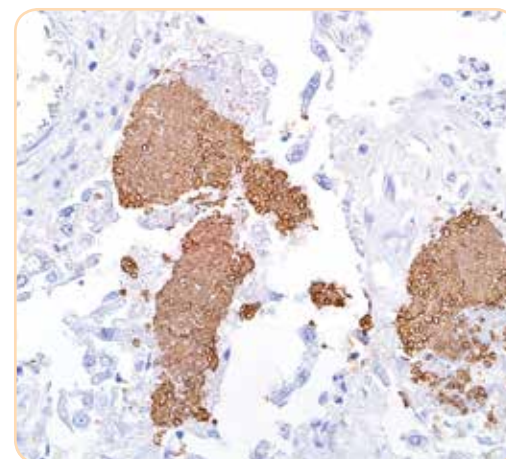
*Please contact your distributor for details on product availability and regulatory status in your country.*



Lung

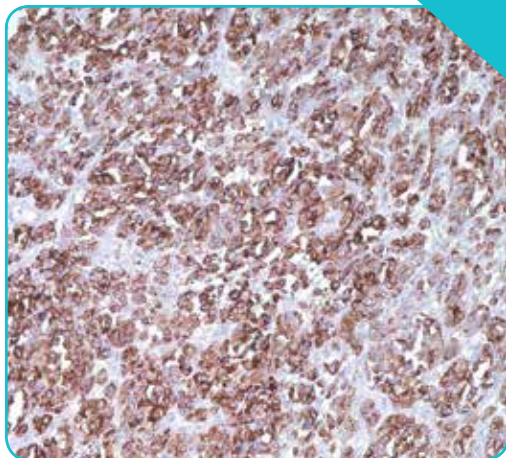


Lung

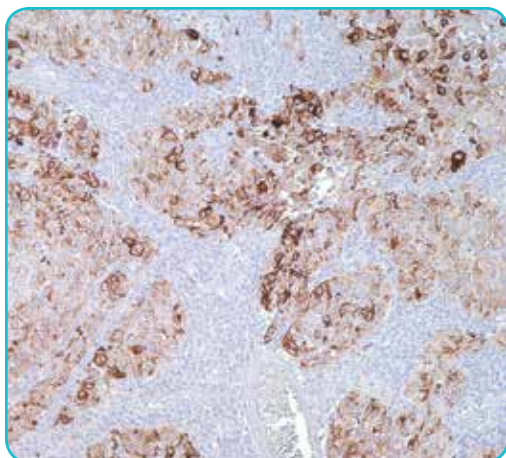


Lung

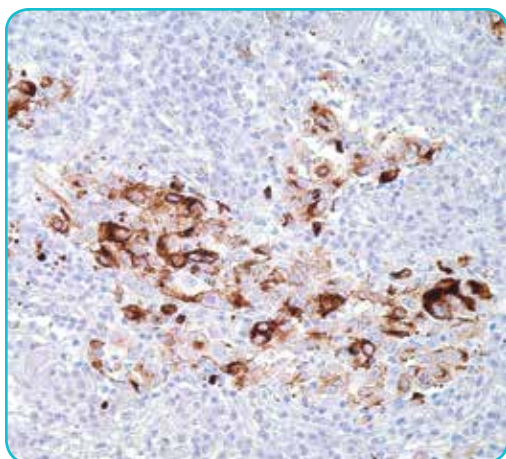
# PNL2



Melanoma



Lymph node, metastatic melanoma



Lymph node, metastatic melanoma

Anti-PNL2 is useful as an immunohistochemical reagent to stain melanocytes and tumors derived therefrom. Anti-PNL2 reactivity is identified in the cytoplasm of cutaneous and oral mucosal melanocytes. Anti-PNL2 labels intraepidermal nevi, while the dermal components of compound nevi are largely non-reactive.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

Melanoma Associated Antigen

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Spindle Cell Melanoma vs. Epithelioid	
Peripheral Nerve Sheath Tumor	300
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Melanotic Lesions	305

## Reference

1. Rochaix P, et al. PNL2, a new monoclonal antibody directed against a fixative-resistant melanocyte antigen. *Mod Pathol.* 2003; 16:481-90.
2. Klaus J, et al. Immunohistochemical analysis of novel monoclonal antibody PNL2 and comparison with other melanocyte differentiation markers. *Am J Surg Pathol.* 2005; 29:400-6.
3. Morris LG, et al. PNL2 melanocytic marker in immunohistochemical evaluation of primary mucosal melanoma of the head and neck. *Head Neck.* 2008; 30:771-5.
4. Zhe X, et al. Combined smooth muscle and melanocytic differentiation in lymphangioleiomyomatosis. *J Histo and Cyto.* 2004; 52:1537-42.

## Ordering Information

### PNL2 (PNL2)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	365M-94
0.5 mL concentrate	365M-95
1 mL concentrate	365M-96
1 mL predilute	365M-97
7 mL predilute	365M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Podoplanin

Podoplanin is a transmembrane mucoprotein (38-kD) recognized by the monoclonal antibody, D2-40. Podoplanin is selectively expressed in lymphatic endothelium as well as lymphangiomas, and Kaposi sarcomas. Podoplanin has also been shown to be expressed in epithelioid mesotheliomas and seminomas.<sup>1-9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Synonyms and Abbreviations

D2-40

## Associated Specialties

Anatomic Pathology

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Skin: Spindle Cell Tissues and Tumors	306, 307
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309
RCC vs. Hemangioblastoma	310
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324
Vascular Tumors	324

## Ordering Information

### Podoplanin (D2-40)

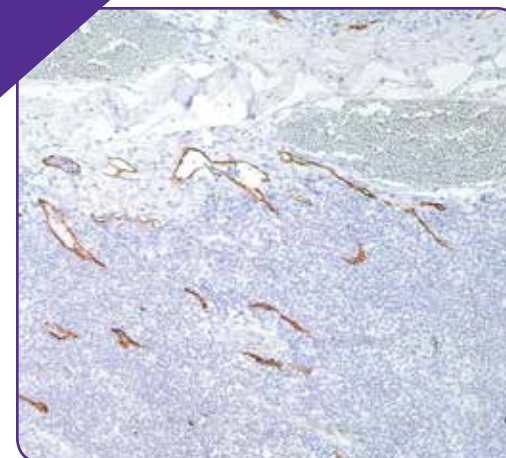
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	322M-14
0.5 mL concentrate	322M-15
1 mL concentrate	322M-16
1 mL predilute	322M-17
7 mL predilute	322M-18
25 mL predilute	322M-10

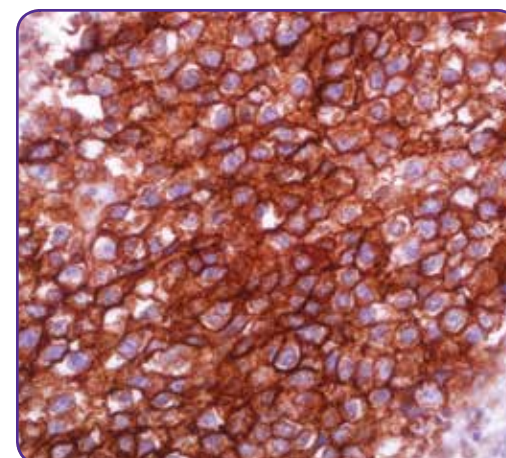
*Please contact your distributor for details on product availability and regulatory status in your country.*

## Reference

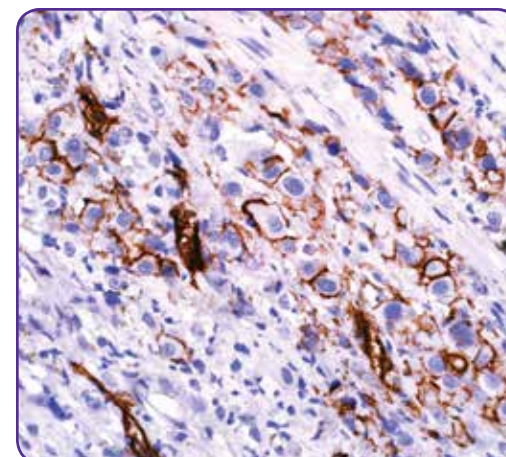
1. Ordóñez NG. Podoplanin: a novel diagnostic immunohistochemical marker. *Adv Anat Pathol.* 2006; 13:83-8.
2. Ordóñez N. D2-40 and podoplanin are highly specific and sensitive immunohistochemical markers of epithelioid malignant mesothelioma. *Hum Pathol.* 2005; 36:372-80.
3. Niakosari F, et al. Detection of lymphatic invasion in primary melanoma with monoclonal antibody D2-40: a new selective immunohistochemical marker of lymphatic endothelium. *Arch Dermatol.* 2005; 141:440-4.
4. Galambos C, et al. Identification of lymphatic endothelium in pediatric vascular tumors and malformations. *Pediatr Dev Pathol.* 2005; 8:181-9.
5. Fukunaga M. Expression of D2-40 in lymphatic endothelium of normal tissues and in vascular tumours. *Histopathology.* 2005; 46:396-402.
6. Chu AY, et al. Utility of D2-40, a novel mesothelial marker, in the diagnosis of malignant mesothelioma. *Mod Pathol.* 2005; 18:105-10.
7. Franke FE, et al. Hobnail hemangiomas (targetoid hemosiderotic hemangiomas) are true lymphangiomas. *J Cutan Pathol.* 2004; 31:362-7.
8. Fogt F, et al. Identification of lymphatic vessels in malignant, adenomatous and normal colonic mucosa using the novel immunostain D2-40. *Oncol Rep.* 2004; 11:47-50.
9. Kahn HJ, et al. Monoclonal antibody D2-40, a new marker of lymphatic endothelium, reacts with Kaposi's sarcoma and a subset of angiosarcomas. *Mod Pathol.* 2002; 15:434-40.



Tonsil

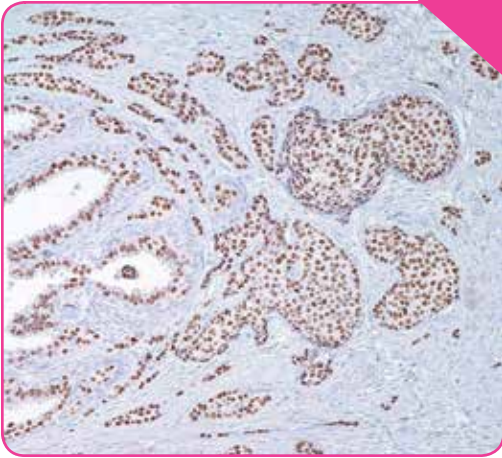


Seminoma

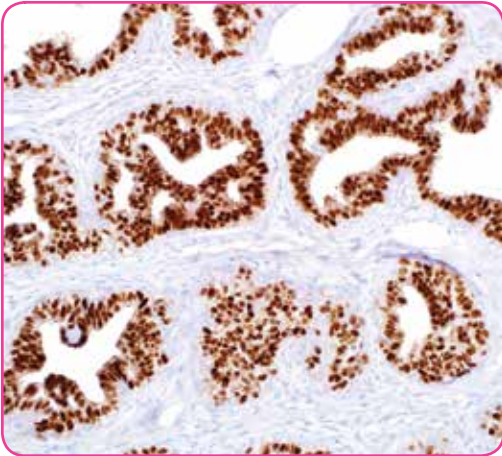


Mesothelioma

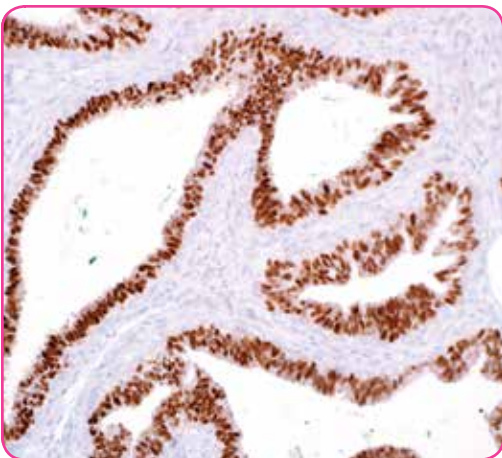
# Progesterone Receptor



Invasive ductal breast carcinoma



Breast



Breast

This anti-progesterone receptor antibody reacts with progesterone receptor forms alpha and beta. This antibody stains nuclei in breast, ovarian and uterus (including endometrial epithelial cells and myometrial cells).<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** breast

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- SP42: IgG<sub>1</sub>
- Y85: IgG

## Synonyms and Abbreviations

PR

## Associated Specialties

Breast/Gynecological Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Breast Carcinoma	302
Brain: CNS Tumors	318
Meningeal Solitary Fibrous Tumor (SFT)	318

## Reference

1. Dabbs D. Diagnostic Immunohistochemistry, 3rd edition. Philadelphia: Saunders Elsevier. 2010; p.728-32.
2. Dunnwald LK, et al. Hormone receptor status, tumor characteristics, and prognosis: a prospective cohort of breast cancer patients. Breast Cancer Res. 2007; 9:R6.
3. Leong A, et al. Manual of Diagnostic Antibodies for Immunohistochemistry, 2nd edition. London: Greenwich Medical Media. 2003; p.375-6.

## Ordering Information

### Progesterone Receptor (SP42) Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	323R-34
0.5 mL concentrate	323R-35
1 mL concentrate	323R-36
1 mL predilute	323R-37
7 mL predilute	323R-38

### Progesterone Receptor (Y85) Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	323R-14
0.5 mL concentrate	323R-15
1 mL concentrate	323R-16
1 mL predilute	323R-17
7 mL predilute	323R-18
25 mL predilute	323R-10

Please contact your distributor for details on product availability and regulatory status in your country.

# Prolactin

Prolactin (PRL) is a single-chain polypeptide of 226 amino acids and plays a role in multiple processes including cell growth, reproduction, and immune function. Anti-prolactin reacts with prolactin-producing cells and is a useful marker in classification of pituitary tumors and the study of pituitary disease.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pituitary

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP193: IgG

## Synonyms and Abbreviations

PRL

## Associated Specialties

Anatomic Pathology

Neuropathology

## Reference

1. Asa SL, et al. Prolactin cells in the human pituitary. A quantitative immunocytochemical analysis. Arch Pathol Lab Med. 1982; 106:360-3.
2. Duello TM, et al. Immunocytochemistry of prolactin-producing human pituitary adenomas. Am J Anat. 1980; 158:463-9.
3. Minniti G, et al. Giant prolactinomas presenting as skull base tumors. Surg Neurol. 2002; 57:99-103.
4. Popadic A, et al. Malignant prolactinoma: case report and review of the literature. Surg Neurol. 1999; 51:47-54.
5. Nevalainen MT, et al. Prolactin and prolactin receptors are expressed and functioning in human prostate. J Clin Invest. 1997; 99:618-27.

## Ordering Information

### Prolactin (EP193)

Rabbit Monoclonal  
Primary Antibody



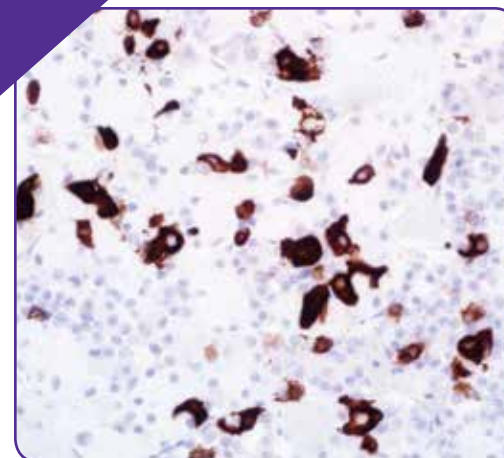
Volume	Part No.
0.1 mL concentrate	210R-14
0.5 mL concentrate	210R-15
1 mL concentrate	210R-16
1 mL predilute	210R-17
7 mL predilute	210R-18

### Prolactin

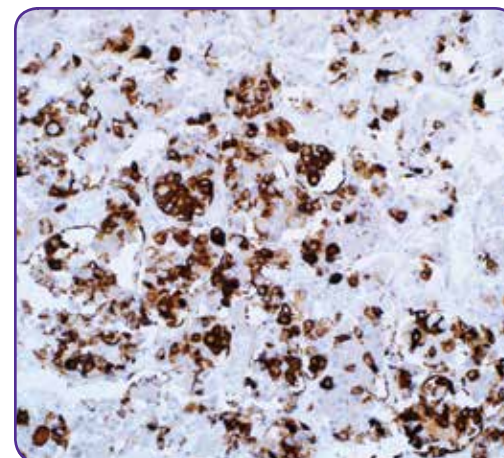
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	210A-14
0.5 mL concentrate	210A-15
1 mL concentrate	210A-16
1 mL predilute	210A-17
7 mL predilute	210A-18

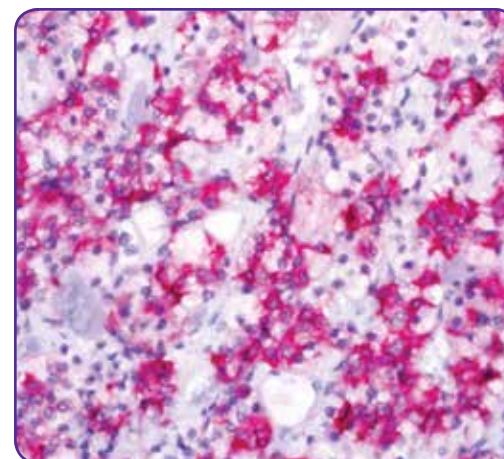
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pituitary gland

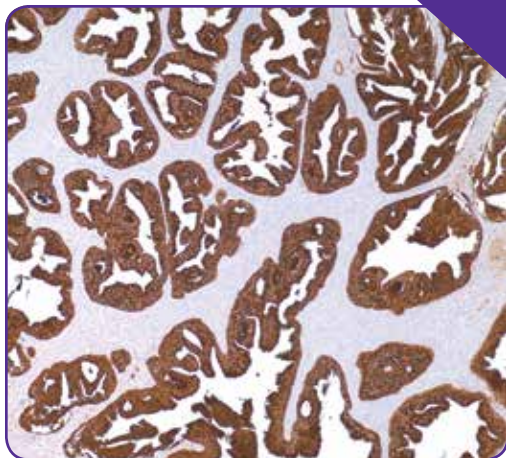


Pituitary gland

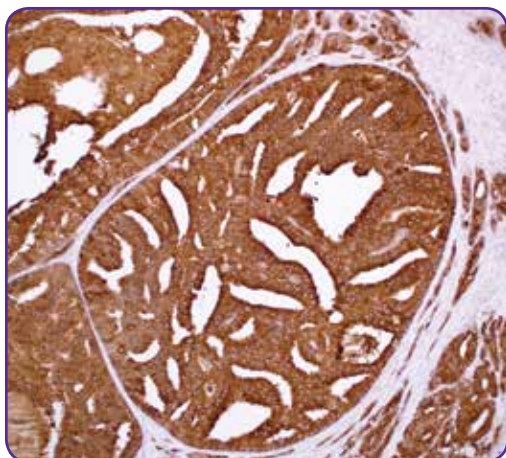


Pituitary adenoma

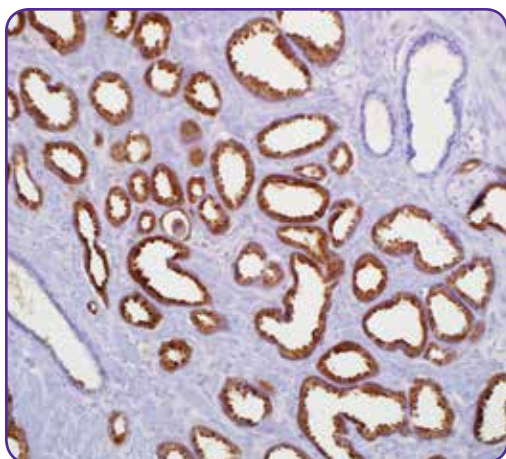
# PSA



Prostate gland



Prostate carcinoma



Prostate carcinoma

Prostate-Specific Antigen (PSA) is a 33-kD protein primarily produced by the prostatic epithelium and the epithelial lining of the periurethral glands.<sup>1</sup> PSA is expressed in both normal and neoplastic prostatic tissue.<sup>1-3</sup> Anti-PSA is most useful in determining the prostatic origin of carcinomas in non-prostate tissues (metastatic disease) using IHC techniques.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate, prostate carcinoma

**Stability** up to 24 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Colon vs. Prostate Adenocarcinoma	294
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Prostate Lesions	310
Prostate: Malignant vs. Benign	310

## Reference

1. Polascik TJ, et al. Prostate specific antigen: a decade of discovery -- what we have learned and where we are going. *J Urol.* 1999; 162:293-306.
2. Stenman UH, et al. Prostate-specific antigen. *Semin Cancer Biol.* 1999; 9:83-93.
3. Alanen KA, et al. Immunohistochemical labelling for prostate specific antigen in non-prostatic tissues. *Pathol Res Pract.* 1996; 192:233-7.
4. Varma M, et al. Diagnostic utility of immunohistochemistry in morphologically difficult prostate cancer: review of current literature. *Histopathology.* 2005; 47:1-16.

## Ordering Information

### PSA (ER-PR8)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	324M-14
0.5 mL concentrate	324M-15
1 mL concentrate	324M-16
1 mL predilute	324M-17
7 mL predilute	324M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# PSAP

Anti-PSAP reacts with prostatic acid phosphatase in the glandular epithelium of normal and hyperplastic prostate, and adenocarcinoma of the prostate. Anti-PSAP is useful in identifying prostatic origin of tumors in the metastatic setting.<sup>1</sup> PSAP complements other immunohistochemical markers in the correct clinical context.<sup>1-2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** prostate, prostate adenocarcinoma, kidney

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas	299
Prostate Lesions	310
Prostate: Malignant vs. Benign	310

## Reference

1. Hameed O, et al. Immunohistochemistry in diagnostic surgical pathology of the prostate. *Semin Diagn Pathol.* 2005; 22:88-104.
2. Geneqa M, et al. Immunophnotype of high-grade prostatic adenocarcinoma and urothelial carcinoma. *Mod Pathol.* 2000; 13:1186-91.

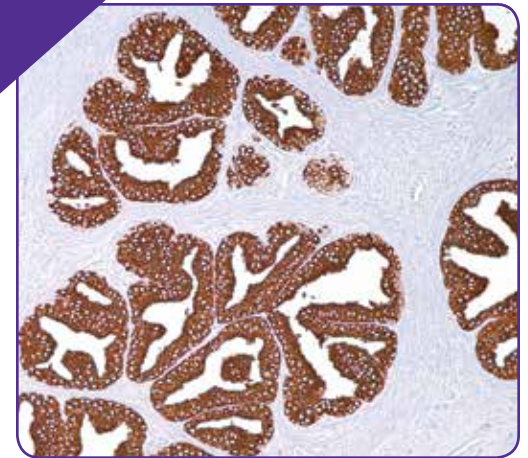
## Ordering Information

### PSAP (PASE/4LJ)

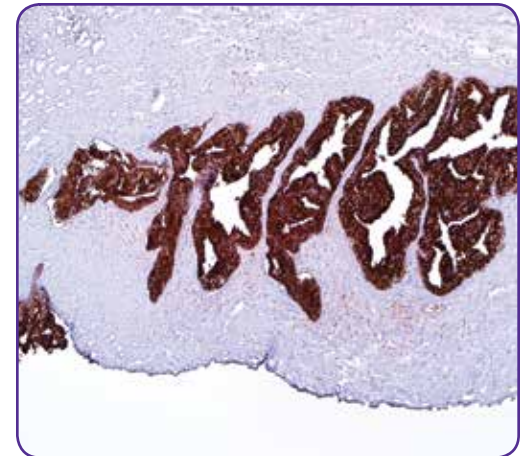
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	326M-15
1 mL concentrate	326M-16
1 mL predilute	326M-17
7 mL predilute	326M-18

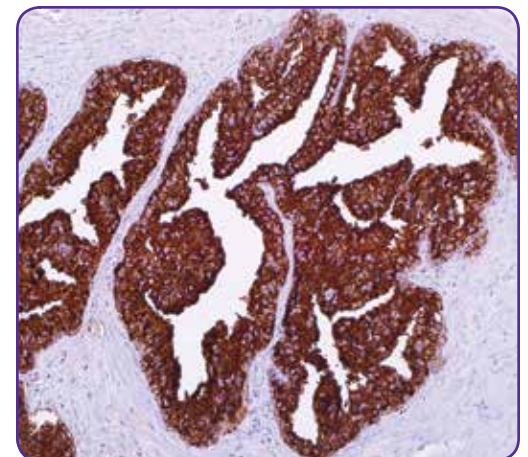
*Please contact your distributor for details on product availability and regulatory status in your country.*



Prostate



Prostate



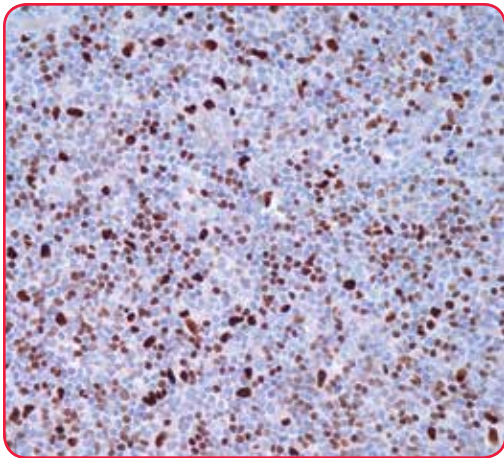
Prostate



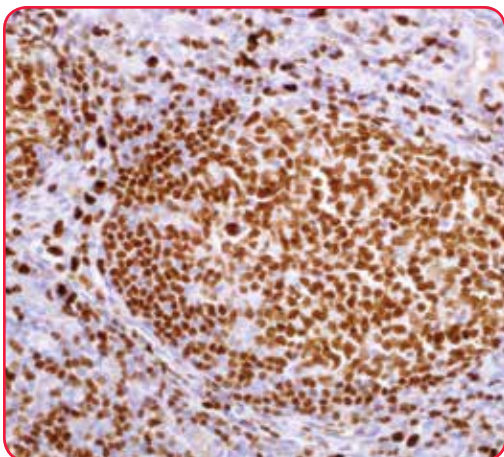
# PU.1



Tonsil



B-cell lymphoma



Follicular lymphoma

PU.1 is a transcription factor that has been shown to be important for normal B-cell development. PU.1 belongs to the ETS family of transcription factors. It is expressed in the myeloid lineage and in immature as well as mature B-lymphocytes, with the exception of plasma cells. PU.1 is essential during early B-cell differentiation. The absence of PU.1 results in total block of B-cell development at the pre-pro stage. Very little is known about PU.1 function in later stages of B-cell development. PU.1 does not seem to play a role in the end-stage of B-cell development and is not expressed in plasma cells. PU.1 exerts an important role in the regulation of the expression of crucial B-cell proteins, such as immunoglobulin (Ig) genes, and CD20 and its putative binding sites were also identified in the promoters of CD79, CD10, and CD22. PU.1 binds to the 3' enhancer region of both the Ig kappa and lambda light chain genes and it also regulates the immunoglobulin heavy chain genes through the intron enhancer region.<sup>1-2</sup>

PU.1 is expressed in germinal center B-cells and mantle B-cells. Various lymphomas are also positive for this marker including the following: B-chronic lymphocytic leukemia, mantle cell lymphoma, follicular lymphoma, marginal zone lymphoma, Burkitt lymphoma, diffuse large cell lymphoma, diffuse large B-cell lymphoma, T-cell rich B-cell lymphoma, and nodular lymphocyte predominant Hodgkin lymphoma.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Hodgkin vs. Non-Hodgkin Lymphomas	314

## Reference

1. Hoefnagel JJ, et al. Expression of B-cell transcription factors in primary cutaneous B-cell lymphoma. *Mod Pathol.* 2006; 19:1270-6.
2. Hromas R, et al. Hematopoietic lineage- and stage-restricted expression of the ETS oncogene family member PU.1. *Blood.* 1993; 82:2998-3004.
3. Loddenkemper C, et al. Differential Emu enhancer activity and expression of BOB.1/OBF.1, Oct2, PU.1, and immunoglobulin in reactive B-cell populations, B-cell non-Hodgkin lymphomas, and Hodgkin lymphomas. *J Pathol.* 2004; 202:60-9.

## Ordering Information

**PU.1 (EPR3158Y)**

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	328R-14
0.5 mL concentrate	328R-15
1 mL concentrate	328R-16
1 mL predilute	328R-17
7 mL predilute	328R-18

Please contact your distributor for details on product availability and regulatory status in your country.

# Renal Cell Carcinoma

Anti-renal cell carcinoma (RCC) recognizes a 200-kD glycoprotein localized in the brush border of the proximal renal tubule.<sup>1</sup> This antibody immunoreacts with most primary renal cell carcinomas and can aid in the diagnosis when renal cell carcinoma enters the differential diagnosis.<sup>2-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** renal cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

RCC

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
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Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Kidney: Epithelial Neoplasms	309
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Kidney, Urothelial, and Soft Tissue Neoplasms	321

## Reference

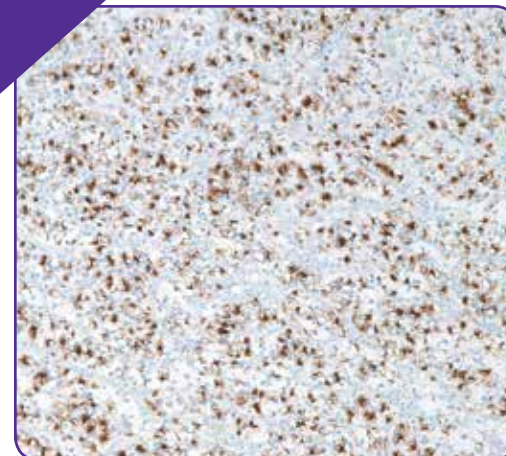
1. Dabbs, D. Diagnostic immunohistochemistry. Theranostic and genomic applications. 4th Edition. Elsevier Saunders. 2014; p234.
2. Bakshi N, et al. Expression of renal cell carcinoma antigen (RCC) in renal epithelial and nonrenal tumors: diagnostic implications. Appl Immunohistochem Mol Morphol. 2007; 15:310-5.
3. McGregor DK, et al. Diagnosing primary and metastatic renal cell carcinoma: the use of the monoclonal antibody 'Renal Cell Carcinoma Marker'. Am J Surg Pathol. 2001; 25:1485-92.

## Ordering Information

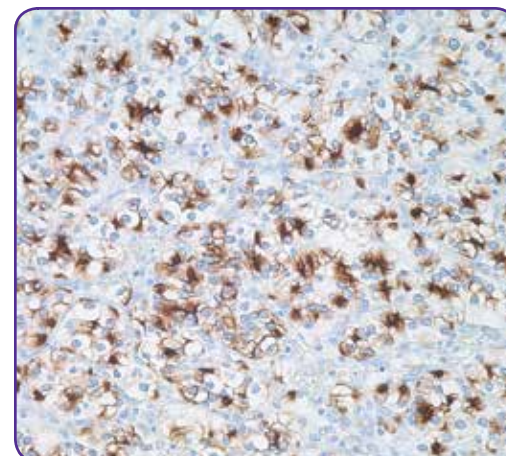
### Renal Cell Carcinoma (PN-15) Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	329M-94
0.5 mL concentrate	329M-95
1 mL concentrate	329M-96
1 mL predilute	329M-97
7 mL predilute	329M-98
25 mL predilute	329M-90

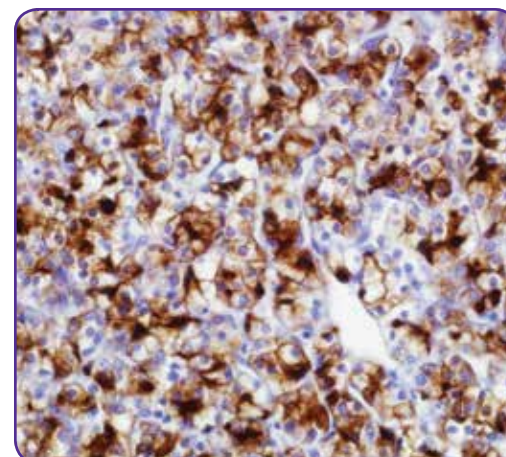
*Please contact your distributor for details on product availability and regulatory status in your country.*



Renal cell carcinoma



Clear cell renal cell carcinoma

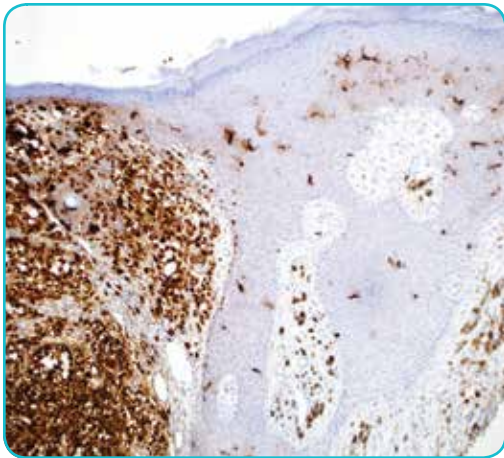


Clear cell renal cell carcinoma

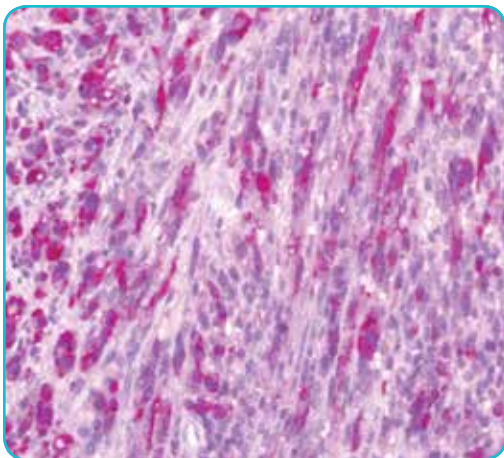
# S-100



Melanoma



Melanoma



Melanoma

S-100 protein has been found in normal melanocytes, Langerhans cells, histiocytes, chondrocytes, lipocytes, skeletal and cardiac muscle, Schwann cells, epithelial and myoepithelial cells of the breast, salivary and sweat glands, as well as in glial cells.<sup>1,2,6</sup> Neoplasms derived from these cells also express S-100 protein, albeit non-uniformly.<sup>1-4</sup> A large number of well differentiated tumors of the salivary gland, adipose and cartilaginous tissue,<sup>3</sup> and Schwann cell-derived tumors express S-100 protein. Almost all malignant melanomas and cases of histiocytosis X are positive for S-100 protein.<sup>4,5</sup> Despite the fact that S-100 protein is an ubiquitous substance, its demonstration is of great value in the identification of several neoplasms, particularly melanomas.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Dermatopathology

## Associated Grids

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Cutaneous Lesion	304
Melanotic Lesions	305
Neuroid Skin Lesions	305
Skin Adnexal Tumors	305
Skin: DFSP vs. DF-FH	306
Skin: Spindle Cell Tissues and Tumors	307
Histiocytic and Dendritic Cell Lesions	313, 320
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Brain: CNS Tumors	318
Meningeal Solitary Fibrous Tumor (SFT)	318
Retroperitoneal Neoplasms	318
Histiocytic Proliferation	319
NB vs. Other Small Round Cell Tumors	321
Soft Tissue Neoplasms	322
Soft Tissue Tumors	322, 323
SFT vs. Other Soft Tissue Tumors	323

## Ordering Information

### S-100 (4C4.9)

### Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	330M-14
0.5 mL concentrate	330M-15
1 mL concentrate	330M-16
1 mL predilute	330M-17
7 mL predilute	330M-18
25 mL predilute	330M-10

## Reference

1. Nakajima T, et al. An Immunoperoxidase Study of S-100 Protein Distribution in Normal and Neoplastic Tissues. *Ad J Surg Path.* 1982; 6:715-727.
2. Kuhn HJ, et al. Role of Antibody to S100 Protein in Diagnostic Pathology. *Am J Clin Path.* 1983; 79:341-347.
3. Monda L, et al. S-100 Protein Immunostaining in the Differential Diagnosis of Chondroblastoma. *Hum Pathol.* 1985; 16:287-293.
4. Yaziji H, et al. Immunohistochemical Markers of Melanocytic Tumors. *Int J Surg Pathol.* 2003; 11:11-5.
5. Patel P, et al. Myxoid Melanoma: Immunohistochemical Studies and a Review of the Literature. *J Am Acad Dermatol.* 2002; 46:264-70.
6. Morrison CD, et al. Immunohistochemistry in the Diagnosis of Neoplasms of the Central Nervous System. *Semin Diagn Pathol.* 2000; 17:204-15.
7. McLaren KM, et al. The Immunohistochemical Localization of S100 in the Diagnosis of Papillary Carcinoma of the Thyroid. *Hum Pathol.* 1996; 27:633-6.

# S100 beta

S100 calcium binding protein B (S100 beta) is a member of the multifunctional S100 family of proteins.<sup>1-3</sup> S100 beta acts as a stimulator of proliferation and migration and as an inhibitor of apoptosis and differentiation in many cell types including astrocytes, Schwann cells, chondrocytes, adipocytes, certain neuronal populations, melanocytes, Langerhans cells, histiocytes, epithelial, and myoepithelial cells.<sup>1-3</sup> S100 beta is also expressed in neoplasms derived from these cell types, making it a useful marker for the identification of melanoma and various nervous system tumors.<sup>1-3</sup> Although ubiquitous, S100 beta has proven to be a sensitive marker for malignant melanoma, including desmoplastic and metastatic variants.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** melanoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Anatomic Pathology

Dermatopathology

Neuropathology

## Associated Grids

Grid	Page No.
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Brain: CNS Tumors	318

## Reference

1. Seddagh F, et al. S100 protein family and its application in clinical practice. Hippokratia. 2008; 12:198-204.
2. Donnato R, et al. Functions of S100 Proteins. Curr Mol Med. 2013; 13:24-57.
3. deBlacam C, et al. HOXC11-SRC-1 regulation of S100 beta in cutaneous melanoma; new targets for the kinase inhibitor dasatinib. Br J Cancer. 2011; 105:118-123.
4. Orchard GE. Comparison of immunohistochemical labelling of melanocyte differentiation antibodies melan-A, tyrosinase and HMB 45 with NKIC3 and S100 protein in the evaluation of benign naevi and malignant melanoma. Histochem J. 2000; 32:475-81.

## Ordering Information

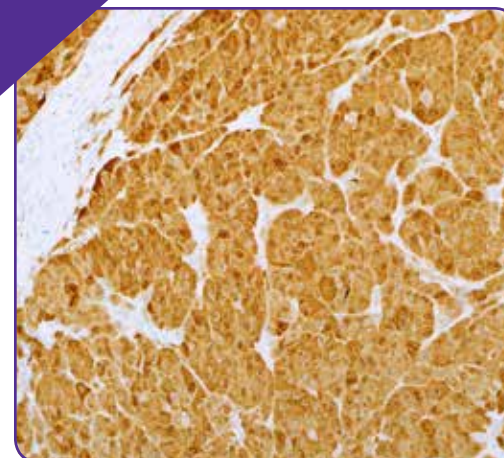
### S100 beta (EP32)

Rabbit Monoclonal  
Primary Antibody

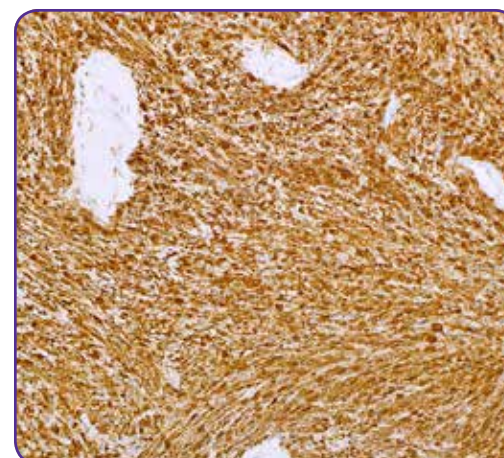


Volume	Part No.
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0.5 mL concentrate	449R-15
1 mL concentrate	449R-16
1 mL predilute	449R-17
7 mL predilute	449R-18

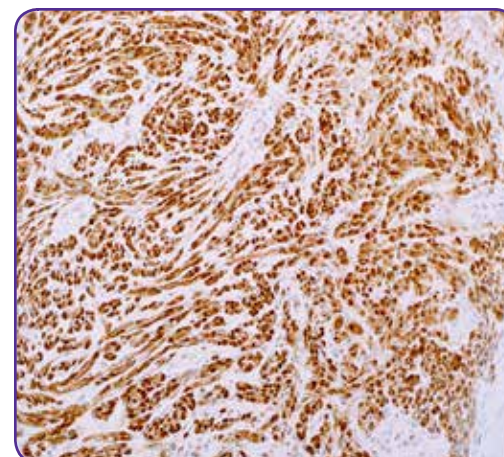
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Melanoma

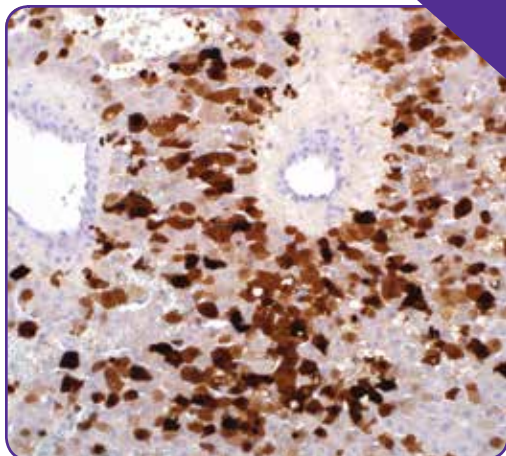


Spindle cell melanoma

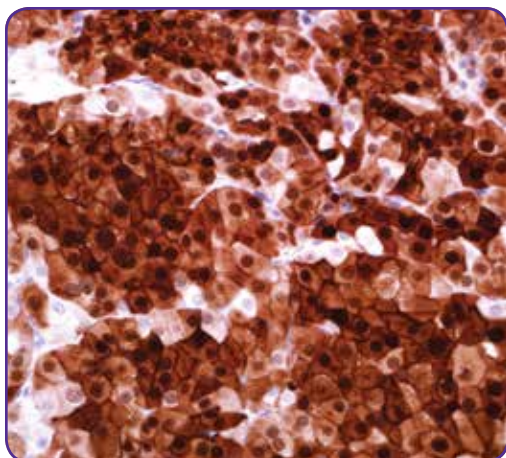


Schwannoma

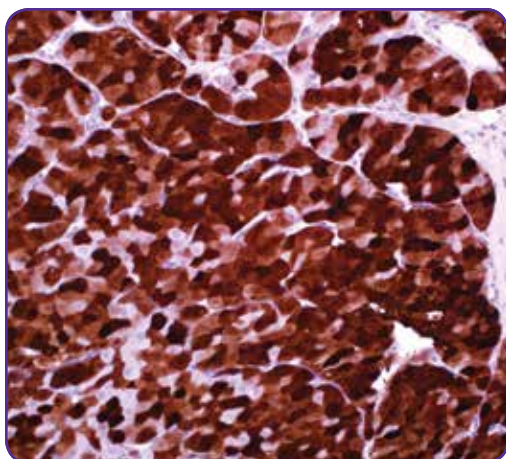
# S100A1



Renal oncocytoma



Renal oncocytoma



Renal oncocytoma

S100 Calcium Binding Protein A1 or S100A1 is in a family of proteins which contain 2 EF-hand calcium binding motifs.<sup>1</sup> S100 proteins are expressed in a wide range of cells, and localized in the cytoplasm and/or nucleus. Anti-S100A1 reactivity is seen in normal renal tissue, proximal tubules, loops of Henle, collecting ducts, skeletal muscle, and dendritic cells of lymph nodes of normal tissues. In immunohistochemistry anti-S100A1 is reportedly useful in differentiating renal oncocytoma from chromophobe renal cell carcinoma.<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic, nuclear  
**Control** renal oncocytoma, kidney  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Kidney Neoplasms	310

## Reference

1. Zimmer DA, et al. The S100 protein family: history, function, and expression. *Brain Res Bull.* 1995; 37:417-29.
2. Rocca PC, et al. Diagnostic utility of S100A1 expression in renal cell neoplasms: an immunohistochemical and quantitative RT-PCR study. *Mod Pathol.* 2007; 20:722-8.
3. Li G, et al. S100A1: a powerful marker to differentiate chromophobe renal cell carcinoma from renal oncocytoma. *Histopathology.* 2007; 50:642-7.

## Ordering Information

**S100A1 (EP184)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	408R-14
0.5 mL concentrate	408R-15
1 mL concentrate	408R-16
1 mL predilute	408R-17
7 mL predilute	408R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# S100P

S100P is a member of the S100 family of proteins. The family is expressed in a wide range of cells and is thought to play a role in cell cycle progression and in differentiation. Anti-S100P with nuclear or nuclear/cytoplasmic immunoreactivity can be seen in pancreatic ductal adenocarcinomas, while it is rarely detectable in benign pancreatic ducts. It may also help to distinguish urothelial carcinomas from other genitourinary neoplasms such as prostate carcinoma.<sup>1-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, nuclear

**Control** pancreatic ductal adenocarcinoma, urothelial carcinoma, placenta

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Kidney: Epithelial Neoplasms	309

## Reference

1. Lin F, et al. Diagnostic utility of S100P and von Hippel-Lindau gene product (pVHL) in pancreatic adenocarcinoma-with implication of their roles in early tumorigenesis. *Am J Surg Pathol.* 2008; 32:78-91.
2. Deng HB, et al. Usefulness of S100P in diagnosis of adenocarcinoma of pancreas on fine-needle aspiration biopsy specimens. *Am J Clin Pathol.* 2008; 129:81-8.
3. Crnogorac-Jurcevi T, et al. Molecular alterations in pancreatic carcinoma: expression profiling shows that dysregulated expression of S100 genes is highly prevalent. *J Pathol.* 2003; 201:63-74.
4. Nakata K, et al. S100P is a novel marker to identify intraductal papillary mucinous neoplasms. *Hum Pathol.* 2010; 41:824-31.
5. Higgins JP, et al. Placental S100 (S100P) and GATA3: markers for transitional epithelium and urothelial carcinoma discovered by complementary DNA microarray. *Am J Surg Pathol.* 2007; 31:673-80.
6. Levy M, et al. S100P, von Hippel-Lindau gene product, and IMP3 serve as a useful immunohistochemical panel in the diagnosis of adenocarcinoma on endoscopic bile duct biopsy. *Hum Pathol.* 2010; 41:1210-9.

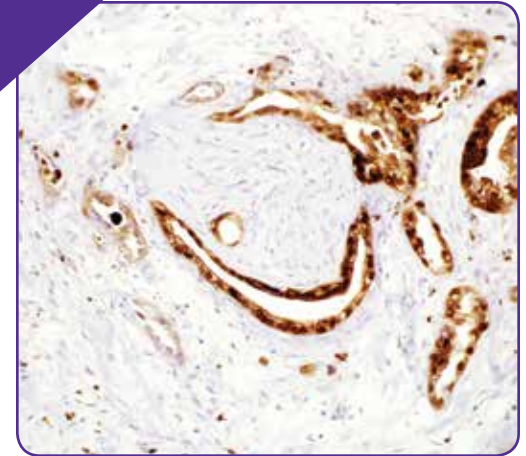
## Ordering Information

### S100P (16/f5)

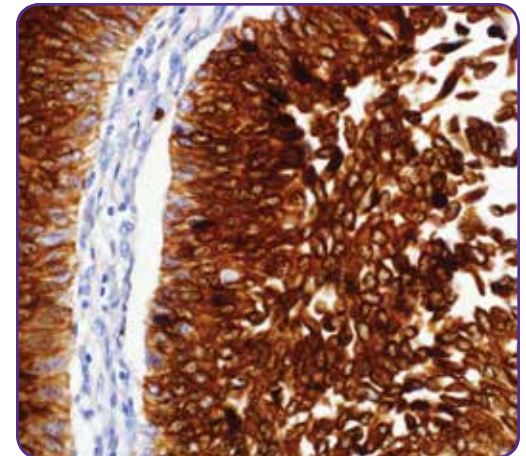
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	376M-94
0.5 mL concentrate	376M-95
1 mL concentrate	376M-96
1 mL predilute	376M-97
7 mL predilute	376M-98

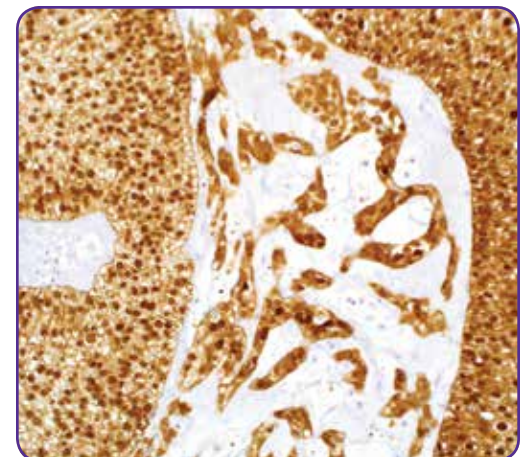
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreatic ductal adenocarcinoma

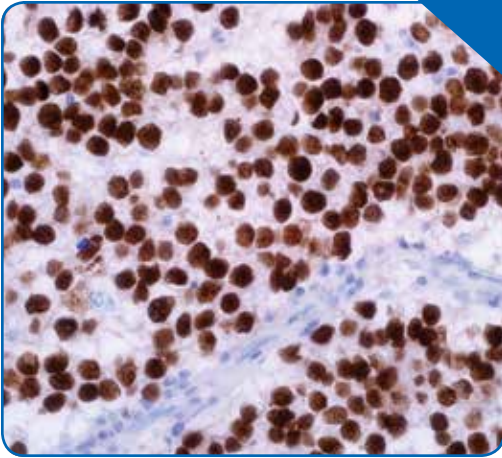


Renal pelvis, urothelial carcinoma

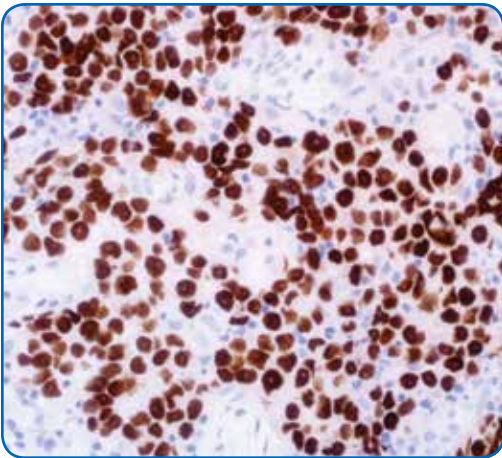


Urothelial carcinoma

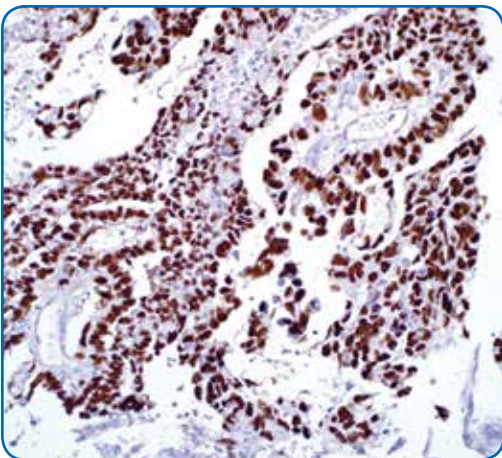
# SALL4



Seminoma



Seminoma



Embryonal carcinoma

Sal-like protein 4 (SALL4) is a zinc-finger transcription factor<sup>1</sup> that serves as a master regulator of embryonic pluripotency and is involved in processes associated with stem cell activities.<sup>2</sup> SALL4 expression in germ cells makes it a useful marker for germ cell tumors such as seminoma, embryonal carcinoma, yolk sac tumors and teratomas.<sup>1</sup> SALL4 expression is also seen in the spermatogonia of normal testis.

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** seminoma, dysgerminoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 6E3: IgG<sub>1</sub>
- EP299: IgG

## Associated Specialties

Anatomic Pathology

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Germ Cell Tumors	309

## Reference

1. Miettinen M, et al. SALL4 expression in germ cell and non-germ cell tumors: a systematic immunohistochemical study of 3215 cases. *Am J Surg Pathol.* 2014; 38:410-20.
2. Yang J, et al. Genome-wide analysis reveals Sall4 to be a major regulator of pluripotency in murine-embryonic stem cells. *PNAS.* 2008; 105:19756-61.

## Ordering Information

### SALL4 (6E3)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	385M-14
0.5 mL concentrate	385M-15
1 mL concentrate	385M-16
1 mL predilute	385M-17
7 mL predilute	385M-18

### SALL4 (EP299)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	385R-14
0.5 mL concentrate	385R-15
1 mL concentrate	385R-16
1 mL predilute	385R-17
7 mL predilute	385R-18

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# SATB2

Special AT-rich sequence-binding protein 2 (SATB2) is a recently described marker that functions as a nuclear matrix-associated transcription factor. It has been reported that SATB2, in combination with CK 20, could identify almost all colorectal carcinomas,<sup>1</sup> including poorly differentiated colorectal carcinomas<sup>2</sup>. Upper gastrointestinal (GI) carcinomas and pancreatic ductal carcinomas are usually negative for SATB2,<sup>1</sup> and ovarian carcinomas, lung adenocarcinomas, and adenocarcinomas from other origin are rarely positive for SATB2.<sup>1,2</sup> Therefore, SATB2 is a good marker for identifying a carcinoma of colorectal origin when working on a tumor of unknown primary.<sup>1,2,5</sup> Another potential utility of SATB2 is to identify neuroendocrine neoplasms/carcinomas of the left colon and rectum because SATB2 is usually negative in other neuroendocrine neoplasms of the GI tract, pancreas, and lung.<sup>3</sup> More recently, it has been shown in literature that SATB2 is a sensitive marker for tumors with osteoblastic differentiation.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** colon adenocarcinoma, colon

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

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Colon vs. Ovarian Carcinoma	294
Neuroendocrine Neoplasms	298

## Reference

1. Mangnusso K, et al. SATB2 in combination with cytokeratin 20 identifies over 95% of all colorectal carcinoma. *Am J Surg Pathol.* 2011; 35:937-48.
2. Lin F, et al. Cadherin17 and SATB2 are sensitive and specific immunomarkers for medullary carcinoma of the large intestine. *Arch Pathol Lab Med.* 2014; 138:1015-26.
3. Li Z, et al. SATB2 is a sensitive marker for lower gastrointestinal well-differentiated neuroendocrine tumors. *Mod Pathol.* 2013; 26:164A.
4. Conner JR, et al. SATB2 is a novel marker of osteoblastic differentiation in bone and soft tissue tumors. *Histopathology.* 2013; 63:182-93
5. Dragomir A, et al. The role of SATB2 as a diagnostic marker for tumors of colorectal origin. *Am J Clin Pathol.* 2014; 141:630-38.

## Ordering Information

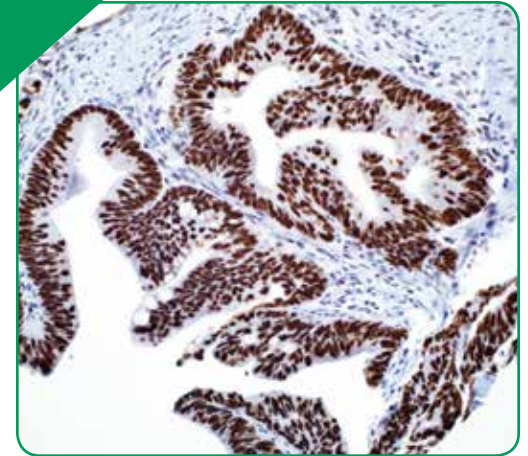
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Rabbit Monoclonal  
Primary Antibody

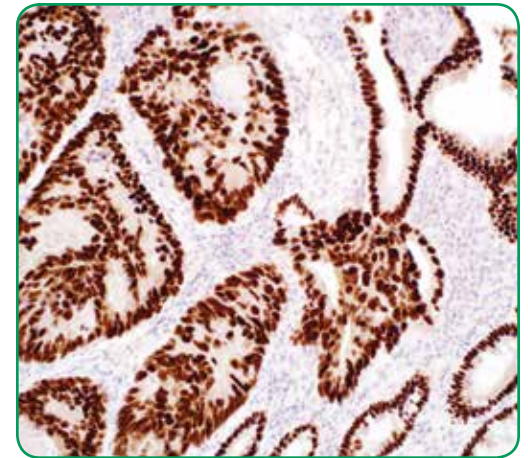


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1 mL predilute	384R-17
7 mL predilute	384R-18
25 mL predilute	384R-10

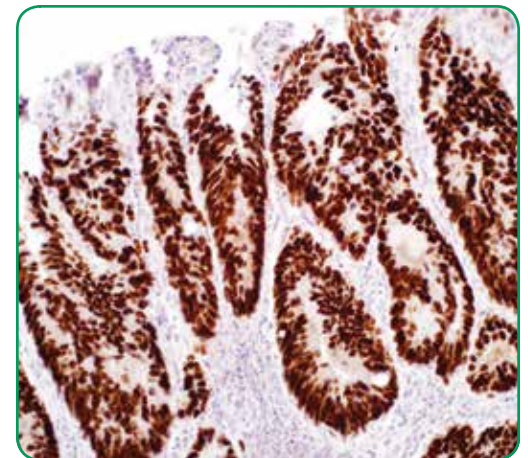
*Please contact your distributor for details on product availability and regulatory status in your country.*



Colorectal carcinoma



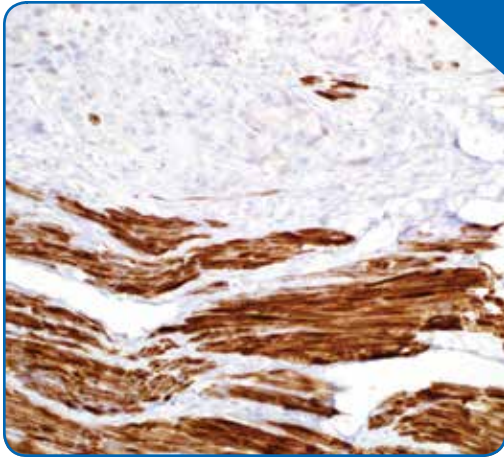
Colorectal carcinoma



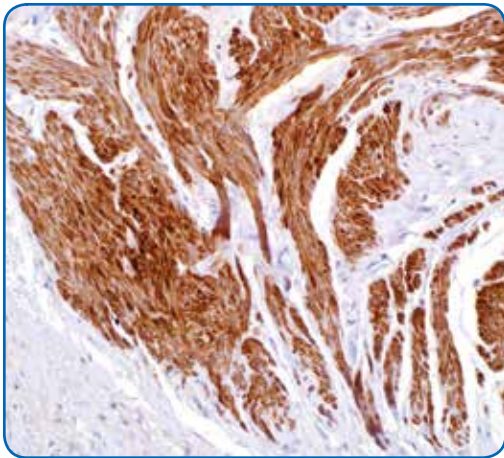
Colorectal carcinoma



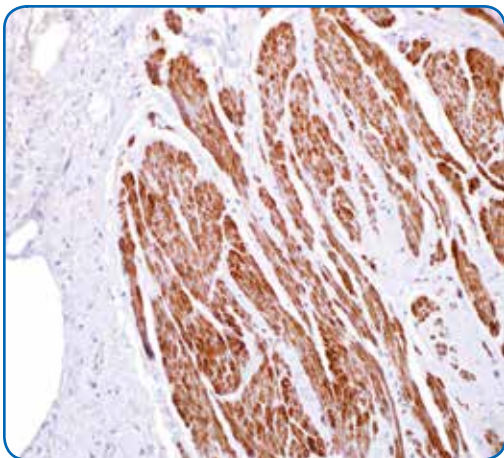
# Smoothelin



Bladder wall, muscularis propria



Bladder



Bladder

Smoothelin is a constituent of the smooth muscle cell cytoskeleton protein exclusively found in differentiated smooth muscle cells (SMC). Cells with SMC-like characteristics, such as myofibroblasts and myoepithelial cells, as well as skeletal and cardiac muscle do not contain smoothelin.<sup>1,2</sup> To distinguish bladder muscularis mucosae (MM) from muscularis propria (MP) muscle bundles is crucial for accurate staging of bladder carcinoma. Strong smoothelin expression is nearly exclusively observed in muscularis propria. Therefore, the staining pattern of MP (strongly positive) and MM (negative or weakly positive) makes this technique an attractive diagnostic tool for the sometimes difficult task of staging bladder urothelial carcinoma, such as in transurethral resection specimens of urinary bladder tumors.<sup>3-8</sup> Differentiating between smooth muscle tumors and other mesenchymal neoplasms of the GI tract can be challenging in small biopsies. Anti-smoothelin immunostaining can be helpful in differentiating benign (+) from malignant smooth muscle tumors (-), and other mimics (-).<sup>9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** bladder

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Bladder Tissue	308

## Reference

1. Krämer J, et al. J Mol Med. 1999; 77:294-8.
2. van der Loop FT, et al. J Cell Biol. 1996; 134:401-11.
3. Maake C, et al. J Urol. 2006; 175:1152-7.
4. Jimenez RE, et al. Adv Anat Pathol. 2000; 7:13-25.
5. Kuijpers KA, et al. Eur Urol. 2007; 52:1213-21.
6. Paner GP, et al. Am J Surg Pathol. 2009; 33:91-8.
7. Paner GP, et al. Am J Surg Pathol. 2010; 34:792-9.
8. Council L, et al. Mod Pathol. 2009; 22:639-650.
9. Coco DP, et al. Am J Surg Pathol. 2009; 33:1795-801.

## Ordering Information

### Smoothelin (R4A)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	377M-14
0.5 mL concentrate	377M-15
1 mL concentrate	377M-16
1 mL predilute	377M-17
7 mL predilute	377M-18

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# Somatostatin

Somatostatin is a peptide hormone widely distributed throughout the body and is an important regulator of endocrine and nervous system function. Somatostatin can also be found in gastrointestinal, bronchopulmonary and thymic neuroendocrine cells, and thyroid C-cells. Anti-somatostatin is a useful marker of D-cells of pancreatic islets.<sup>1,2</sup> It recognizes somatostatin-containing cells in pancreatic tumors, islet cell hyperplasia, and islet cells originating in pancreatic ductules.<sup>3-6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pancreas

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP130: IgG



## Associated Specialties

Anatomic Pathology

## Reference

1. Krejs GJ. Physiological role of somatostatin in the digestive tract: gastric acid secretion, intestinal absorption, and motility. *Scand J Gastroenterol Suppl.* 1986; 119:47-53.
2. Tzaneva MA. Ultrastructural immunohistochemical localization of gastrin, somatostatin and serotonin in endocrine cells of human antral gastric mucosa. *Acta Histochem.* 2003; 105:191-201.
3. Krejs GJ, et al. Somatostatinoma syndrome. Biochemical, morphologic and clinical features. *N Engl J Med.* 1979; 9:285-92.
4. Friesen SR. Tumors of the endocrine pancreas. *N Engl J Med.* 1982; 306:580-90.
5. Kanavaros P, et al. Serotonin-producing pancreatic endocrine tumour. Histological, ultrastructural and immunohistochemical study of a case. *Histol Histopathol.* 1990; 5:325-8.
6. Chejfec G, et al. Neuroendocrine carcinoma of the stomach with extensive somatostatin immunoreactivity. *Ultrastruct Pathol.* 1992; 16:537-45.

## Ordering Information

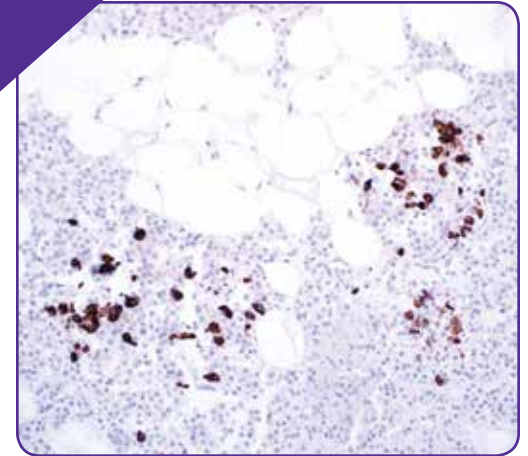
**Somatostatin (EP130)**  CELL MARQUE  
Rabbit Monoclonal  
Primary Antibody  RabMAb  
Technology from Abcam

Volume	Part No.
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0.5 mL concentrate	332R-15
1 mL concentrate	332R-16
1 mL predilute	332R-17
7 mL predilute	332R-18

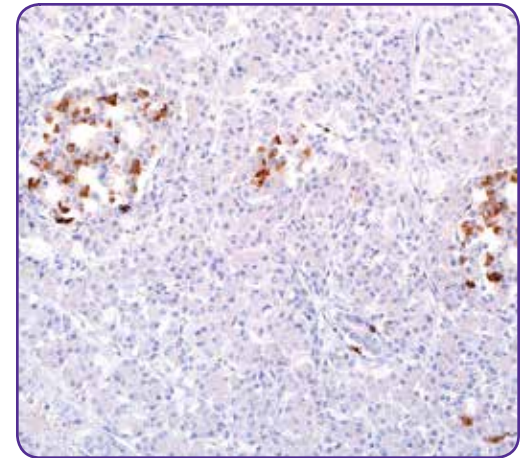
**Somatostatin**  
Rabbit Polyclonal Antibody

Volume	Part No.
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0.5 mL concentrate	332A-15
1 mL concentrate	332A-16
1 mL predilute	332A-17
7 mL predilute	332A-18

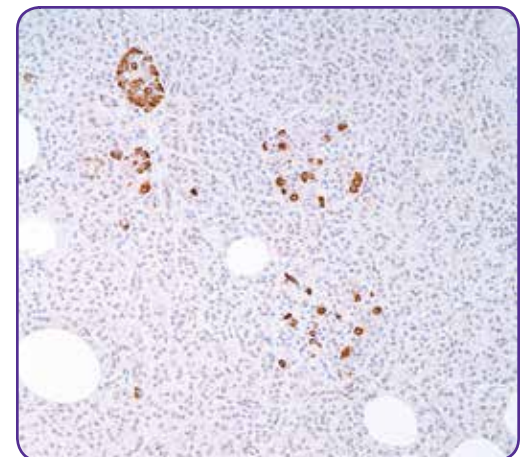
*Please contact your distributor for details on product availability and regulatory status in your country.*



Pancreas

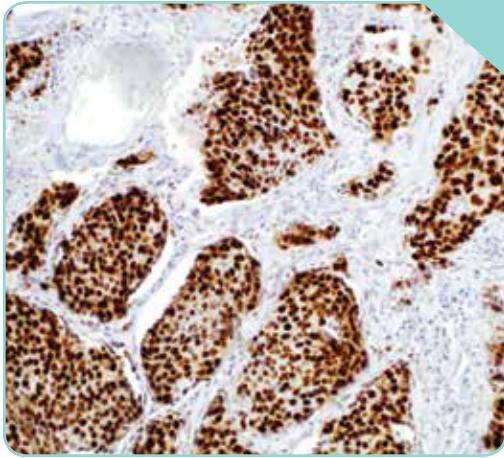


Pancreas

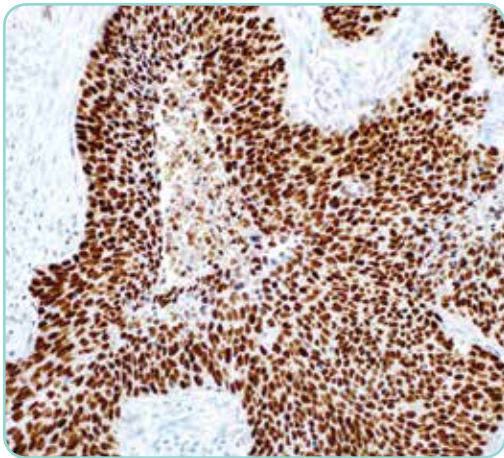


Pancreatic islets

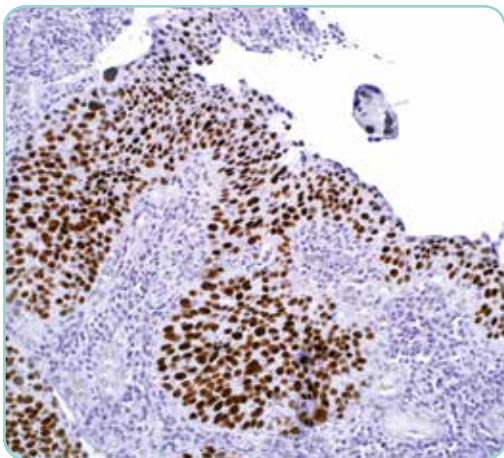
# SOX-2



Lung squamous cell carcinoma



Lung squamous cell carcinoma



Skin squamous cell carcinoma

The SOX-2 protein is part of a large family of transcription factors that function in regulating a variety of different processes during embryonic development and maintaining pluripotency of stem cells including germ cells and neural cells.<sup>1-4</sup> Dysregulation of SOX-2 can lead to malignancies in many organ systems, specifically lung carcinomas, non-seminomatous germ cell tumors, neuroendocrine cancers and neuroglial tumors.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** lung squamous cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP103: IgG
- SP76: IgG

## Associated Specialties

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Various Germ Cell Tumor Components	301
Germ Cell Tumors	309
Lung Squamous Cell Carcinoma vs. Adenocarcinoma	320

## Reference

1. Sholl LM, et al. SOX2 expression in pulmonary non-small cell and neuroendocrine carcinomas. *Appl Immunohistochem Mol Morphol.* 2010; 18:55-61.
2. Gopalan A, et al. Testicular mixed germ cell tumors: a morphological and immunohistochemical study using stem cell markers, OCT3/4, SOX2 and GDF3, with emphasis on morphologically difficult-to-classify areas. *Mod Pathol.* 2009; 22:1066-74.
3. Maier S, et al. SOX 2 amplification is a common event in squamous cell carcinomas of different organ sites. *Human Pathol.* 2011; 42:1078-88.
4. Phi JH, et al. Sox 2 expression in brain tumors: a reflection of the neuroglial differentiation pathway. *Am J Surg Pathol.* 2008; 32:103-12.

## Ordering Information

### SOX-2 (EP103)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	371R-24
0.5 mL concentrate	371R-25
1 mL concentrate	371R-26
1 mL predilute	371R-27
7 mL predilute	371R-28

### SOX-2 (SP76)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	371R-14
0.5 mL concentrate	371R-15
1 mL concentrate	371R-16
1 mL predilute	371R-17
7 mL predilute	371R-18
25 mL predilute	371R-10

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# SOX-10

Sry-related HMG-BOX gene 10, SOX-10, is a transcription factor involved in neural crest and peripheral nervous system development, and acts as a nucleocytoplasmic shuttle protein.<sup>1</sup> SOX-10 is expressed in melanocytic lineages, and is a sensitive marker of melanoma for conventional, and desmoplastic subtypes.<sup>2-3</sup> In normal tissues, SOX-10 is expressed in melanocytes, and myoepithelial cells.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** melanoma, skin melanocytes

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP268: IgG

## Associated Specialties

Dermatopathology

## Associated Grids

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Cutaneous Lesion	304
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Meningeal Solitary Fibrous Tumor (SFT)	318

## Reference

1. Rehberg S, et al. Sox10 is an active nucleocytoplasmic shuttle protein, and shuttling is crucial for Sox10-mediated transactivation. *Mol Cell Biol.* 2002; 22:5826-34.
2. Nonaka D, et al. Sox10: a pan-schwannian and melanocytic marker. *Am J Surg Pathol.* 2008; 32:1291-8.
3. Nielsen TO, et al. Sox10 and S100 in the diagnosis of soft-tissue neoplasms. *Appl Immunohistochem Mol Morphol.* 2012; 20:445-50.
4. Miettinen M, et al. Sox10--a marker for not only schwannian and melanocytic neoplasms but also myoepithelial cell tumors of soft tissue: a systematic analysis of 5134 tumors. *Am J Surg Pathol.* 2015; 39:826-35.

## Ordering Information

### SOX-10 (EP268)

Rabbit Monoclonal  
Primary Antibody



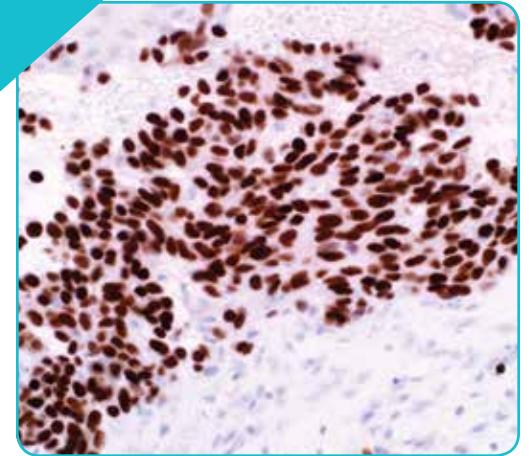
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25 mL predilute	383R-10

### SOX-10

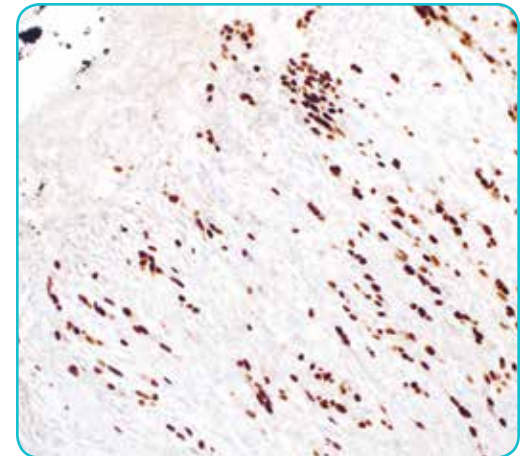
Rabbit Polyclonal Antibody

Volume	Part No.
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7 mL predilute	383A-78

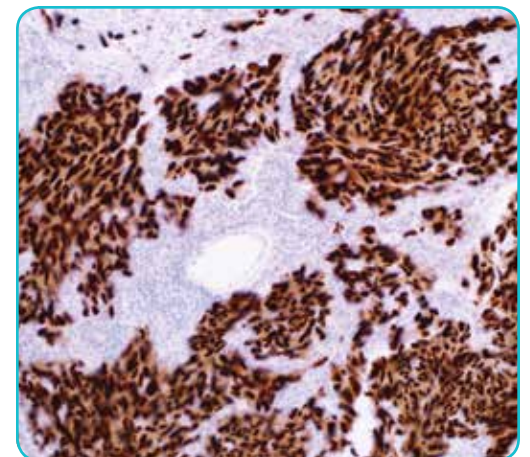
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Desmoplastic melanoma

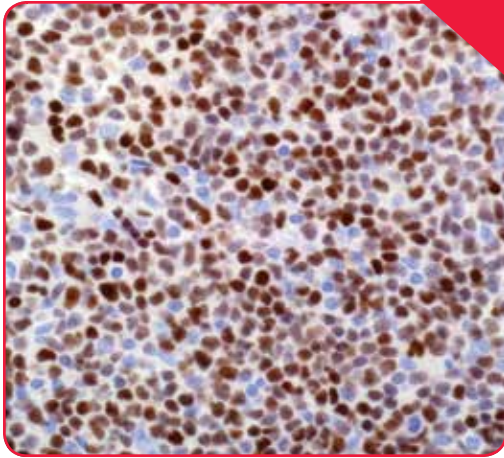


Malignant melanoma

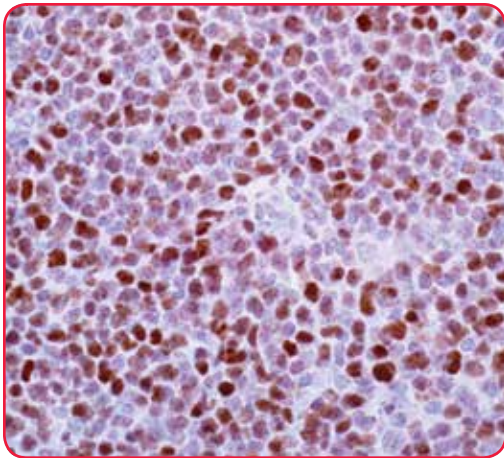


Lung, metastatic melanoma

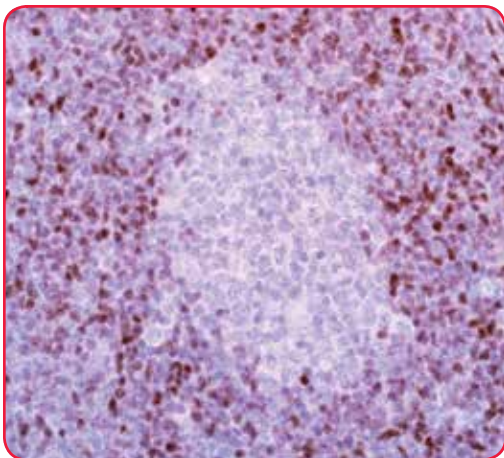
# SOX-11



Mantle cell lymphoma



Mantle cell lymphoma



Mantle cell lymphoma

SOX-11 which is a member of the SOX (SRY-related HMG-box) family is a transcription factor normally expressed in the developing human central nervous system and plays a role in embryonic cell determination.<sup>1,3</sup> Studies show that SOX-11 can be used as a marker for mantle cell lymphoma (MCL).<sup>2,3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** mantle cell lymphoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

Hematopathology

## Associated Grids

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CD5 in B-cell Neoplasms	312
Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)	314

## Reference

1. Hargrave M, et al. Expression of the SOX-11 gene in mouse embryos suggests roles in neuronal maturation and epithelio-mesenchymal induction. *Dev Dyn.* 1997; 210:79-86.
2. Zeng W, et al. Cyclin D1-negative blastoid mantle cell lymphoma identified by SOX-11 expression. *Am J Surg Pathol.* 2012; 36:214-9.
3. Narurkar R, et al. SOX11 is a biomarker for cyclin D1-negative mantle cell lymphoma. *Biomark Res.* 2016; 4:6.

## Ordering Information

### SOX-11 (MRQ-58)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	382M-14
0.5 mL concentrate	382M-15
1 mL concentrate	382M-16
1 mL predilute	382M-17
7 mL predilute	382M-18
25 mL predilute	382M-10

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Spectrin

Spectrin is a cytoskeletal protein which is found in muscles, red blood cells and red cell precursors. Spectrin is an actin-crosslinking and molecular scaffold protein that links the plasma membrane to the actin cytoskeleton and functions in the determination of cell shape, arrangement of transmembrane proteins, and organization of organelles. The gene is one member of a family of alpha-spectrin genes. The encoded protein is primarily composed of 22 spectrin repeats which are involved in dimer formation. It forms weaker tetramer interactions than non-erythrocytic alpha spectrin, which may increase the plasma membrane elasticity and deformability of red blood cells. Mutations in the gene result in a variety of hereditary red blood cell disorders, including elliptocytosis type 2, pyropoikilocytosis, and spherocytic hemolytic anemia. Anti-spectrin is useful in the identification of erythrocytes and erythroid disorders.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** membranous

**Control** bone marrow

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP251: IgG
- RBC2/3D5: IgG<sub>2b</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Erythroid	313

## Reference

1. Sadahira Y, et al. Immunohistochemical identification of erythroid precursors in paraffin embedded bone marrow sections: spectrin is a superior marker to glycophorin. *J Clin Pathol.* 1999; 52:919-21.
2. Nehls V, et al. Different sequences of expression of band 3, spectrin, and ankyrin during normal erythropoiesis and erythroleukemia. *Am J Pathol.* 1993; 142:1565-73.
3. Muller M, et al. Immunohistological demonstration of erythroid cells in canine bone marrow. *J Vet Med A Physiol Pathol Clin Med.* 2001; 48:51-7.
4. Terada N, et al. An immunocytochemical study of changes in the human erythrocyte membrane skeleton produced by stretching examined by the quick-freezing and deep-etching method. *J Anat.* 1997; 190:397-404.

## Ordering Information

### Spectrin (EP251)

Rabbit Monoclonal  
Primary Antibody



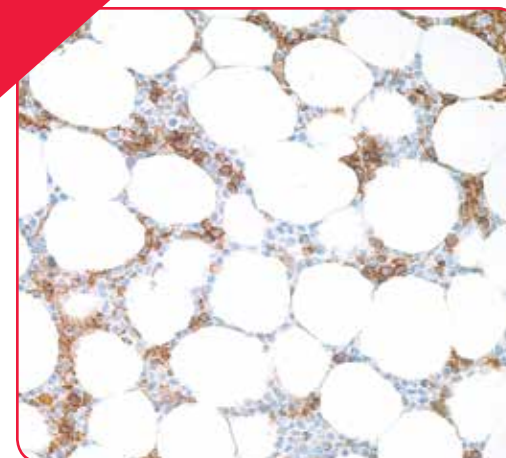
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1 mL concentrate	333R-16
1 mL predilute	333R-17
7 mL predilute	333R-18

### Spectrin (RBC2/3D5)

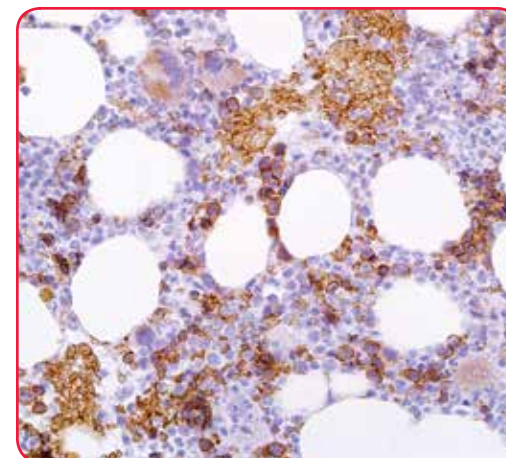
Mouse Monoclonal Antibody

Volume	Part No.
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7 mL predilute	333M-18

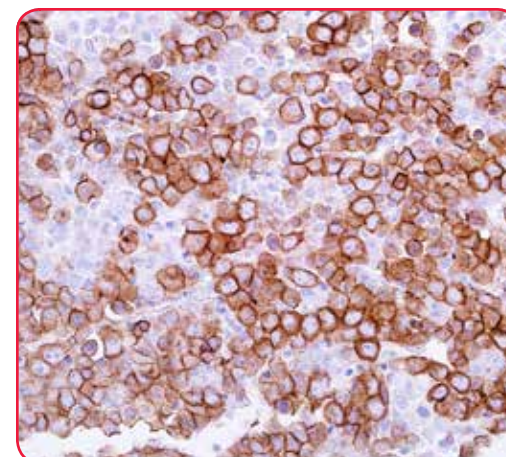
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Bone marrow

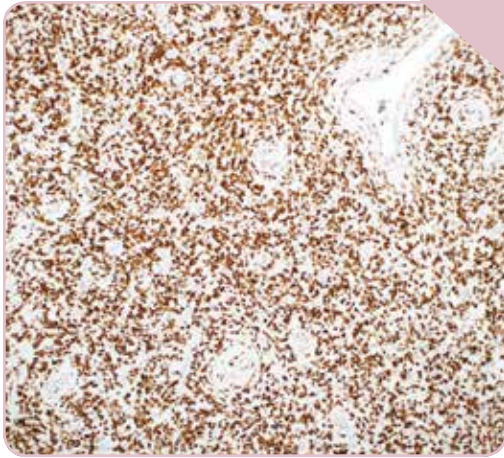


Bone marrow

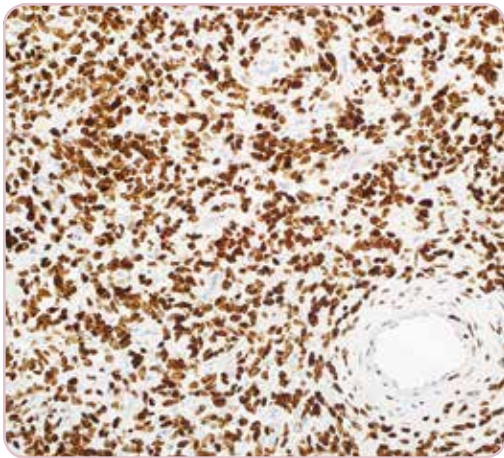


Acute erythroid leukemia

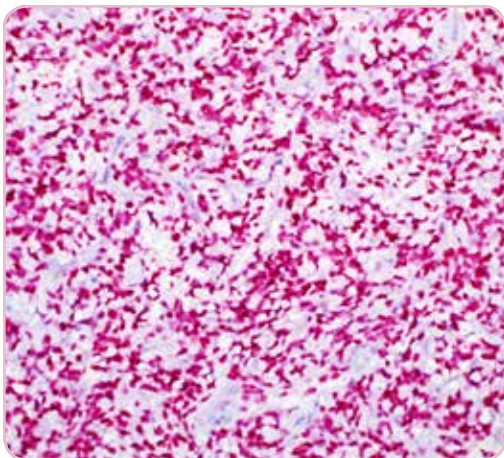
# STAT6



Solitary fibrous tumor



Solitary fibrous tumor



Solitary fibrous tumor

STAT6, a member of the signal transducers and activators of transcription (STAT) family, has been found to form recurrent fusions with NAB2 on chromosome 12q13 in the majority of solitary fibrous tumors.<sup>1-3</sup> Inactivated STAT6 can be found in the form of a dimer located in the cytoplasm.<sup>1</sup> STAT6 and NAB2 fusion enables cytosolic STAT6 to migrate to the nucleus and thus allowing for detection in immunohistochemical assays.<sup>1</sup> NAB2-STAT6 fusion transcriptions have been reported in the majority of solitary fibrous tumors but not in meningiomas, hemangioblastomas, schwannomas, and hemangiomas.<sup>1-3</sup> This makes STAT6 a useful marker in distinguishing solitary fibrous tumors from other tumors with similar morphology.

## Product Specifications

**Reactivity** paraffin  
**Visualization** nuclear  
**Control** solitary fibrous tumor  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Soft Tissue Pathology  
Pulmonary Pathology

## Associated Grids

Grid	Page No.
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Thoracic Solitary Fibrous Tumor vs. Potential Mimics	320
Solitary Fibrous Tumor vs. Other Soft Tissue Tumors	323
Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms	324

## Reference

1. Cheah AL, et al. STAT6 rabbit monoclonal antibody is a robust diagnostic tool for the distinction of solitary fibrous tumour from its mimics. *Pathology*. 2014; 46:389-95.
2. Schweizer L, et al. Meningeal hemangiopericytoma and solitary fibrous tumors carry the NAB2-STAT6 fusion and can be diagnosed by the nuclear expression of STAT6 protein. *Acta Neuropathol*. 2013; 125:651-58.
3. Koelsche C, et al. Nuclear relocation of STAT6 reliably predicts NAB2-STAT6 fusion for the diagnosis of solitary fibrous tumour. *Histopathology*. 2014; 65:613-22.

## Ordering Information

**STAT6 (EP325)**  
Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	426R-14
0.5 mL concentrate	426R-15
1 mL concentrate	426R-16
1 mL predilute	426R-17
7 mL predilute	426R-18

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# Stathmin

Stathmin functions as a regulatory element in microtubule dynamics, making its role in the cell cycle critical. Its expression is therefore ubiquitous, but it is particularly found in tissues with higher cell turnover.<sup>1-2</sup> Stathmin expression in cervical intraepithelial neoplasia (CIN) has been demonstrated to be grade dependent, with the highest expression in CIN III and the least expression in CIN I.<sup>3-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil, cervical intraepithelial neoplasia-high grade

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

Oncoprotein 18

Stathmin-1

## Associated Specialties

Breast/Gynecological Pathology

Cytopathology

## Associated Grids

Grid	Page No.
Cervical Epithelial Neoplastic Lesions	302
Cervical Squamous Cell Neoplasms	309

## Reference

1. Rubin CI. The role of stathmin in the regulation of the cell cycle. *J Cell Biochem.* 2004; 93:242-50.
2. Belletti B, et al. Stathmin: a protein with many tasks. New biomarker and potential target in cancer. *Expert Opin Ther Targets.* 2011; 15:1249-66.
3. Syrjanen KJ. Spontaneous evolution of intraepithelial lesions according to the grade and type of the implicated human papillomavirus (HPV). *Eur J Obstet Gynecol Reprod Biol.* 1996; 65:45-53.
4. Howitt BE, et al. Stathmin-1 expression as a complement to p16 helps identify high-grade cervical intraepithelial neoplasia with increased specificity. *Am J Surg Pathol.* 2013; 37:89-97.

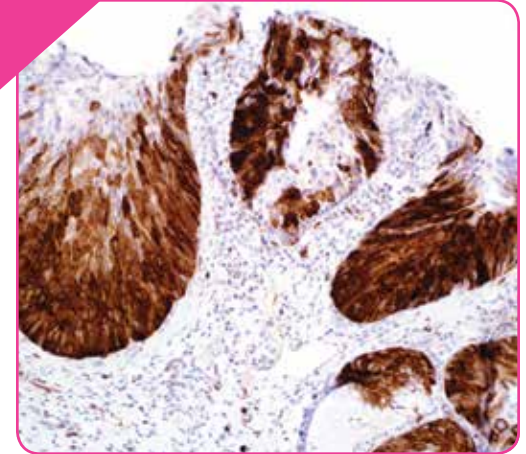
## Ordering Information

### Stathmin (SP49)

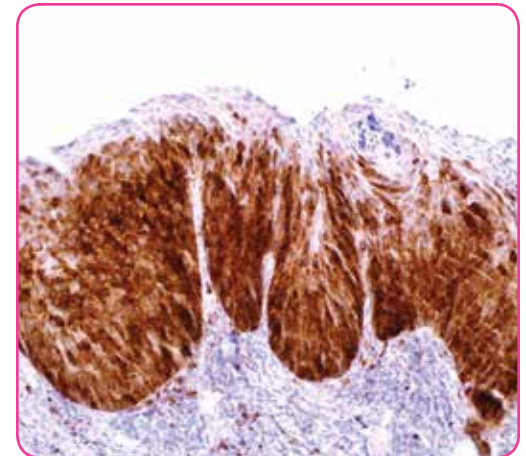
Rabbit Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	394R-15
1 mL concentrate	394R-16
1 mL predilute	394R-17
7 mL predilute	394R-18

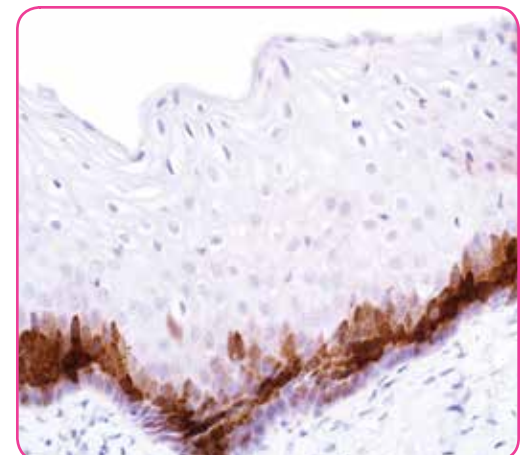
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Cervical intraepithelial neoplasia III (CIN III)



High grade cervical intraepithelial neoplasia (CIN III)



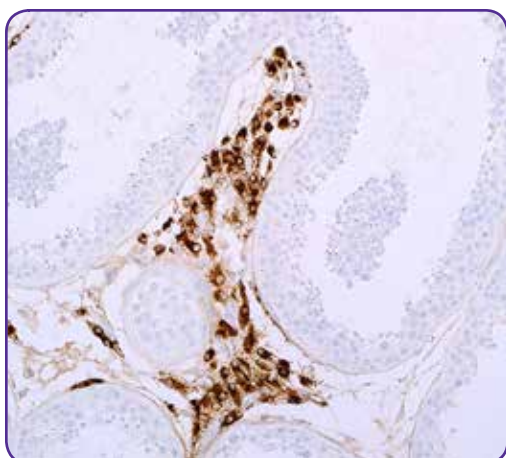
Low grade cervical intraepithelial neoplasia (CIN I)



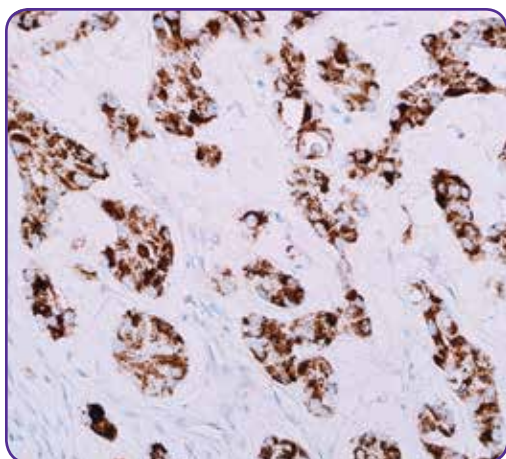
# Steroidogenic Acute Regulatory Protein (STAR)



Adrenal cortex



Testis, Leydig cells



Testis, Leydig cell tumor

Steroidogenic Acute Regulatory Protein (STAR) is a sterol transfer protein that is critical for steroidogenesis.<sup>1</sup> Steroidogenesis is the process where steroid hormones are made within specialized cells.<sup>2</sup> STAR controls the rate-limiting step of steroidogenesis by translocating cholesterol from the outer mitochondrial membrane to the inner membrane where it is later cleaved to pregnenolone.<sup>2</sup> Immunohistochemically, STAR is a cytoplasmic marker that is generally localized in the normal and neoplastic cells of steroid hormone producing tissues such as testis and adrenal gland.<sup>3</sup> Due to their low levels of pregnenolone, seminomas and Leydig cell tumors display no specific STAR staining.<sup>3</sup> Therefore, this antibody may assist in differentiating sex cord stromal tumors, seminomas and embryonal carcinomas.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin  
**Visualization** cytoplasmic  
**Control** adrenal cortex  
**Stability** up to 36 mos. at 2-8°C  
**Isotype** IgG

## Associated Specialties

Anatomic Pathology  
 Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Adrenal Neoplasms	292
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Sex Cord Stromal Tumors	303

## Reference

1. Kallen CB, et al. Steroidogenic Acute Regulatory Protein (StAR) is a sterol transfer protein. *J Biol Chem.* 1998; 273:26285-8.
2. Chiu CH, et al. Production and application of a polyclonal peptide antiserum for universal detection of StAR protein. *Chin J Physiol.* 2008; 51:54-61.
3. Pollack SE, et al. Localization of the steroidogenic acute regulatory protein in human tissues. *J Clin Endocrinol Metab.* 1997; 82:4343-51.

## Ordering Information

**Steroidogenic Acute Regulatory Protein (STAR) (EP226)**  
 Rabbit Monoclonal Primary Antibody



Volume	Part No.
0.1 mL concentrate	446R-14
0.5 mL concentrate	446R-15
1 mL concentrate	446R-16
1 mL predilute	446R-17
7 mL predilute	446R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# SV40

SV40, Simian Virus 40, is a polyomavirus that is found in both monkeys and humans. Like other polyomaviruses, SV40 is a DNA virus that has the potential to cause tumors. SV40 is believed to suppress the transcriptional properties of tumor-suppressing p53 in humans through the SV40 large T-antigen and SV40 small T-antigen.<sup>1-2</sup> It is generally assumed that large T-antigen is the major protein involved in neoplastic processes and the large T-antigen predominantly exerts its effect through deregulation of tumor suppressor p53, which is responsible for initiating regulated cell death ("apoptosis"), or cell cycle arrest when a cell is damaged. Anti-SV40 recognizes the large T-antigen of SV40.<sup>3</sup> A mutated p53 gene may contribute to uncontrolled cellular proliferation, leading to a tumor. The hypothesis that SV40 might cause cancer in humans has been a particularly controversial area of research.<sup>4</sup> Some research has suggested that SV40 is associated with brain tumors, bone cancers, non-Hodgkin lymphoma, and malignant mesothelioma.<sup>1,2,5,6</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** SV40 infected tissue

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Anatomic Pathology

## Reference

1. Huang H, et al. Identification in human brain tumors of DNA sequences specific for SV40 large T antigen. *Brain Pathol.* 1999; 9:33-42.
2. Butel JS. Increasing evidence for involvement of SV40 in human cancer. *Dis Markers.* 2001; 17:167-72.
3. Gurney EG, et al. Monoclonal antibodies against simian virus 40 T antigens: evidence for distinct subclasses of large T antigen and for similarities among nonviral T antigens. *J Virol.* 1980; 34:752-63.
4. Poulin DL, et al. Is there a role for SV40 in human cancer? *J Clin Oncol.* 2006; 24:4356-65.
5. Pershouse M, et al. The role of SV40 in malignant mesothelioma and other human malignancies. *Inhal Toxicol.* 2006; 18:995-1000.
6. Kroczyńska B, et al. Crocidolite asbestos and SV40 are cocarcinogens in human mesothelial cells and in causing mesothelioma in hamsters. *Proc Natl Acad Sci USA.* 2006; 103:14128-33.

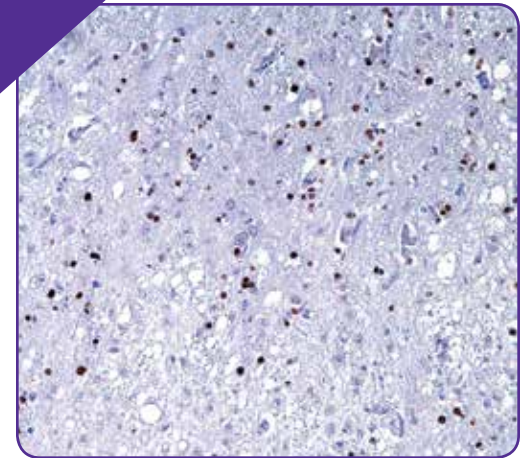
## Ordering Information

### SV40 (MRQ-4)

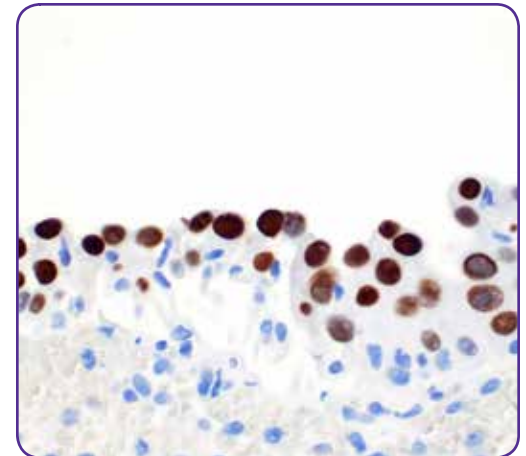
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	351M-14
0.5 mL concentrate	351M-15
1 mL concentrate	351M-16
1 mL predilute	351M-17
7 mL predilute	351M-18

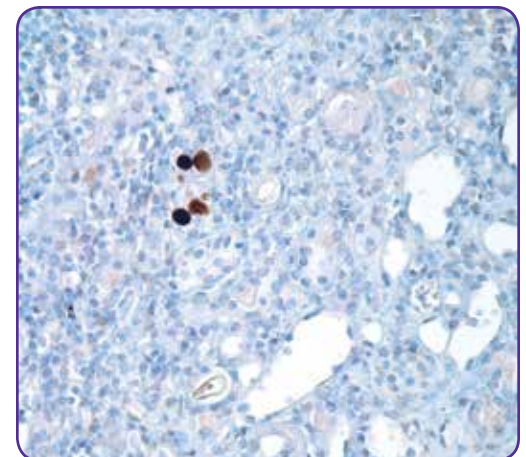
*Please contact your distributor for details on product availability and regulatory status in your country.*



Brain

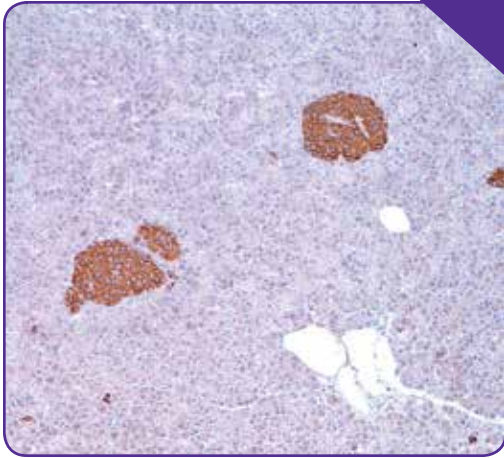


Bladder, hemorrhagic cystitis

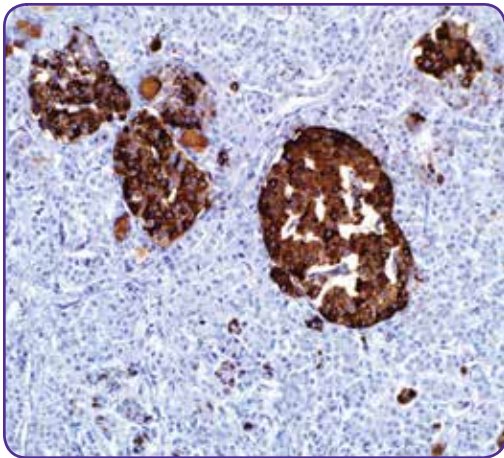


Kidney

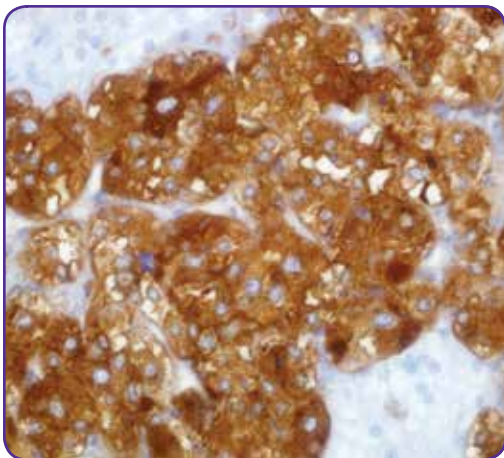
# Synaptophysin



Pancreatic islet cells



Pancreas islets



Adrenal gland

Anti-synaptophysin reacts with neuroendocrine cells of human adrenal medulla, carotid body, skin, pituitary, thyroid, lung, pancreas, and gastrointestinal mucosa. This antibody identifies normal neuroendocrine cells and neuroendocrine neoplasms. Diffuse, finely granular, cytoplasmic staining is observed, which probably correlates with the distribution of the antigen within neurosecretory vesicles. The expression of synaptophysin is independent of the presence of NSE or other neuroendocrine markers. Anti-synaptophysin is an independent, broad-range marker of neural and neuroendocrine differentiation.<sup>1-9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pancreatic islet cells

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP158: IgG<sub>1</sub>
- MRQ-40: IgG

## Associated Specialties

Anatomic Pathology

## Associated Grids

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Carcinomas from Thyroid and Other Sites	294
Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics	295
Differential Diagnosis of Thyroid and Parathyroid Tumors	295, 311
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Lung Small Cell Carcinoma vs. MCC	297
Neuroendocrine Tumors from Different Anatomical Locations	299
Retroperitoneal Lesions	299, 319
MCC vs. Cutaneous Small Cell Tumors	305
Pancreatic Epithelial Tissues and Tumors	308
Germ Cell Tumors	309
Brain: CNS Tumors	318
Retroperitoneal Neoplasms	318
NB vs. Other Small Round Cell Tumors	321

## Reference

1. Navone F, et al. J Cell Biol. 1986; 103:2511-2527.
2. Wiedenmann B, et al. Cell. 1985; 41:1017-1028.
3. Kayser K, et al. Path Res Pract. 1988; 183:412-417.

For the complete list of references see the product IFU.

## Ordering Information

### Synaptophysin (EP158)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	336R-14
0.5 mL concentrate	336R-15
1 mL concentrate	336R-16
1 mL predilute	336R-17
7 mL predilute	336R-18

### Synaptophysin (MRQ-40)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	336R-94
0.5 mL concentrate	336R-95
1 mL concentrate	336R-96
1 mL predilute	336R-97
7 mL predilute	336R-98

### Synaptophysin

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	336A-74
0.5 mL concentrate	336A-75
1 mL concentrate	336A-76
1 mL predilute	336A-77
7 mL predilute	336A-78
25 mL predilute	336A-70

Please contact your distributor for details on product availability and regulatory status in your country.

# T-bet

T-bet, a T-box transcription factor, is expressed in CD4+ T-lymphocytes committed to T-helper (T<sub>H</sub>)1 T-cell development from naïve T-helper precursor cells (T<sub>H</sub>p) and redirects T<sub>H</sub>2 T-cells to T<sub>H</sub>1 development. Anti-T-bet is a marker of mature T-cells and is expressed at very low levels in T<sub>H</sub>p cells and is absent in precursor T-lymphoblastic leukemia/lymphoma cells. Scattered small lymphocytes in the interfollicular T-cell zone of reactive lymphoid tissue, including tonsil, lymph node, and spleen exhibited nuclear staining for anti-T-bet, with no anti-T-bet staining observed in germinal centers or mantle or marginal zones. T-bet is expressed in a significant subset of B-cell lymphoproliferative disorders, particularly at an early stage of B-cell development (precursor B-cell lymphoblastic leukemia/lymphoblastic lymphoma), and B-cell neoplasms derived from mature B-cells, including CLL/SLL, marginal zone lymphoma, and hairy cell leukemia. In contrast, B-cell neoplasms derived from pre-germinal center or germinal center B-cells, including mantle cell lymphoma, follicular lymphoma, diffuse large B-cell lymphoma, and Burkitt lymphoma are negative for T-bet.<sup>1-7</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** tonsil, hairy cell leukemia

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

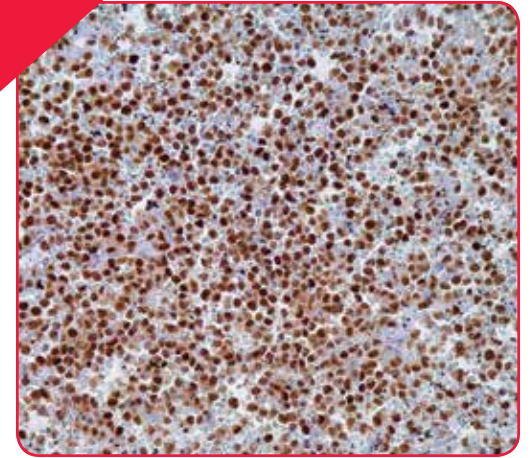
Hematopathology

## Associated Grids

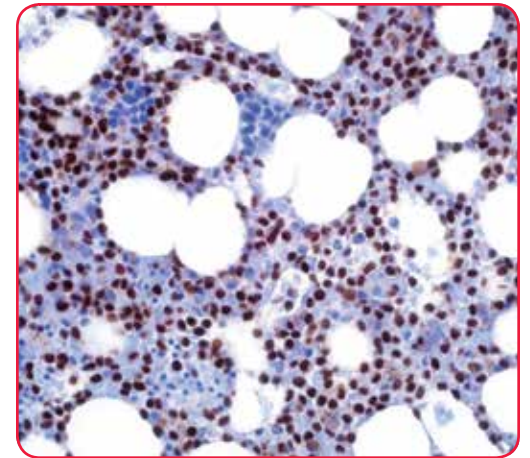
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Small and Medium/Large B-Cell Neoplasms	317

## Reference

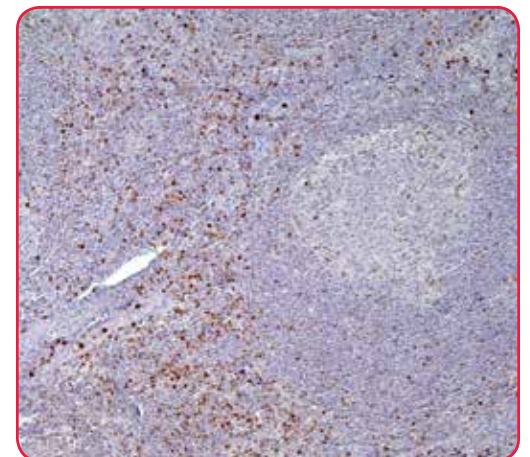
1. Szabo SJ, et al. A novel transcription factor, T-bet, directs Th1 lineage commitment. *Cell*. 2000; 100:665-69.
2. Zhang WX, et al. Cloning and characterization of a new member of the T-box gene family. *Genomics*. 2000; 70:41-8.
3. Jöhrens K, et al. T-bet transcription factor detection facilitates the diagnosis of minimal hairy cell leukemia infiltrates in bone marrow trephines. *Am J Surg Pathol*. 2007; 31:1181-5.
4. Atayar C, et al. Expression of the T-cell transcription factors, GATA-3 and T-bet, in the neoplastic cells of Hodgkin lymphomas. *Am J Pathol*. 2005; 166:127-34.
5. Dorfman DM, et al. T-bet, a T-cell associated transcription factor, is expressed in a subset of B-cell lymphoproliferative disorders. *Am J Clin Pathol*. 2004; 122:292-7.
6. Harashima A, et al. Transcription factor expression in B-cell precursor-leukemia cell lines: preferential expression of T-bet. *Leuk Res*. 2005; 29:841-8.
7. Marafioti T, et al. Expression of B-cell lymphocyte-associated transcription factors in human T-cell neoplasms. *Am J Pathol*. 2003; 162:861-71.



Hairy cell leukemia



Hairy cell leukemia



Tonsil

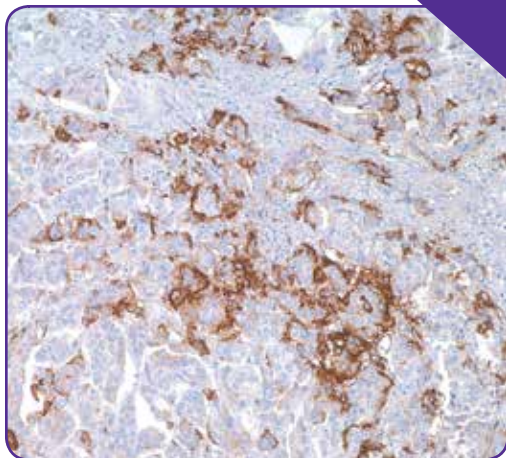
## Ordering Information

**T-bet (MRQ-46)**  
Rabbit Monoclonal Antibody

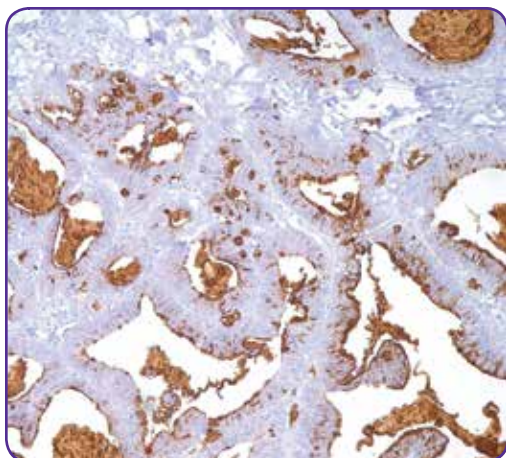
Volume	Part No.
0.1 mL concentrate	368R-74
0.5 mL concentrate	368R-75
1 mL concentrate	368R-76
1 mL predilute	368R-77
7 mL predilute	368R-78

*Please contact your distributor for details on product availability and regulatory status in your country.*

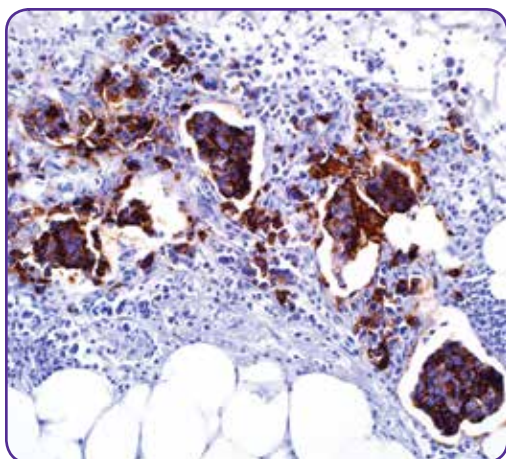
# TAG-72



Lung adenocarcinoma



Colon adenocarcinoma



Metastatic adenocarcinoma

Tumor associated glycoprotein (TAG)-72 is a high molecular weight glycoprotein that is present on the surface of many neoplastic cells, including adenocarcinomas of the breast, colon, and lung.<sup>1-5</sup> TAG-72 is found in lung adenocarcinoma and is absent in mesothelioma, making the TAG-72 antibody useful in distinguishing adenocarcinoma from mesothelioma.<sup>5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** lung adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Synonyms and Abbreviations

BRST-3

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Lung Adenocarcinoma vs. Mesothelioma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320

## Reference

1. Thor A, et al. Distribution of oncofetal antigen tumor-associated glycoprotein-72 defined by monoclonal antibody B72.3. *Cancer Res.* 1986; 46:3118-24.
2. Johnston WW, et al. Use of a monoclonal antibody (B72.3) as a novel immunohistochemical adjunct for the diagnosis of carcinomas in fine needle aspiration biopsy specimens. *Hum Pathol.* 1986; 17:501-13.
3. Lundy J, et al. Monoclonal antibody B72.3 as a diagnostic adjunct in fine needle aspirates of breast masses. *Ann Surg.* 1986; 203:399-402.
4. Kline TS, et al. Monoclonal antibody B72.3. An adjunct for evaluation of suspicious aspiration biopsy cytology from the breast. *Cancer.* 1989; 63:2253-56.
5. Ordóñez NG. *Am J Surg Pathol.* The immunohistochemical diagnosis of mesothelioma: a comparative study of epithelioid mesothelioma and lung adenocarcinoma. 2003; 27:1031-51.

## Ordering Information

### TAG-72 (B72.3)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	337M-84
0.5 mL concentrate	337M-85
1 mL concentrate	337M-86
1 mL predilute	337M-87
7 mL predilute	337M-88

*Please contact your distributor for details on product availability and regulatory status in your country.*

# TdT

TdT (terminal deoxynucleotidyl transferase) is a template-independent DNA polymerase that adds nucleotides randomly to single-stranded DNA. This randomization plays a role in acquired immunity by increasing antigen receptor diversity and aiding in the generation of immunoglobulins and T-cell antigen receptors.<sup>1</sup> TdT expression is characteristic of lymphoid progenitor cells in thymus.<sup>2</sup> Anti-TdT is a useful marker for lymphoblastic lymphomas<sup>3</sup> and has been observed in some cases of acute myeloid leukemia.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** thymus

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP266: IgG

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)	315
Lymphomas and Myeloid Sarcoma	315

## Reference

1. Motea EA, et al. Terminal deoxynucleotidyl transferase: the story of a misguided DNA polymerase. *Biochimica et Biophysica Acta*. 2010; 1804:1151-66.
2. Stauchen JA, et al. Lymphoid progenitor cells in human tonsils. *Int J Surg Pathol*. 2003; 11:21-4.
3. Suzumiya J, et al. Terminal deoxynucleotidyl transferase staining of malignant lymphomas in paraffin sections: a useful method for the diagnosis of lymphoblastic lymphoma. *J Pathol*. 1997; 182:86-91.
4. Arber DA, et al. Paraffin section immunophenotyping of acute leukemias in bone marrow specimens. *Am J Clin Pathol*. 1996; 106:462-8.

## Ordering Information

### TdT (EP266)

Rabbit Monoclonal  
Primary Antibody



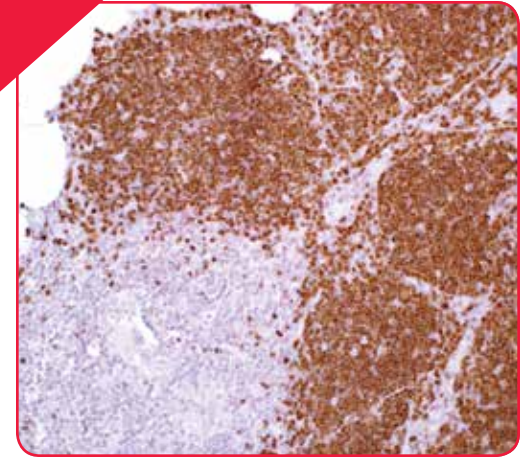
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0.1 mL concentrate	338R-24
0.5 mL concentrate	338R-25
1 mL concentrate	338R-26
1 mL predilute	338R-27
7 mL predilute	338R-28

### TdT

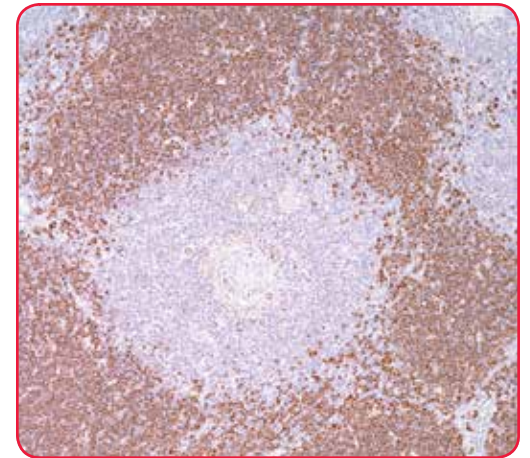
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	338A-74
0.5 mL concentrate	338A-75
1 mL concentrate	338A-76
1 mL predilute	338A-77
7 mL predilute	338A-78

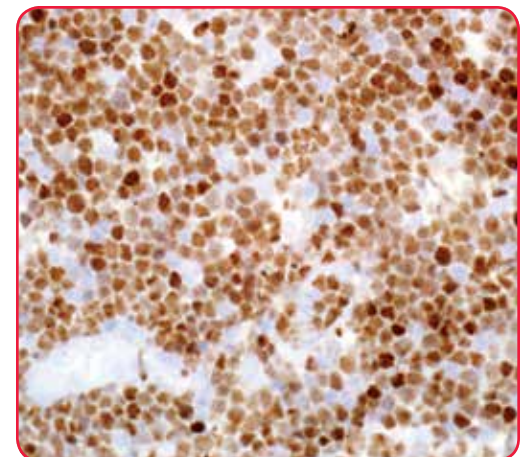
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Thymus

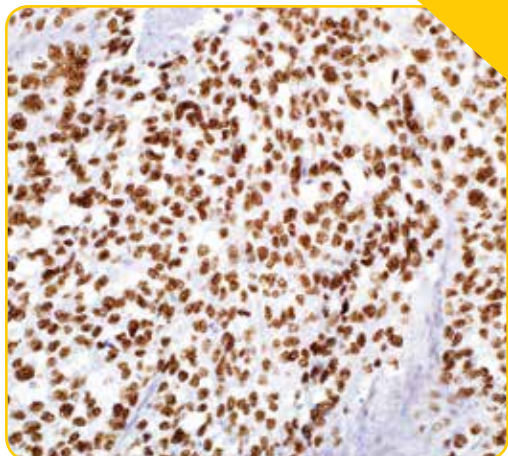


Thymus

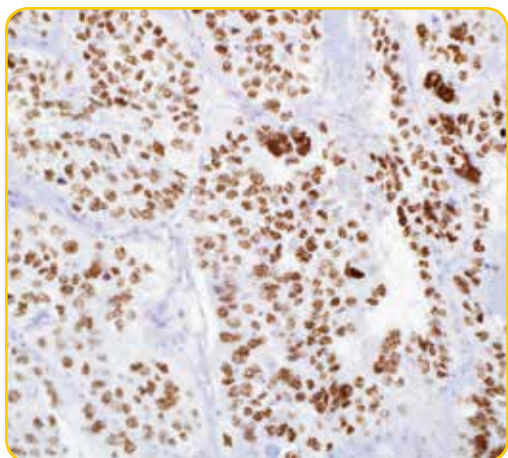


Lymphoblastic lymphoma

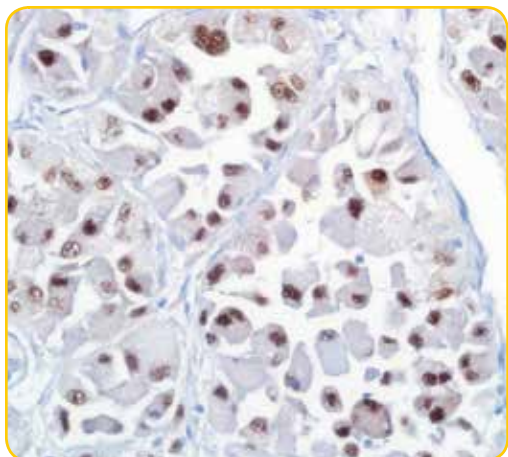
# TFE3



Xp11 translocated renal cell carcinoma



Renal cell carcinoma



Alveolar soft part sarcoma

Transcription factor E3 (TFE3) is a protein expressed in many cell types that are encoded by the TFE3 gene. This gene may be involved in chromosomal translocations that occur in some cancers. Xp11 translocation renal cell carcinomas (RCC) are a recently recognized subset of RCC, characterized by chromosome translocations involving the Xp11.2 break point and resulting in gene fusions involving the TFE3 transcription factor gene that maps to this locus.<sup>1</sup> Alveolar soft part sarcoma (ASPS) is an uncommon soft tissue sarcoma of uncertain differentiation. The hallmark of ASPS is a chromosomal rearrangement at 17q25 and Xp11.2 engendering an ASPSCR1-TFE3 fusion gene responsible for an aberrant transcription factor presumably enabling pathogenesis.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** testis, melanoma, Xp11.2 translocation renal cell carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Associated Specialties

Pediatric Pathology

Soft Tissue Pathology

## Associated Grids

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Kidney: Epithelial Neoplasms	309
Kidney, Urothelial, and Soft Tissue Neoplasms	321
Soft Tissue Neoplasms	322
Soft Tissue Tumors	322, 323

## Reference

1. Argani P. The evolving story of renal translocation carcinomas. *Am J Clin Pathol.* 2006; 126:332-4.
2. Argani P, et al. Aberrant nuclear immunoreactivity for TFE3 in neoplasms with TFE3 gene fusions: a sensitive and specific immunohistochemical assay. *Am J Surg Pathol.* 2003; 27:750-61.
3. Argani P, et al. Translocation carcinomas of the kidney. *Clin Lab Med.* 2005; 25:363-78.
4. Lazar AJ, et al. Validation of potential therapeutic targets in alveolar soft part sarcoma: an immunohistochemical study utilizing tissue microarray. *Histopathol.* 2009; 55:750-5.
5. Lin G, et al. An update on the application of newly described immunohistochemical markers in soft tissue pathology. *Arch Pathol Lab Med.* 2015; 139:106-21.

## Ordering Information

### TFE3 (MRQ-37)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	354R-14
0.5 mL concentrate	354R-15
1 mL concentrate	354R-16
1 mL predilute	354R-17
7 mL predilute	354R-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Thrombomodulin

Thrombomodulin is a transmembrane glycoprotein composed of 575 amino acids (molecular weight 75-kD) with natural anticoagulant properties. It is normally expressed by a restricted number of cells, such as endothelial and mesothelial cells. In addition, synovial lining and syncytiotrophoblasts of human placenta also express thrombomodulin.<sup>1-3</sup> Anti-thrombomodulin has demonstrated positivity in benign vascular tumors such as hemangioma and most malignant vascular tumors (Kaposi sarcoma and epithelioid hemangioendothelioma).<sup>1-2</sup> Hence, anti-thrombomodulin serves as a sensitive marker for lymphatic endothelial cells and their tumors.<sup>1-2</sup> There has also been recent interest in the use of anti-thrombomodulin as an immunohistochemical marker for mesothelial cells and malignant mesotheliomas.<sup>3-8</sup> Anti-thrombomodulin is immunexpressed in a variety of other tumors including urothelial cell carcinomas.<sup>9,10</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** bladder, mesothelioma

**Stability** up to 24 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

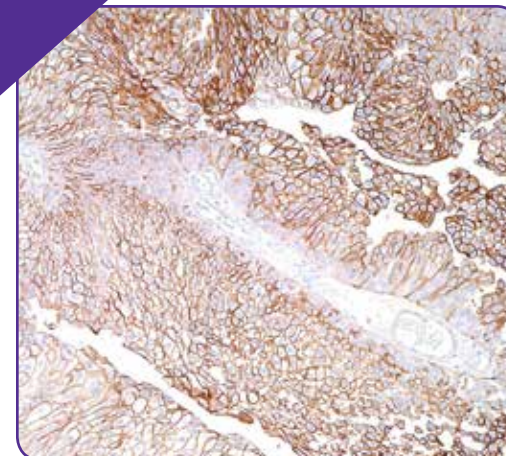
## Associated Grids

Grid	Page No.
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Epithelioid Mesothelioma vs. Carcinoma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320

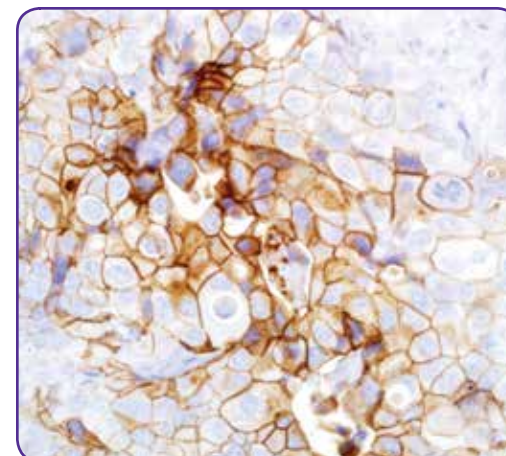
## Reference

1. Acebo E, et al. Thrombomodulin, calretinin and c-kit (CD117) expression in cardiac myxoma. *Histol Histopath.* 2001; 16:1031-6.
2. Appleton MA, et al. Thrombomodulin as a marker of vascular and lymphatic tumors. *Histopathology.* 1996; 29:153-7.
3. Attanoos RL, et al. Mesothelioma-binding antibodies: Thrombomodulin, OV632 and HBME-1 and their use in the diagnosis of malignant mesothelioma. *Histopathology.* 1996; 29:209-15.
4. Attanoos RL, et al. Malignant epithelioid mesothelioma: anti-mesothelial marker expression correlates with histological pattern. *Histopathology.* 2001; 39:584-8.
5. Attanoos RL, et al. Primary thymic epithelial tumours of the pleura mimicking malignant mesothelioma. *Histopathology.* 2002; 41:42-9.
6. Brown RW, et al. Multiple-marker immunohistochemical phenotypes distinguishing malignant pleural mesothelioma from pulmonary adenocarcinoma. *Hum Pathol.* 1993; 24:347-54.

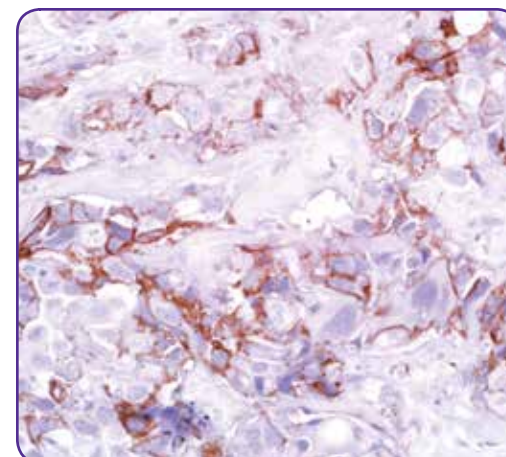
*For the complete list of references see the product IFU.*



Urothelial carcinoma



Urothelial carcinoma



Urothelial carcinoma

## Ordering Information

### Thrombomodulin (1009)

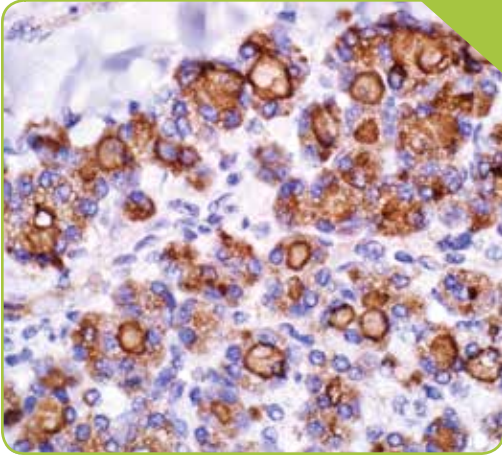
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	339M-14
0.5 mL concentrate	339M-15
1 mL concentrate	339M-16
1 mL predilute	339M-17
7 mL predilute	339M-18

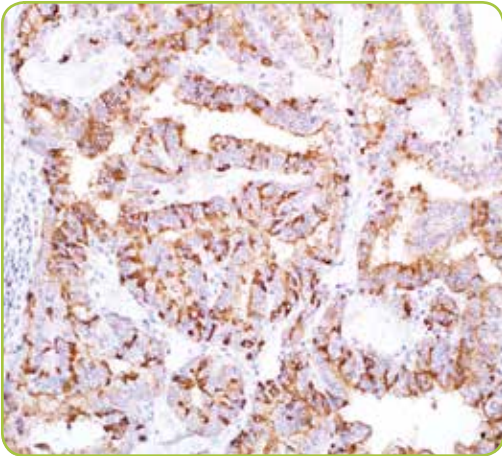
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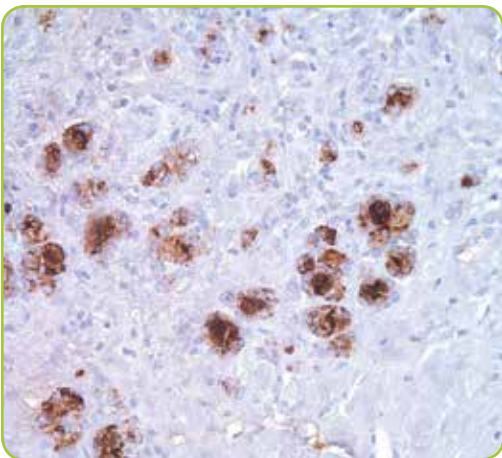
# Thyroglobulin



Follicular thyroid carcinoma



Papillary thyroid carcinoma



Thyroid tissue

Thyroglobulin (Tg) is the precursor of the iodinated thyroid hormones thyroxine (T<sub>4</sub>) and triiodothyronine (T<sub>3</sub>).<sup>1</sup> Tg is a high molecular weight glycoprotein found in normal thyroid follicular cells.<sup>1,2</sup> Thyroglobulin is useful for identifying thyroid carcinoma of papillary and follicular types and for identifying tumors of thyroid origin when working with adenocarcinoma of unknown primary.<sup>2-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** thyroid

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- 2H11: IgG<sub>1</sub> kappa + 6E1: IgG<sub>1</sub> kappa
- MRQ-41: IgG<sub>1</sub>

## Associated Specialties

Head/Neck Pathology

## Associated Grids

Grid	Page No.
Carcinomas from Thyroid and Other Sites	294
Thyroid: Malignant vs. Benign	301

## Reference

1. Sellitti DF and Suzuki K. Intrinsic regulation of thyroid function by thyroglobulin. *Thyroid*. 2014; 24:625-38.
2. Bellet D, et al. Production and in vitro utilization of monoclonal antibodies to human thyroglobulin. *J Clin Endocrinol Metab*. 1983; 56:530-3.
3. Bejarano PA, et al. Thyroid transcription factor-1, thyroglobulin, cytokeratin 7, and cytokeratin 20 in thyroid neoplasms. *Appl Immunohistochem Mol Morphol*. 2000; 8:189-94.
4. Judkins AR, et al. Utility of immunohistochemistry in the evaluation of necrotic thyroid tumors. *Hum Pathol*. 1999; 30:1373-6.
5. Hammer SP. Metastatic adenocarcinoma of unknown primary origin. *Hum Pathol*. 1998; 29:1393-402.

## Ordering Information

### Thyroglobulin (2H11+ 6E1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	340M-14
0.5 mL concentrate	340M-15
1 mL concentrate	340M-16
1 mL predilute	340M-17
7 mL predilute	340M-18

### Thyroglobulin (MRQ-41)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	340M-94
0.5 mL concentrate	340M-95
1 mL concentrate	340M-96
1 mL predilute	340M-97
7 mL predilute	340M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Thyroid Peroxidase

Thyroid peroxidase (TPO) is a thyroid-specific enzyme involved in thyroid hormone synthesis. TPO can be found in normal thyroid and thyroid carcinoma of papillary and follicular type. Studies indicate that TPO is a useful marker for the differentiation of benign and malignant thyroid neoplasms.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** thyroid, papillary thyroid carcinoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG

## Synonyms and Abbreviations

TPO

## Associated Specialties

Head/Neck Pathology

## Associated Grids

Grid	Page No.
Carcinomas from Thyroid and Other Sites	294

## Reference

1. Yousaf U, et al. Immunohistochemical staining for thyroid peroxidase (TPO) of needle core biopsies in the diagnosis of scintigraphically cold thyroid nodules. Clin Endocrinol (Oxf). 2005; 68:996-1001.
2. Savin S, et al. Thyroid peroxidase and galectin-3 immunostaining in differentiated thyroid carcinoma with clinicopathologic correlation. Hum Pathol. 2008; 39:1656-63.
3. Paunovic I, et al. Combined immunohistochemistry for thyroid peroxidase, galectin-3, CK19 and HBME-1 in differential diagnosis of thyroid tumors. APMIS. 2012; 120:368-79.

## Ordering Information

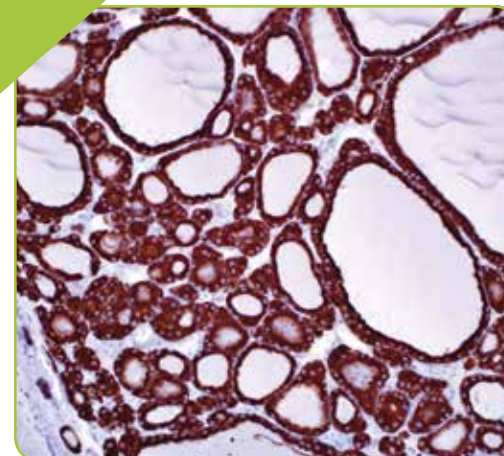
### Thyroid Peroxidase (EP159)

Rabbit Monoclonal  
Primary Antibody

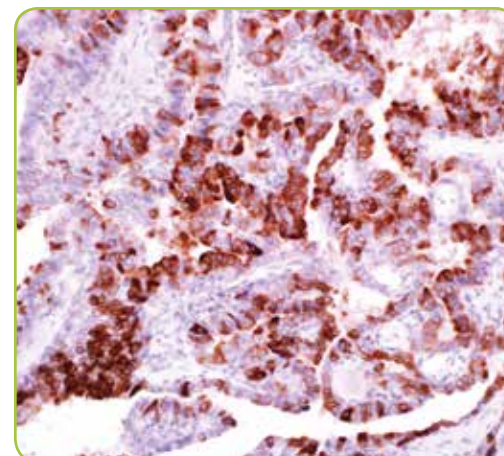


Volume	Part No.
0.1 mL concentrate	409R-14
0.5 mL concentrate	409R-15
1 mL concentrate	409R-16
1 mL predilute	409R-17
7 mL predilute	409R-18

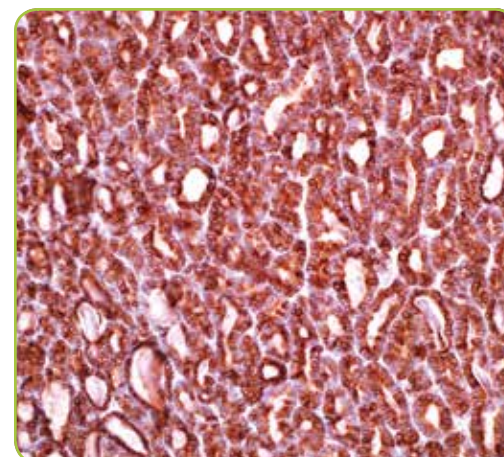
Please contact your distributor for details on product availability and regulatory status in your country.



Papillary thyroid carcinoma

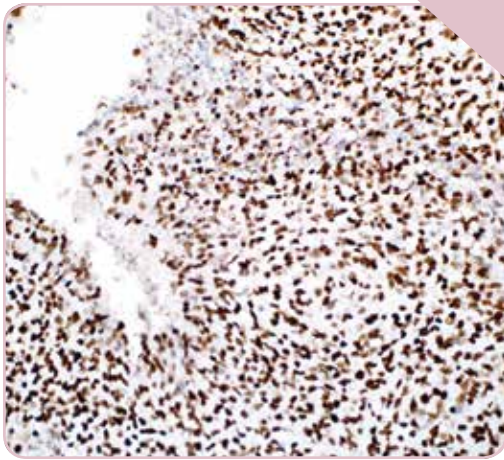


Papillary thyroid carcinoma

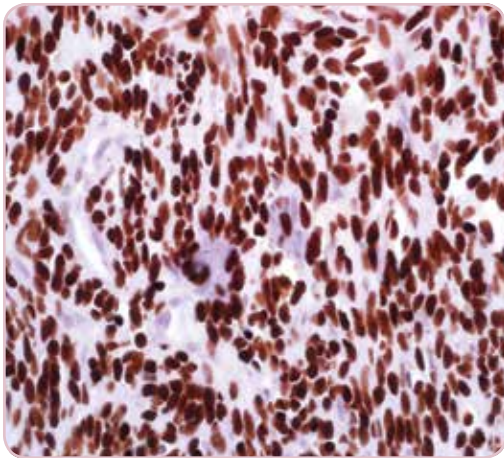


Follicular thyroid carcinoma

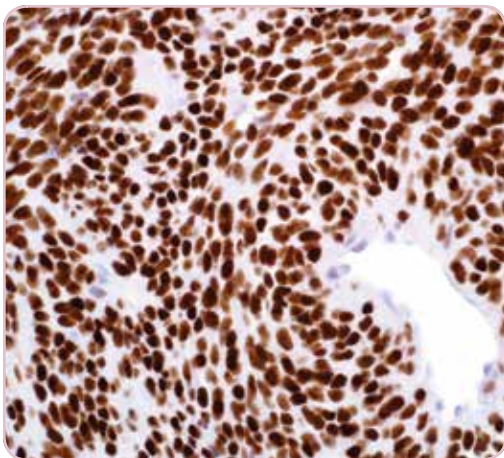
# TLE1



Synovial sarcoma



Synovial sarcoma



Synovial sarcoma

Transducin-like enhancer protein 1 (TLE1) is a protein that is encoded by the TLE1 gene and is involved in control of hematopoiesis, neuronal, and terminal epithelial differentiation. Positive immunohistochemical nuclear staining with anti-TLE-1 has been shown to be a useful addition to an IHC panel when differentiating synovial sarcoma from other soft tissue malignancies.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** synovial sarcoma

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Soft Tissue Pathology

## Associated Grids

Grid	Page No.
Soft Tissue Tumors	322, 323

## Reference

1. Jagdis A, et al. Prospective evaluation of TLE1 as a diagnostic immunohistochemical marker in synovial sarcoma. *Am J Surg Pathol.* 2009; 33:1743-51.

## Ordering Information

### TLE1 (1F5)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	401M-14
0.5 mL concentrate	401M-15
1 mL concentrate	401M-16
1 mL predilute	401M-17
7 mL predilute	401M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Toxoplasma gondii

*Toxoplasma gondii* is a spindle-to-oval-shaped protozoan which presents as an infection in humans of various sorts. The cyst (30  $\mu\text{m}$ ) and trophozoite (7  $\mu\text{m}$ ) stages can be identified in humans in such cases. This intracellular parasite is transmitted via raw/undercooked meat, contaminated soil, or by direct contact with an infected host. Infection in humans is usually associated with a variable degree of immunosuppression such as in pregnancy or immunosuppression due to various drugs.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cell wall

**Control** *Toxoplasma gondii* infected tissue

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

## Reference

1. Rosai J. Rosai and Ackerman's Surgical Pathology, Tenth Ed., Mosby Elsevier. 2011, New York. p. 2331-2.
2. Held TK, et al. Diagnosis of toxoplasmosis in bone marrow transplant recipients: comparison of PCR-based results and immunohistochemistry. Bone Marrow Transplant. 2000; 25:1257-6.
3. Sundermann CA, et al. Immunohistochemical diagnosis of *Toxoplasma gondii*: potential for cross-reactivity with *Neospora caninum*. J Parasitol. 1997; 83:440-3.
4. Jautzke G, et al. Extracerebral toxoplasmosis in AIDS. Histological and immunohistological findings based on 80 autopsy cases. Pathol Res Pract. 1993; 189:428-36.

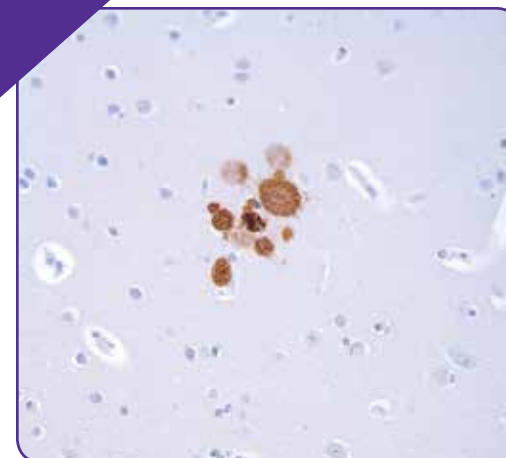
## Ordering Information

### *Toxoplasma gondii*

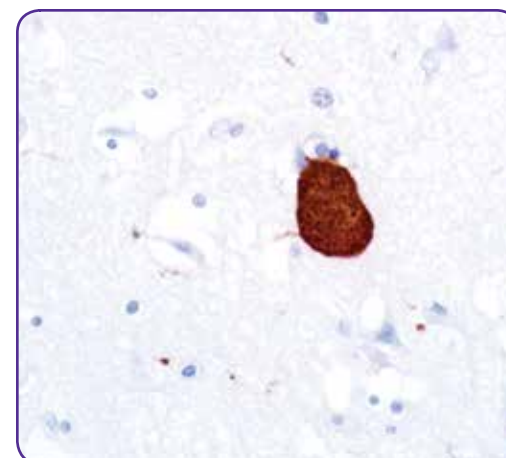
Rabbit Polyclonal Antibody

Volume	Part No.
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0.5 mL concentrate	220A-15
1 mL concentrate	220A-16
1 mL predilute	220A-17
7 mL predilute	220A-18

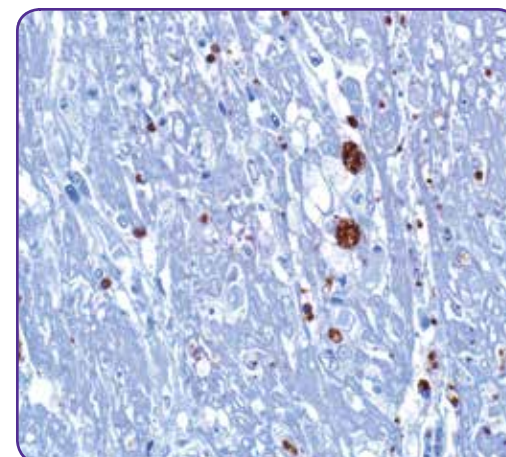
*Please contact your distributor for details on product availability and regulatory status in your country.*



Brain

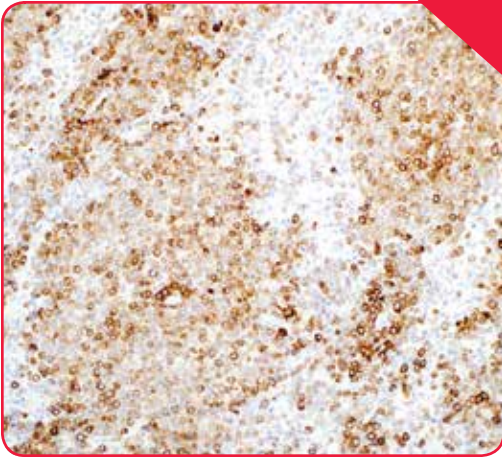


Brain

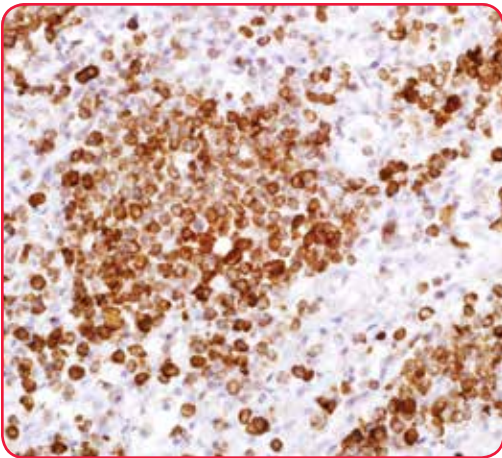


Smooth muscle

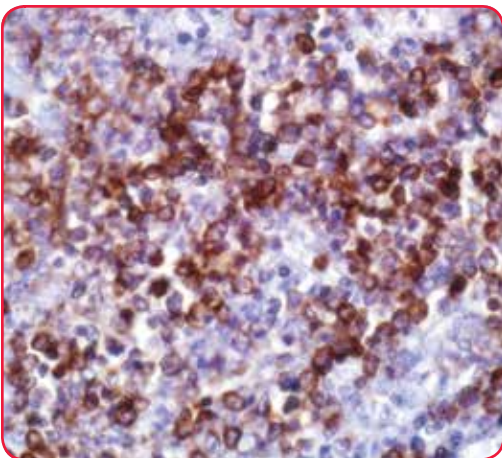
# TRAcP



Hairy cell leukemia



Hairy cell leukemia



Marginal zone lymphoma

The type-5 tartrate resistant acid phosphatase (TRAcP) is an iron-binding glycoprotein that exists in humans as distinct unprocessed and processed isoforms, 5a and 5b, respectively. TRAcP is principally expressed in cells of the monocyte lineage, including macrophages, dendritic cells, and osteoclasts, with its most well understood function being in facilitating the bone resorption process.<sup>1</sup> A variety of hematological disorders display TRAcP activity but antibodies developed against the protein have a particularly high sensitivity and specificity for labeling hairy cells in patient cases of hairy cell leukemia.<sup>2-4</sup> Anti-TRAcP has immunohistochemical utility in providing adjunctive information for the identification of hairy cell leukemia.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** hairy cell leukemia

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2b</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma	312

## Reference

1. Janckila AJ, et al. Biology and clinical significance of tartrate-resistant acid phosphatases: new perspectives on an old enzyme. *Calcif Tissue Int.* 2009; 85:465-83.
2. Hayman AR. Tartrate-resistant acid phosphatase (TRAP) and the osteoclast/immune cell dichotomy. *Autoimmunity.* 2008; 41:218-23.
3. Hoyer JD, et al. Immunohistochemical demonstration of acid phosphatase isoenzyme 5 (tartrate-resistant) in paraffin sections of hairy cell leukemia and other hematologic disorders. *Am J Clin Pathol.* 1997; 108:308-15.
4. Janckila AJ, et al. Hairy cell identification by immunohistochemistry of tartrate-resistant acid phosphatase. *Blood.* 1995; 85:2839-44.

## Ordering Information

### TRAcP (9C5)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	341M-94
0.5 mL concentrate	341M-95
1 mL concentrate	341M-96
1 mL predilute	341M-97
7 mL predilute	341M-98

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Transgelin

Transgelin is a shape change sensitive 22- to 25-kD actin cross-linking/gelling protein of the calponin family localized to the cell membrane and cytoplasm as a novel regulator of MMP-9 expression.<sup>1</sup> Recent evidence suggests that transgelin may act as a tumor suppressor; for example, its expression can be lost in prostate, breast and colon cancers which is consistent with suppression of the matrix metalloproteinase-9 (MMP-9) by transgelin, whereas MMP-9 is upregulated in these common cancers.<sup>1</sup> This protein is ubiquitous to vascular and visceral smooth muscle and is considered an early marker of smooth muscle differentiation and may be an early and sensitive marker for the onset of transformation.<sup>2</sup> Transgelin can be found in fibroblasts, smooth muscle and some epithelium where expression is likely driven by TGF-beta1.<sup>3</sup> In some cases differentiating smooth muscle within malignant lesions can be challenging, therefore use of myogenic markers such as transgelin may serve to define smooth muscle differentiation in soft tissue tumors.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** leiomyoma, smooth muscle tumors

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>

## Associated Specialties

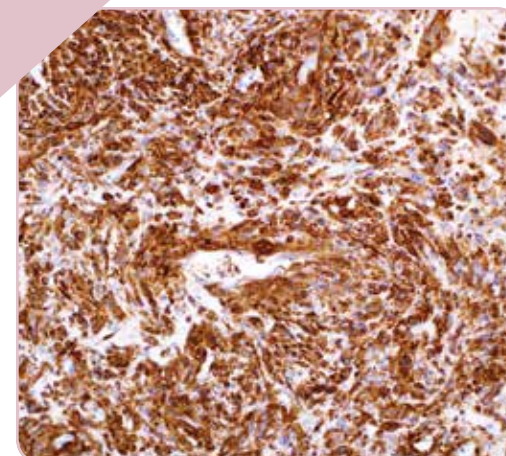
Soft Tissue Pathology

## Associated Grids

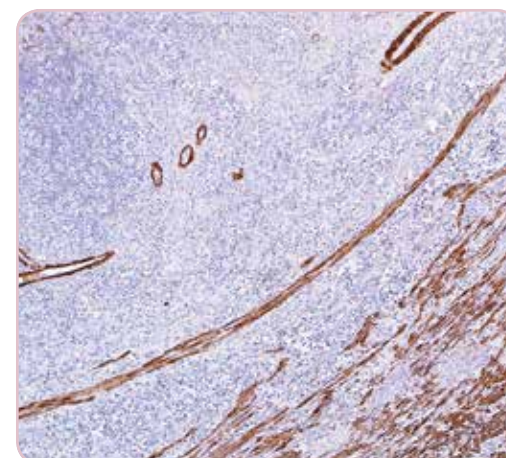
Grid	Page No.
Soft Tissue Tumors	322, 323

## Reference

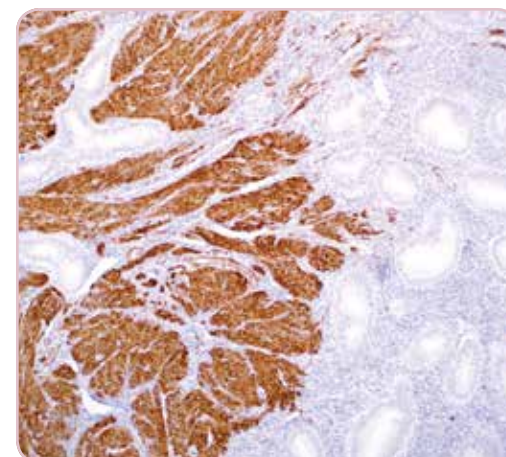
1. Assinder SJ, et al. Transgelin: An Action-Binding Protein and Tumor Suppressor. *Int Journal of Biochemistry and Cell Biology*. 2009; 41:482-486.
2. Robin YM, et al. Transgelin Is a Novel Marker of Smooth Muscle Differentiation That Improves Diagnostic Accuracy of Leiomyosarcomas: A Comparative Immunohistochemical Reappraisal of Myogenic Markers in 900 Soft Tissue Tumors. *Modern Pathology*. 2013; 4:502-10.
3. Pérot G, et al. Smooth Muscle Differentiation Identifies Two Classes of Poorly Differentiated Pleomorphic Sarcomas with Distinct Outcome. *Modern Pathology*. 2014; 6:840-850.



Leiomyosarcoma



Appendix



Uterus

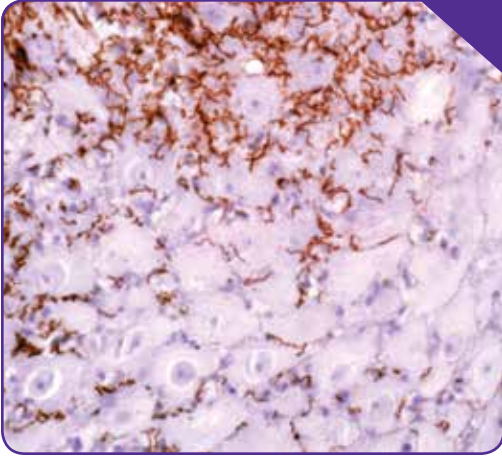
## Ordering Information

**Transgelin (2A10C2)**  
Mouse Monoclonal Antibody

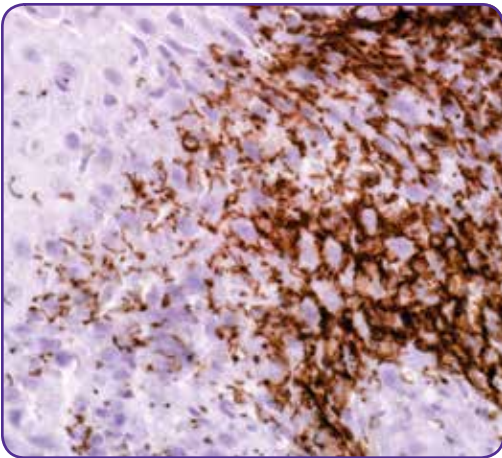
Volume	Part No.
0.1 mL concentrate	423M-14
0.5 mL concentrate	423M-15
1 mL concentrate	423M-16
1 mL predilute	423M-17
7 mL predilute	423M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

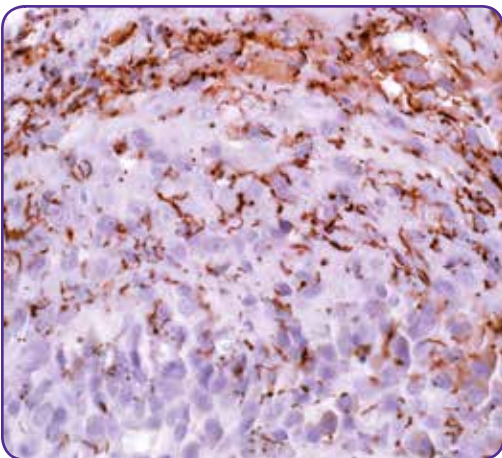
# Treponema pallidum



Ganglion tissue



Skin



Skin

Syphilis is a sexually transmitted disease caused by the spirochete *Treponema pallidum*. The presentation of the disease includes a variety of clinical symptoms as the spirochetes spread through the bloodstream to all organ systems.<sup>1</sup> *Treponema pallidum* in formalin-fixed tissue sections is classically identified using silver-impregnation staining techniques such as the Warthin-Starry (WS) stains.<sup>2</sup> However, when evaluating silver stained mucocutaneous histologic slides, difficulties often arise due mostly to the nonspecific, artifactual background staining of tissue elements, such as reticulum fibers and melanin, which may give rise to false-positive or false-negative results.<sup>1-2</sup> Immunohistochemical techniques, using specific antibodies against *T. pallidum*, have been reported as sensitive and specific methods to avoid background staining and facilitate the identification and visualization of spirochetes in paraffin-embedded tissues.<sup>2-3</sup> In one study, WS staining led to the identification of treponemes in 17 of 34 paraffin-embedded biopsy specimens (50%), corresponding to 4 of 8 primary syphilis and 13 of 26 secondary syphilis cases.<sup>4</sup> Immunohistochemical evaluation of all biopsy specimens with anti-*T. pallidum* detected spirochetes in 29 of 34 biopsies (85%), corresponding to 8 cases of 8 primary syphilis and to 21 of 26 cases of secondary syphilis.<sup>4</sup> All WS-determined positives were also positive with the immunohistochemical technique.<sup>4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** microorganism

**Control** *Treponema pallidum* infected tissue

**Stability** up to 36 mos. at 2-8°C

## Associated Specialties

Anatomic Pathology

## Reference

1. Hoang MP, et al. Secondary syphilis: a histologic and immunohistochemical evaluation. *J Cutan Pathol.* 2004; 31:595-9.
2. Beckett JH, et al. Immunoperoxidase localization of *Treponema pallidum*. *Arch Pathol Lab Med.* 1979; 103:135-8.
3. Phelps RG, et al. Immunoperoxidase technique for detecting spirochetes in tissue sections: comparison with other methods. *Int J Dermatol.* 2000; 39:609-13.
4. Martin-Ezquerro G, et al. *Treponema pallidum* distribution patterns in mucocutaneous lesions of primary and secondary syphilis: An immunochemical and ultrastructural study. *Hum Pathol.* 2009; 40:624-630.

## Ordering Information

**Treponema pallidum**  
Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	397A-14
0.5 mL concentrate	397A-15
1 mL concentrate	397A-16
1 mL predilute	397A-17
7 mL predilute	397A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Tryptase

Tryptases compose a subfamily of proteinases with trypsin-like activity that are mostly stored in mast cell secretory granules and released into the extracellular environment upon mast cell activation.<sup>1</sup> Several biological functions for tryptases have been proposed, including involvement in inflammatory and allergic responses.<sup>1</sup> Mature mast cells have a complex distribution throughout the body.<sup>2</sup> Anti-tryptase is a useful marker for mast cells.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** uterus

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- EP259: IgG
- G3: IgG<sub>1</sub>

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Mastocytosis	315

## Reference

1. Fiorucci L, et al. Mast cell tryptase, a still enigmatic enzyme. *Cell Mol Life Sci.* 2004; 61:1278-95.
2. Roberts IS, et al. Mast cells: the forgotten cells of renal fibrosis. *J Clin Pathol.* 2000; 53:858-62.

## Ordering Information

**Tryptase (EP259)**  
Rabbit Monoclonal  
Primary Antibody

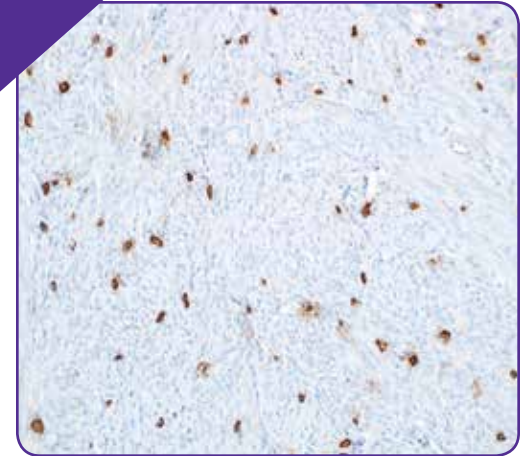


Volume	Part No.
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0.5 mL concentrate	342R-15
1 mL concentrate	342R-16
1 mL predilute	342R-17
7 mL predilute	342R-18

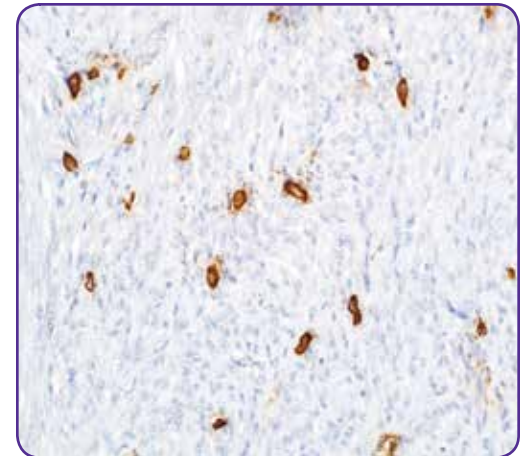
**Tryptase (G3)**  
Mouse Monoclonal Antibody

Volume	Part No.
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0.5 mL concentrate	342M-15
1 mL concentrate	342M-16
1 mL predilute	342M-17
7 mL predilute	342M-18

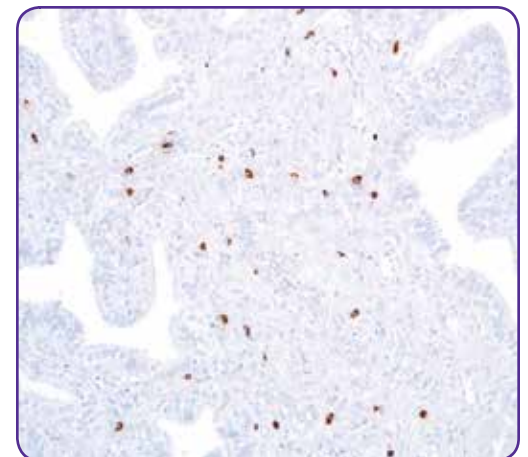
*Please contact your distributor for details on product availability and regulatory status in your country.*



Leiomyoma mast cells



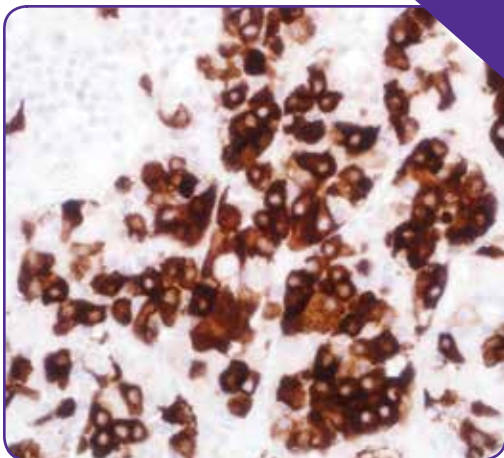
Leiomyoma mast cells



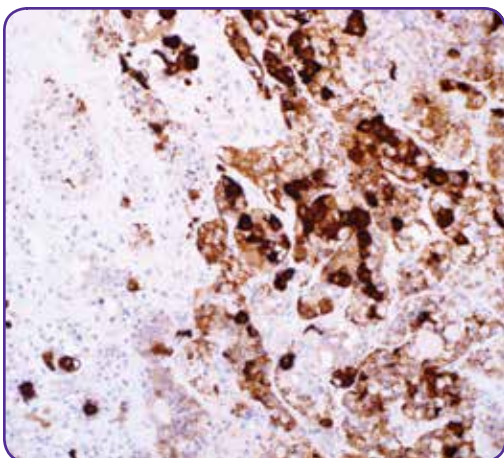
Fallopian tube mast cells



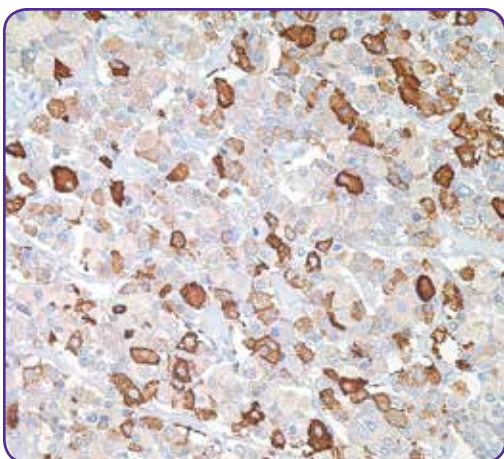
# TSH



Pituitary gland



Pituitary gland



Pituitary gland

Thyroid-stimulating hormone (also known as TSH or thyrotropin) is a peptide hormone synthesized and secreted by thyrotrophs in the anterior pituitary gland which regulate the endocrine function of the thyroid gland. TSH is a glycoprotein and consists of two subunits which are non-covalently bound to one another. Anti-TSH reacts with TSH-producing cells (thyrotrophs), and is a useful marker in classification of pituitary tumors.<sup>1-5</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** pituitary

**Stability** up to 36 mos. at 2-8°C

**Isotype** EP254: IgG

## Synonyms and Abbreviations

Thyrotropin

## Associated Specialties

Anatomic Pathology

Neuropathology

## Reference

1. Batanero E, et al. The neural and neuro-endocrine component of the human thymus. II. Hormone immunoreactivity. *Brain Behav Immun.* 1992; 6:249-64.
2. Sanno N, et al. GH and PRL gene expression by nonradioisotopic in situ hybridization in TSH-secreting pituitary adenomas. *J Clin Endocrinol Metab.* 1995; 80:2518-22.
3. La Rosa S, et al. Detection of gonadotropin-releasing hormone receptor in normal human pituitary cells and pituitary adenomas using immunohistochemistry. *Virchows Arch.* 2000; 437:264-9.
4. Kuzuya N, et al. Endocrine and immunohistochemical studies on thyrotropin (TSH)-secreting pituitary adenomas: responses of TSH, alpha-subunit, and growth hormone to hypothalamic releasing hormones and their distribution in adenoma cells. *J Clin Endocrinol Metab.* 1990; 71:1103-11.
5. Clore JN, et al. Thyrotropin-induced hyperthyroidism: evidence for a common progenitor stem cell. *Am J Med Sci.* 1988; 295:3-5.

## Ordering Information

### TSH (EP254)

Rabbit Monoclonal

Primary Antibody



Volume	Part No.
0.1 mL concentrate	211R-14
0.5 mL concentrate	211R-15
1 mL concentrate	211R-16
1 mL predilute	211R-17
7 mL predilute	211R-18

### TSH

Rabbit Polyclonal Antibody

Volume	Part No.
0.1 mL concentrate	211A-14
0.5 mL concentrate	211A-15
1 mL concentrate	211A-16
1 mL predilute	211A-17
7 mL predilute	211A-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# TTF-1

Anti-TTF-1 (Thyroid Transcription Factor 1) is useful in differentiating primary adenocarcinoma of the lung from metastatic carcinomas originating in the organs rather than thyroid<sup>1-2</sup>, germ cell tumors<sup>3</sup>, and malignant mesothelioma.<sup>4-5</sup> It can also be used to differentiate small cell lung carcinoma from lymphoid infiltrates.<sup>6</sup> TTF-1 labeling is also seen in thyroid and thyroid-derived tumors.<sup>7</sup> TTF-1 immunostaining is useful in the differentiation between pulmonary and nonpulmonary origin of adenocarcinomas in malignant effusions.<sup>8</sup> TTF-1 staining is very reliable in discerning whether a brain metastasis has arisen from a pulmonary or nonpulmonary site, particularly when dealing with adenocarcinomas and large-cell carcinomas.<sup>9</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** lung adenocarcinoma

**Stability** up to 36 mos. at 2-8°C

### Isotype

- 8G7G3/1: IgG<sub>1</sub>
- EP229: IgG

## Associated Specialties

Anatomic Pathology

Pulmonary Pathology

## Associated Grids

Grid	Page No.
Adenocarcinoma and Non-Epithelial Neoplasms	292
Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate	295
Carcinomas from Thyroid and Other Sites	294
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Lung Small Cell CA vs. Merkel Cell CA	297
Micropapillary Carcinomas	297
Neuroendocrine Neoplasms	298
Neuroendocrine Tumors from Different Anatomical Locations	299
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310
Epithelioid Mesothelioma vs. Carcinoma	319
Lung Adenocarcinoma vs. Mesothelioma	319
Lung Squamous Cell Carcinoma vs. Adenocarcinoma	320
Thoracic SFT vs. Potential Mimics	320

## Ordering Information

### TTF-1 (8G7G3/1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	343M-94
0.5 mL concentrate	343M-95
1 mL concentrate	343M-96
1 mL predilute	343M-97
7 mL predilute	343M-98
25 mL predilute	343M-90

### TTF-1 (EP229)

Rabbit Monoclonal Primary Antibody

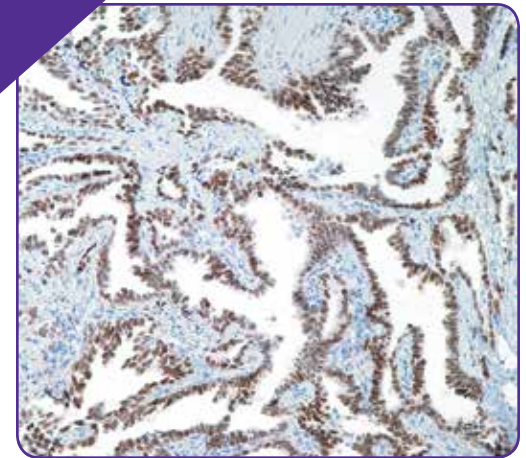


Volume	Part No.
0.1 mL concentrate	343R-14
0.5 mL concentrate	343R-15
1 mL concentrate	343R-16
1 mL predilute	343R-17
7 mL predilute	343R-18

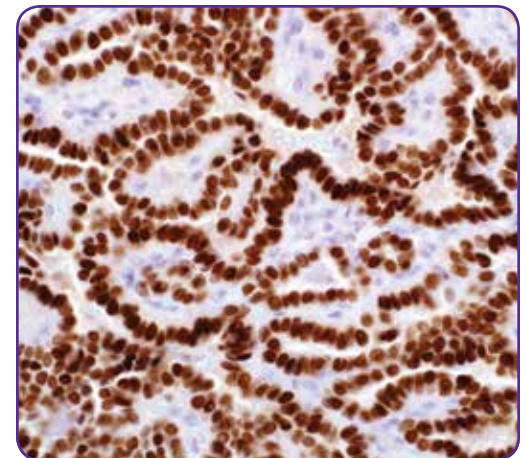
Please contact your distributor for details on product availability and regulatory status in your country.

## Reference

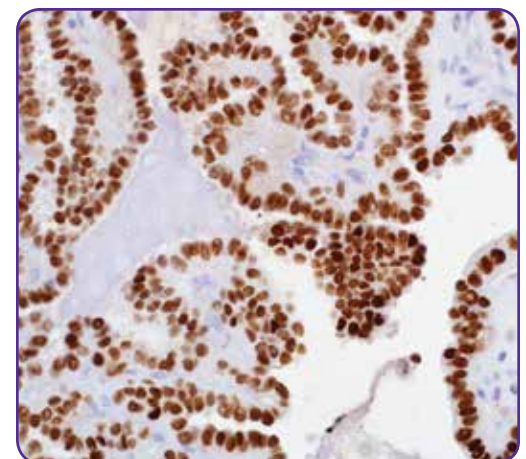
1. Bejarano PA, et al. Mod Pathol. 1996; 9:445-52.
2. Holzinger A, et al. Hybridoma. 1996; 15:49-53.
3. Saad RS, et al. Appl Immunohistochem Mol Morphol. 2003; 11:107-12.
4. Di Loreto C, et al. Cancer Lett. 1998; 124:73-8.
5. Abutaily AS, et al. J Clin Pathol. 2002; 55:662-8.
6. Di Loreto C, et al. J Clin Pathol. 1997; 50:30-2.
7. Katoh R, et al. Mod Pathol. 2000; 13:570-6.
8. Jang KY, et al. Anal Quant Cytol Histol. 2001; 23:400-4.
9. Srodon M, et al. Hum Pathol. 2002; 33:642-5.
10. Tan D, et al. Hum Pathol. 2003; 34:597-604.



Lung adenocarcinoma

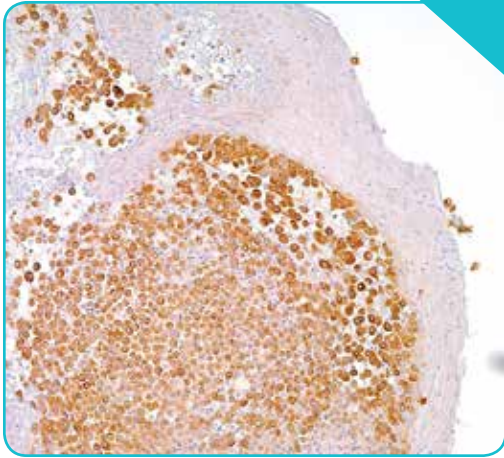


Papillary thyroid carcinoma

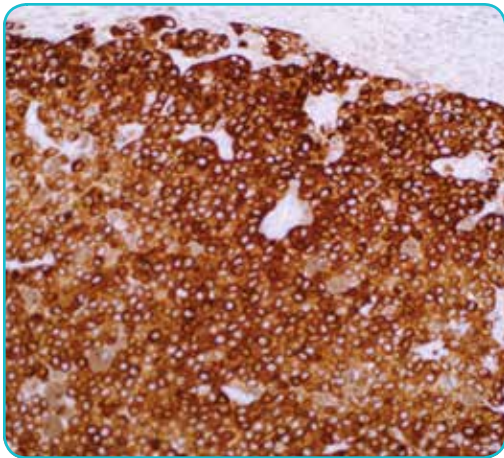


Papillary thyroid carcinoma

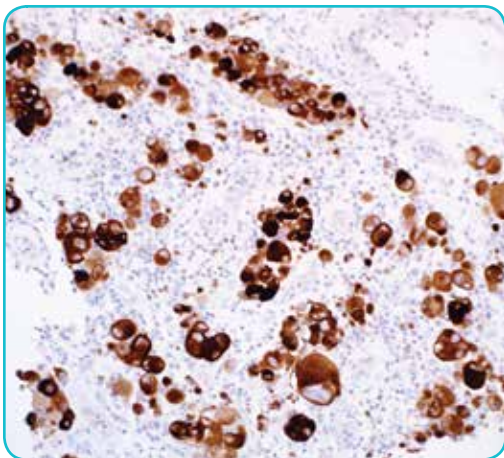
# Tyrosinase



Melanoma



Melanoma



Melanoma

Tyrosinase is an enzyme, amongst a family of enzymes, which is involved in the biosynthesis of melanin. It is a highly specific and sensitive marker for melanocytic differentiation, and has been found to be quite specific for melanotic lesions such as malignant melanoma.<sup>1-3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** melanoma, skin

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Dermatopathology

## Associated Grids

Grid	Page No.
Spindle Cell Melanoma vs. Epithelioid	
Peripheral Nerve Sheath Tumor	300
Various Lesions with Melanocytic or Myomelanocytic Differentiation	301
Melanotic Lesions	305

## Reference

1. Jungbluth AA, et al. T311--an anti-tyrosinase monoclonal antibody for the detection of melanocytic lesions in paraffin embedded tissues. *Pathol Res Pract.* 2000; 196:235-42.
2. Ordóñez NG. Value of melanocytic-associated immunohistochemical markers in the diagnosis of malignant melanoma: a review and update. *Hum Pathol.* 2014; 45:191-205.
3. Jaanson N, et al. Identification of the immunodominant regions of the melanoma antigen tyrosinase by anti-tyrosinase monoclonal antibodies. *Melanoma Res.* 2003; 13:473-82.

## Ordering Information

### Tyrosinase (T311)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	344M-94
0.5 mL concentrate	344M-95
1 mL concentrate	344M-96
1 mL predilute	344M-97
7 mL predilute	344M-98

Please contact your distributor for details on product availability and regulatory status in your country.

# Uroplakin III

Uroplakins (UPs) are a family of transmembrane proteins (UPs Ia, Ib, II and III) that are specific differentiation products of urothelial cells. In non-neoplastic mammalian urothelium, UPs are expressed in the luminal surface plasmalemma of superficial (umbrella) cells, forming complexes of 16nm crystalline particles. UPIII is specific for tumors of urothelial origin and, when used in combination with other markers, can aid in the diagnosis of primary and metastatic tumors.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** bladder

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- AU-1: IgG<sub>1</sub>
- SP73: IgG

## Synonyms and Abbreviations

URO III

UP III

## Associated Specialties

Genitourinary (GU) Pathology

## Associated Grids

Grid	Page No.
Micropapillary Carcinomas	297
Prostate Lesions	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma	310
Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma	310

## Reference

1. Moll R, et al. Uroplakins, specific membrane proteins of urothelial umbrella cells, as histological markers of metastatic transitional cell carcinomas. *Am J Pathol.* 1995; 147:1383-97.
2. Olsburgh J, et al. Uroplakin gene expression in normal human tissues and locally advanced bladder cancer. *J Pathol.* 2003; 199:41-9.
3. Parker DC, et al. Potential utility of uroplakin III, thrombomodulin, high molecular weight cytokeratin and cytokeratin 20 in noninvasive, invasive, and metastatic urothelial (transitional cell) carcinomas. *Am J Surg Pathol.* 2003; 27:1-10.
4. Ohtsuka Y, et al. Loss of uroplakin III expression is associated with a poor prognosis in patients with urothelial carcinoma of the upper urinary tract. *BJU Int.* 2006; 97:1322-6.

## Ordering Information

### Uroplakin III (AU-1)

Mouse Monoclonal Antibody

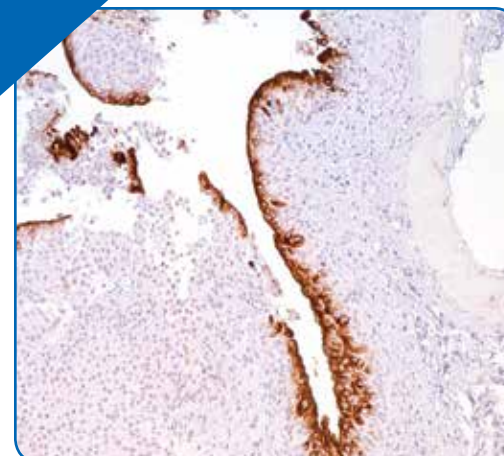
Volume	Part No.
0.1 mL concentrate	345M-14
0.5 mL concentrate	345M-15
1 mL concentrate	345M-16
1 mL predilute	345M-17
7 mL predilute	345M-18

### Uroplakin III (SP73)

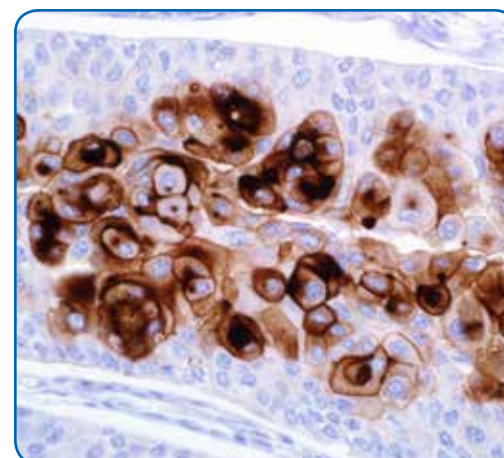
Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	345R-14
0.5 mL concentrate	345R-15
1 mL concentrate	345R-16
1 mL predilute	345R-17
7 mL predilute	345R-18

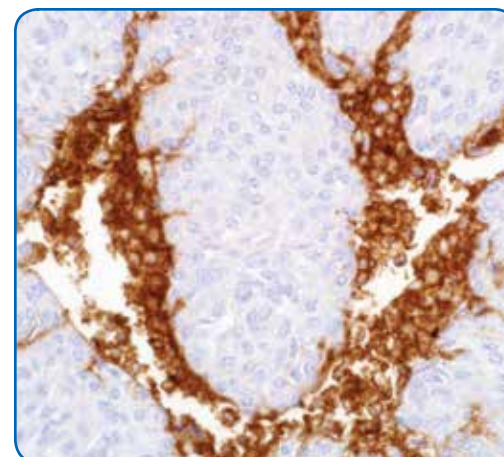
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Bladder, urothelial carcinoma

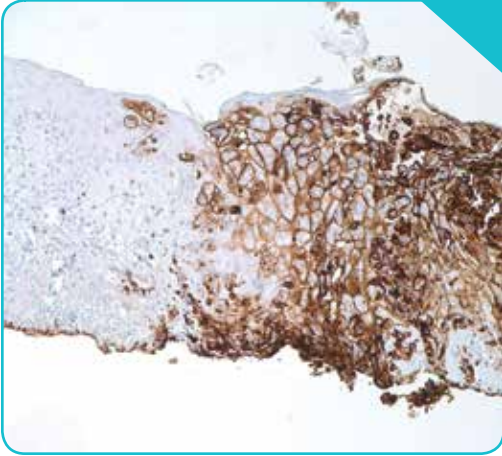


Urothelial carcinoma

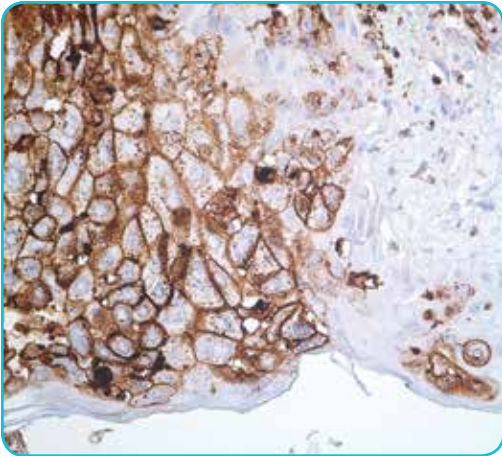


Urothelial carcinoma

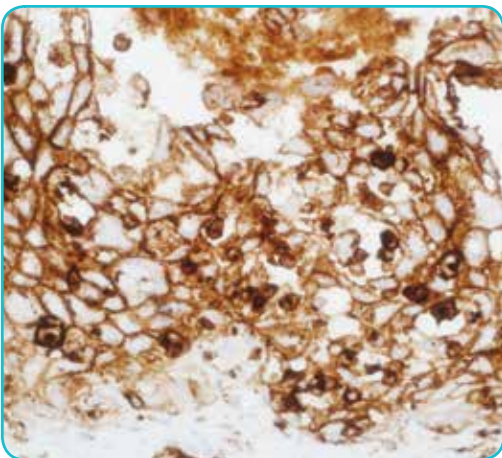
# Varicella Zoster Virus



Skin



Skin



Skin

Varicella zoster virus (VZV), a member of the human herpes virus family, causes two distinct clinical manifestations: chickenpox and shingles. Even when clinical symptoms of chickenpox have resolved, VZV remains dormant in the nervous system (virus latency) in the trigeminal and dorsal root ganglia. VZV is closely related to the herpes simplex virus (HSV). Affected skin shares so many histological similarities that distinguishing between them may be difficult.<sup>3</sup> Anti-VZV is directed against the VZV virus.

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** varicella zoster virus infected tissue

**Stability** up to 36 mos. at 2-8°C

## Synonyms and Abbreviations

VZV

## Associated Specialties

Dermatopathology

## Reference

1. Kleinschmidt-DeMasters BK, et al. Profound cerebrospinal fluid pleocytosis and Froin's Syndrome secondary to widespread necrotizing vasculitis in an HIV-positive patient with varicella zoster virus encephalomyelitis. *J Neurol Sci.* 1998; 159:213-8.
2. Kaye SB, et al. Human herpesviruses in the cornea. *Br J Ophthalmol.* 2000; 84:563-71.
3. Nikkels AF, et al. Comparative immunohistochemical study of herpes simplex and varicella-zoster infections. *Virchows Arch A Pathol Anat Histopathol.* 1993; 422:121-6.

## Ordering Information

**Varicella Zoster Virus (SG1-1, SG1-SG4, NCP-1 & IE-62)**  
Mouse Cocktail Antibody

Volume	Part No.
0.1 mL concentrate	364M-14
0.5 mL concentrate	364M-15
1 mL concentrate	364M-16
1 mL predilute	364M-17
7 mL predilute	364M-18

*Please contact your distributor for details on product availability and regulatory status in your country.*

# Villin

Villin is an actin-binding glycoprotein that serves an important role in the maintenance of the microvilli brush border in gastrointestinal (GI) mucosal epithelium and its associated tumors.<sup>1,2</sup> Recent immunohistochemical studies with villin have shown that villin is not only expressed in carcinomas of the gastrointestinal tract, but also in renal cell carcinomas, pancreatic carcinomas, endometrial carcinomas, as well as carcinomas of the ovary and lungs.<sup>2</sup> In addition, positive villin expression may be seen in neuroendocrine/carcinoid tumors of the GI tract and lungs.<sup>3</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic, membranous

**Control** colon

**Stability** up to 36 mos. at 2-8°C

**Isotype**

- CWWB1: IgG<sub>1</sub>
- EP163: IgG

## Associated Specialties

Gastrointestinal (GI) Pathology

## Associated Grids

Grid	Page No.
Carcinomas	292, 293

## Reference

1. Suh N, et al. Value of CDX2, villin, and alpha-methylacyl coenzyme A racemase immunostains in the distinction between primary adenocarcinoma of the bladder and secondary colorectal adenocarcinoma. *Mod Pathol.* 2005; 18:1217-22.
2. Tamboli P, et al. Colonic adenocarcinoma metastatic to the urinary tract versus primary tumors of the urinary tract with glandular differentiation: a report of 7 cases and investigation using a limited immunohistochemical panel. *Arch Pathol Lab Med.* 2002; 126:1057-63.
3. Zhang PJ, et al. Immunoexpression of villin in neuroendocrine tumors and its diagnostic implications. *Arch Pathol Lab Med.* 1999; 123:812-6.

## Ordering Information

### Villin (CWWB1)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	346M-14
0.5 mL concentrate	346M-15
1 mL concentrate	346M-16
1 mL predilute	346M-17
7 mL predilute	346M-18

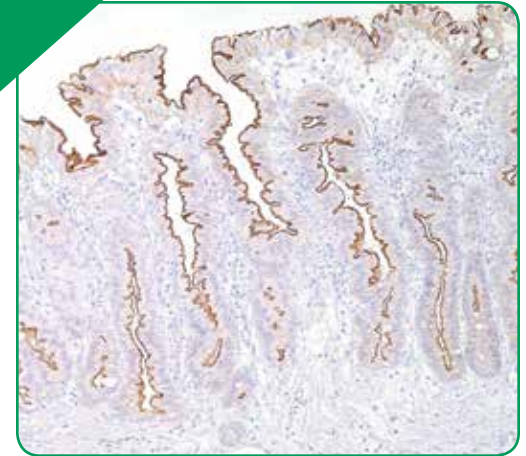
### Villin (EP163)

Rabbit Monoclonal  
Primary Antibody

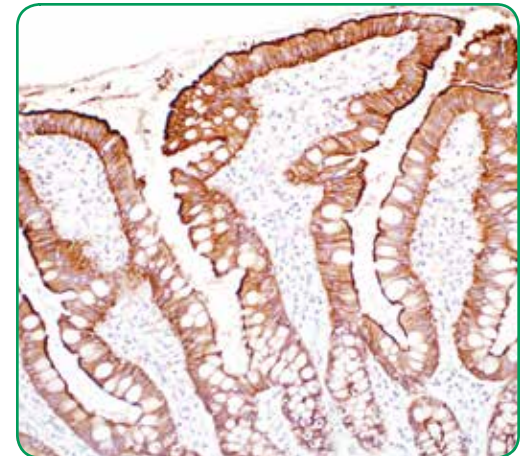


Volume	Part No.
0.1 mL concentrate	346R-14
0.5 mL concentrate	346R-15
1 mL concentrate	346R-16
1 mL predilute	346R-17
7 mL predilute	346R-18

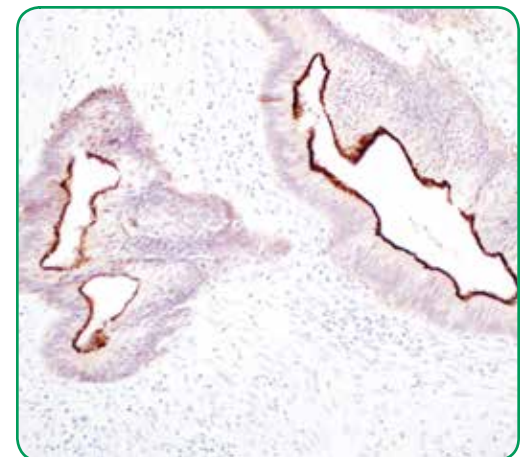
*Please contact your distributor for details on product availability and regulatory status in your country.*



Colon

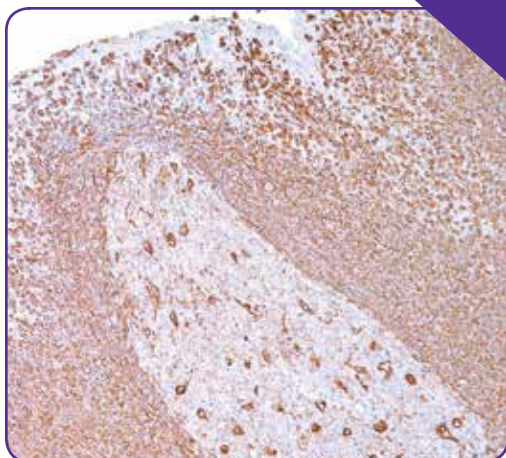


Colon

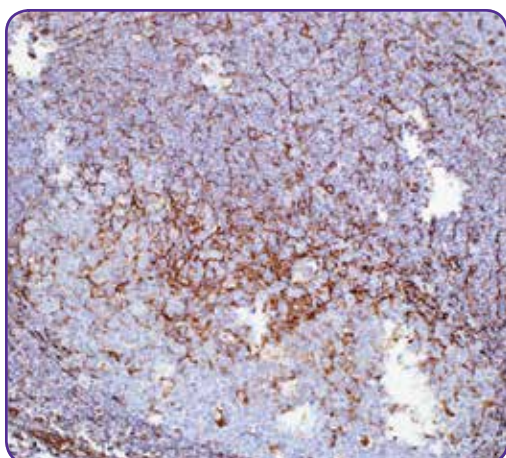


Colon carcinoma

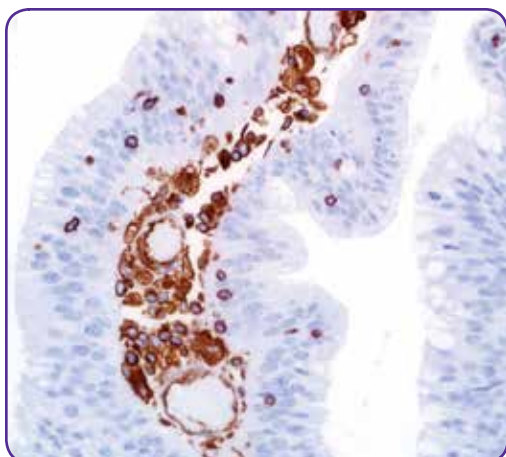
# Vimentin



Tonsil



Tonsil



Colon

Anti-vimentin recognizes a 57-kD intermediate filament protein initially isolated from mouse fibroblast culture. Anti-vimentin often serves as a useful control marker to ensure that the tissue has been properly preserved and processed.<sup>1</sup> Expression of vimentin, when used in conjunction with keratin, is helpful when distinguishing melanomas from undifferentiated carcinomas and large cell lymphomas. All melanomas and schwannomas react strongly with vimentin. It labels a variety of mesenchymal cells, including melanocytes, endothelial cells, fibroblasts and some lymphocytes. In the area of gynecologic tumors, uterine endometrioid adenocarcinomas display a highly characteristic immunophenotype, with coexpression of low molecular weight cytokeratin and vimentin.<sup>1-4</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** tonsil

**Stability** up to 36 mos. at 2-8°C

### Isotype

- EP21: IgG
- SP20: IgG<sub>1</sub>
- V9: IgG/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Neuroendocrine Neoplasms	298
Placental Trophoblastic Proliferations	303
Sex Cord Stromal Tumors	303
Uterus: Trophoblastic Proliferations	304
Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors	305
Germ Cell Tumors	309
Gonads: Germ Cell Tumors and Small Cell Carcinoma	309
Kidney Neoplasms	310
Brain: CNS Tumors	318
Histiocytic Proliferation	319
Muscle Malignant Tumors	321
Small Blue Round Cell Tumors	322

## Ordering Information

### Vimentin (EP21)

Rabbit Monoclonal  
Primary Antibody



Volume	Part No.
0.1 mL concentrate	347R-24
0.5 mL concentrate	347R-25
1 mL concentrate	347R-26
1 mL predilute	347R-27
7 mL predilute	347R-28

### Vimentin (SP20)

Rabbit Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	347R-14
0.5 mL concentrate	347R-15
1 mL concentrate	347R-16
1 mL predilute	347R-17
7 mL predilute	347R-18

### Vimentin (V9)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	347M-14
0.5 mL concentrate	347M-15
1 mL concentrate	347M-16
1 mL predilute	347M-17
7 mL predilute	347M-18
25 mL predilute	347M-10

## Reference

1. Dabbs DJ. Diagnostic Immunohistochemistry. Third Edition. Philadelphia, PA: Saunders/Elsevier. 2010. Print.
2. Dabbs DJ, et al. Hum Pathol. 1996; 27:172-7.
3. Dabbs DJ, et al. Am J Surg Pathol. 1986; 10:568-76.
4. Yaziji H, et al. Int J Gynecol Pathol. 2001; 20:64-78.

# WT1

Wilms tumor 1 protein (WT1) is a zinc finger transcription factor, normally expressed in tissues of mesodermal origin.<sup>1</sup> The Wilms tumor gene encodes a protein that functions as a tumor suppressor gene.<sup>2</sup> WT1 is detected in tumor cells of Wilms Tumor (also known as nephroblastoma) and mesothelioma.<sup>3</sup> Additionally, WT1 expression has been found in ovarian serous carcinomas<sup>4</sup> and some breast carcinomas.<sup>1</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** nuclear

**Control** ovarian serous carcinoma, mesothelioma, kidney, testis

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>1</sub>/k

## Associated Specialties

Anatomic Pathology

## Associated Grids

Grid	Page No.
Colon vs. Ovarian Carcinoma	294
Ewing Sarcoma vs. Other Small Round Cell Tumor Lesions	296
Micropapillary Carcinomas	297
Ovarian Carcinomas	303
Melanotic Lesions	305
Epithelioid Mesothelioma vs. Carcinoma	319
Pleura: Adenocarcinoma vs. Mesothelioma	320
Thoracic Solitary Fibrous Tumor vs. Potential Mimics	320
Neuroblastoma vs. Other Small Round Cell Tumors	321
Small Blue Round Cell Tumors	322

## Reference

1. May RJ, et al. Peptide epitopes from the Wilms tumor 1 oncoprotein stimulate CD4+ and CD8+ T cells that recognize and kill human malignant mesothelioma tumor cells. *Clin Cancer Res.* 2007; 13:4547-55.
2. Foster MR, et al. Immunohistochemical analysis of nuclear versus cytoplasmic staining of WT1 in malignant mesotheliomas and primary pulmonary adenocarcinomas. *Arch Pathol Lab Med.* 2001; 125:1316-20.
3. Nakatsuka S, et al. Immunohistochemical detection of WT1 protein in a variety of cancer cells. *Mod Pathol.* 2006; 19:804-14.
4. Goldstein NS, et al. WT1 immunoreactivity in uterine papillary serous carcinomas is different from ovarian serous carcinomas. *Am J Clin Pathol.* 2002; 117:541-5.

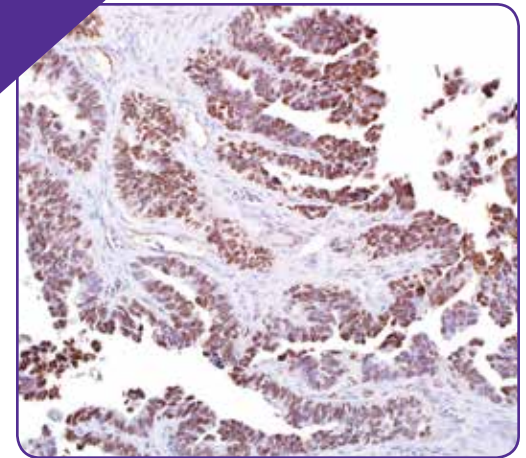
## Ordering Information

### WT1 (6F-H2)

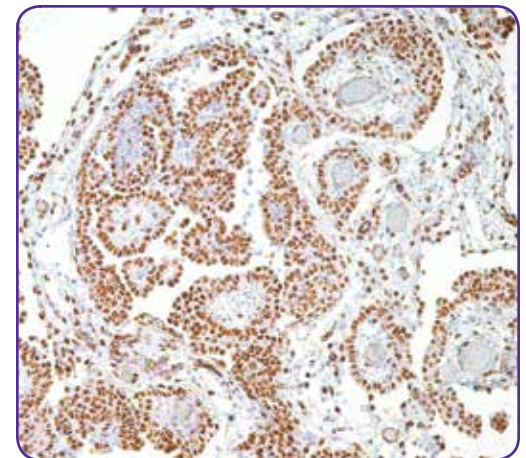
Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	348M-94
0.5 mL concentrate	348M-95
1 mL concentrate	348M-96
1 mL predilute	348M-97
7 mL predilute	348M-98
25 mL predilute	348M-90

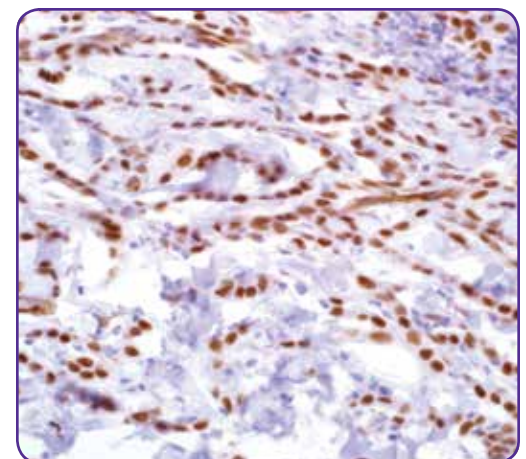
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Ovarian serous carcinoma



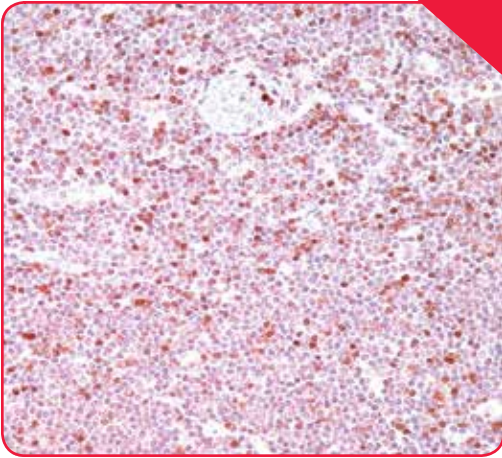
Mesothelioma



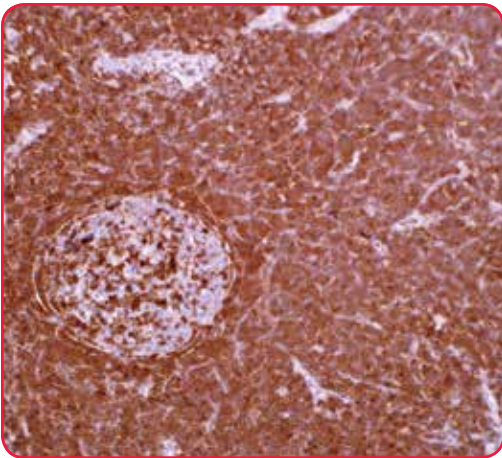
Mesothelioma



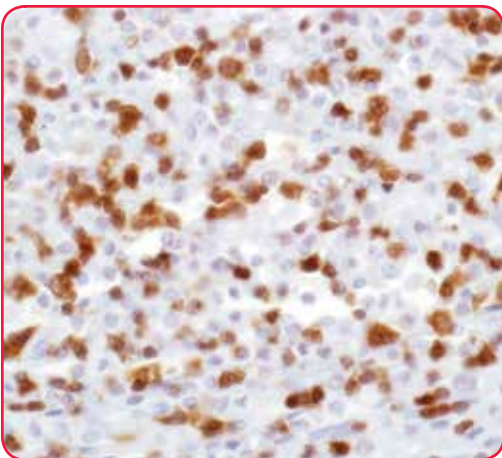
# ZAP-70



Chronic lymphocytic leukemia



Small lymphocytic lymphoma



Low grade lymphoma

Zeta-associated protein-70 (ZAP-70) is a member of the Syk family of tyrosine kinases, a group of proteins that attach to the zeta chain components of T-cell receptors to signal downstream events involved in the regulation of cell function, proliferation, and death.<sup>1</sup> Research suggests that the ZAP-70 protein may also play an important role in natural killer (NK) cell activation and early B-cell development; however, it is not expressed in most normal mature B-cells.<sup>1</sup> Expression of ZAP-70 has been reported in various lymphomas, including mantle cell lymphoma, small lymphocytic lymphoma and marginal zone lymphoma.<sup>1, 2</sup>

## Product Specifications

**Reactivity** paraffin

**Visualization** cytoplasmic

**Control** chronic lymphocytic leukemia/small lymphocytic lymphoma, tonsil

**Stability** up to 36 mos. at 2-8°C

**Isotype** IgG<sub>2a</sub>

## Associated Specialties

Hematopathology

## Associated Grids

Grid	Page No.
B-cell Lymphomas	311
Small and Medium/Large B-Cell Neoplasms	317

## Reference

1. Admirand J, et al. Immunohistochemical detection of ZAP-70 in 341 cases of non-Hodgkin and Hodgkin lymphoma. *Modern Pathology*. 2004; 17:954-61.
2. Carreras J, et al. Immunohistochemical analysis of ZAP-70 expression in B-cell lymphoid neoplasms. *J Pathol*. 2005; 205:507-13.

## Ordering Information

### ZAP-70 (2F3.2)

Mouse Monoclonal Antibody

Volume	Part No.
0.1 mL concentrate	349M-94
0.5 mL concentrate	349M-95
1 mL concentrate	349M-96
1 mL predilute	349M-97
7 mL predilute	349M-98

*This product is for in vitro diagnostic use only. It is not to be used for any other commercial purpose. Use of this product to produce products for sale or for research, therapeutic or drug discovery purposes is prohibited. In order to obtain a license to use this product for any purpose other than in vitro diagnostic use, contact Cell Marque™.*



**positive control  
slides**

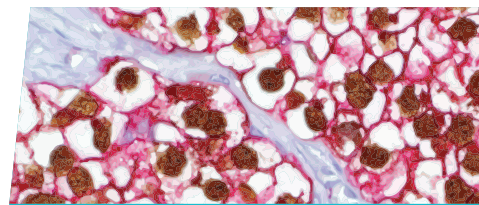
# Positive Control Slides

A-1-Antichymotrypsin	222S	CD4	104S	CD123	198S
A-1-Antitrypsin	223S	CD5	205S	CD138/syndecan-1	138S
ACTH	206S	CD7	107S	CD163	163S
Actin, Muscle Specific	201S	CD8	108S	CDX-2	235S
Actin, Smooth Muscle	202S	CD10	110S	CEA	236S
Adenovirus	212S	CD13	113S	Chromogranin A	238S
Adipophilin	393S	CD14	114S	CITED1	424S
ALDH1A1	400S	CD15	115S	Claudin 1	359S
ALK Protein	204S	CD16	116S	Claudin 7	418S
Alpha-Fetoprotein	203S	CD19	119S	CMV	213S
Androgen Receptor	200S	CD20	120S	Collagen Type IV	239S
Annexin A1	221S	CD21	121S	COX-2	240S
Arginase-1	380S	CD23	123S	Cyclin D1	241S
BCA-225	225S	CD25	125S	Cytokeratin (34betaE12)	334S
BCL2	226S	CD30	130S	Cytokeratin (35betaH11)	335S
BCL6	227S	CD31	131S	Cytokeratin (CAM 5.2)	452S
Beta-Catenin	224S	CD34	134S	Cytokeratin (OSCAR)	300S
BG8, Lewis <sup>y</sup>	228S	CD35	135S	Cytokeratin 5	305S
BOB.1	294S	CD38	118S	Cytokeratin 5 & 6	356S
c-Myc	395S	CD43	143S	Cytokeratin 7	307S
C3d	403S	CD44	144S	Cytokeratin 8 & 18	818S
C4d	404S	CD45 (LCA)	145S	Cytokeratin 10	410S
CA-125	325S	CD45R	146S	Cytokeratin 14	314S
CA19-9	399S	CD45RO	147S	Cytokeratin 17	317S
Cadherin-17	378S	CD56	156S	Cytokeratin 19	319S
Calcitonin	229S	CD57	157S	Cytokeratin 20	320S
Caldesmon	230S	CD61	161S	Cytokeratin Cocktail	313S
Calponin	231S	CD63	263S	Cytokeratin, HMW	303S
Calretinin	232S	CD68	168S	Cytokeratin, LMW	301S
Carbonic Anhydrase IX (CA IX)	379S	CD71	171S	Desmin	243S
Cathepsin K	402S	CD74	174S	Desmoglein 3	436S
Caveolin-1	412S	CD79a	179S	DOG1	244S
CD1a	101S	CD99	199S	E-cadherin	246S
CD2	102S	CD103	437S	EGFR	414S
CD3	103S	CD117, c-kit	117S	EMA	247S

Ep-CAM/Epithelial Specific Antigen	248S
Epstein-Barr Virus	245S
ERG	434S
Estrogen Receptor	249S
EZH2	415S
Factor VIII-R Ag.	250S
Factor XIIIa	251S
Fascin	252S
FLI-1	254S
FOXA1	405S
FoxP1	350S
FSH	207S
Galectin-3	255S
Gastrin	256S
GATA1	417S
GATA3	390S
GCDFP-15	257S
GH	208S
Glial Fibrillary Acidic Protein	258S
Glucagon	259S
GLUT1	355S
GLUT3	413S
Glutamine Synthetase	389S
Glycophorin A	260S
Glypican-3	261S
Granzyme B	262S
HBME-1	283S
hCG	234S
Heat Shock Protein 27	398S
Helicobacter pylori	215S
Hemoglobin A	360S
Hepatitis B Virus Core Antigen	216S
Hepatitis B Virus Surface Antigen	217S
Hepatocyte Specific Antigen (Hep-Par1)	264S
Her2/Neu	237S
Herpes Simplex Virus I & II	214S
HGAL	375S
HHV-8	265S
HMB-45	282S
Human Placental Lactogen (hPL)	266S

IgA	267S
IgD	268S
IgG	269S
IgG4	367S
IgM	270S
IMP3	433S
Inhibin, alpha	271S
INI-1	272S
Insulin	273S
Islet-1	431S
Kappa	274S
KBA.62	366S
Ki-67	275S
Ksp-cadherin	276S
Lambda	277S
Langerin	392S
LEF1	442S
LH	209S
LIN28	464S
LMO2	370S
Lysozyme	278S
Macrophage	279S
Mammaglobin	280S
MART-1 (Melan A)	281S

MCM3	435S
Mesothelin	439S
Microphthalmia Transcription Factor (Mitf)	284S
MLH1	285S
MSH2	286S
MSH6	287S
MUC1	290S
MUC2	291S
MUC4	406S
MUC5AC	292S
MUC6	293S
MUM1	358S
Myelin Basic Protein	295S
Myeloperoxidase	289S
MyoD1	386S
Myogenin	296S
Myoglobin	297S
Myosin, Smooth Muscle	298S
Nanog	443S
Napsin A	352S
Nerve Growth Factor Receptor (NGFR)	304S
Nestin	388S
Neurofilament	302S
NKX2.2	445S



# Positive Control Slides

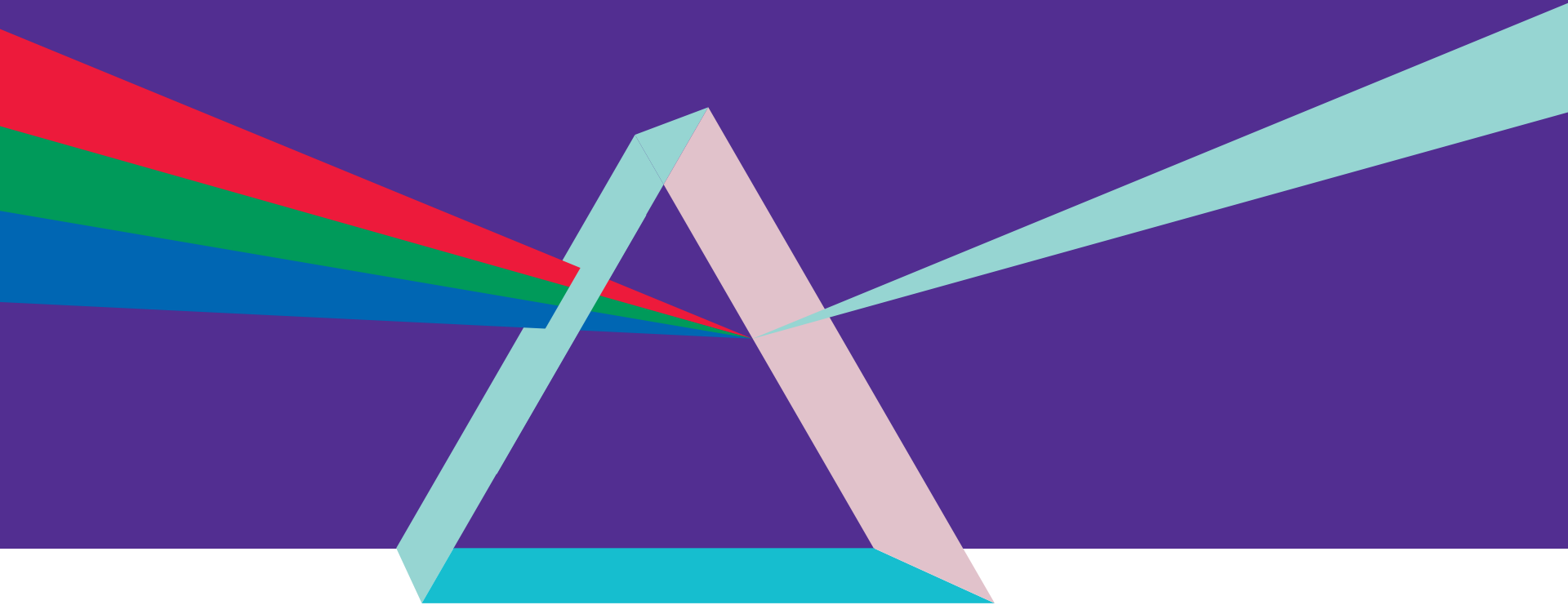
NKX3.1	441S
NSE	306S
Oct-2	308S
Oct-4	309S
Olig2	387S
p21 <sup>WAF1</sup>	421S
p27 <sup>Kip1</sup>	427S
p53	453S
p57 <sup>Kip2</sup>	457S
p120 Catenin	420S
P504s	504S
Parathyroid Hormone (PTH)	310S
Parvalbumin	396S
Parvovirus B19	218S
PAX-2	311S
PAX-5	312S
PAX-8	363S
PD-1	315S
Perforin	316S
PGP 9.5	318S
Phosphohistone H3 (PHH3)	369S
PHOX2B	422S
PLAP	321S
PMS2	288S
Pneumocystis jiroveci (carinii)	219S
PNL2	365S
Podoplanin	322S
Progesterone Receptor	323S
Prolactin	210S
PSA	324S
PSAP	326S
PU.1	328S
Renal Cell Carcinoma	329S
S-100	330S

S100 beta	449S
S100A1	408S
S100P	376S
SALL4	385S
SATB2	384S
Smoothelin	377S
Somatostatin	332S
SOX-2	371S
SOX-10	383S
SOX-11	382S
Spectrin	333S
STAT6	426S
Stathmin	394S
Steroidogenic Acute Regulatory Protein (STAR)	446S
SV40	351S
Synaptophysin	336S
T-bet	368S
TAG-72	337S
TCL1	357S
TdT	338S
TFE3	354S
Thrombomodulin	339S
Thyroglobulin	340S
Thyroid Peroxidase	409S
TLE1	401S
Toxoplasma gondii	220S
TRAcP	341S
Transgelin	423S
Treponema pallidum	397S
Tryptase	342S
TSH	211S
TTF-1	343S
Tyrosinase	344S

Uroplakin III	345S
Varicella Zoster Virus	364S
Villin	346S
Vimentin	347S
WT1	348S
ZAP-70	349S

# Ancillary products





### Trilogy™ Pretreatment Solution

Trilogy™ is an EDTA-based solution that combines the three pretreatment steps: deparaffinization, rehydration, and unmasking in immunohistochemistry stains. Use of this product standardizes the pretreatment procedure.

Pretreatment buffers are used to prepare specimens for immunohistochemical staining protocols. This solution helps maintain the morphological characteristics of the tissue while preparing epitopes for specific binding of antibodies within an immunochemical reaction.

50 mL, 20X concentrated	920P-04
200 mL, 20X concentrated	920P-06
200 mL, ready-to-use	920P-05
1 liter, ready-to-use	920P-09
1 gallon, ready-to-use	920P-10

### Declere™ Pretreatment Solution

Declere™ is a citrate-based solution that combines the three pretreatment steps: deparaffinization, rehydration, and unmasking in immunohistochemistry stains. The product is completely biodegradable and non-toxic.

Declere™ may be used whenever immunohistochemistry staining is performed on formalin-fixed, paraffin-embedded tissue sections. Using this product encourages standardization of the pretreatment procedure, thereby producing more consistent, more reliable results.

50 mL concentrate, 20X concentrated	921P-04
200 mL concentrate, 20X concentrated	921P-06
1 liter concentrate, 20X concentrated	921P-09

### Diamond: Antibody Diluent

Diamond: Antibody Diluent is a Tris buffered solution (TBS) for the dilution of both polyclonal and monoclonal antibodies for IHC. It is designed to minimize nonspecific reactions and encourage specific antigen-antibody binding.

Diamond: Antibody Diluent can also be used to stabilize diluted antibodies when stored at 2-8°C.

50 mL	938B-03
200 mL	938B-05
1000 mL	938B-09

### Emerald: Antibody Diluent

Emerald: Antibody Diluent is a phosphate buffered solution (PBS) for the dilution of both polyclonal and monoclonal antibodies for IHC. It is designed to minimize nonspecific reactions and encourage specific antigen-antibody binding.

Emerald: Antibody Diluent can also be used to stabilize diluted antibodies when stored at 2-8°C.

50 mL	936B-03
250 mL	936B-08
1000 mL	936B-09



### Plastic Staining Dishes & Slide Rack

Designed for histological or cytological staining. Each rack vertically holds up to 24 slides. This kit includes two staining dishes and two slide racks.

Staining dish + slide rack (2 of each)	975L
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### Background Block

Background Block is used to reduce the background staining often associated with immunohistochemistry. This reagent contains chemistry that helps reduce any non-specific protein binding that may occur in tissue sections.

15 mL, ready-to-use	927B-02
200 mL, ready-to-use	927B-05
1000 mL, ready-to-use	927B-09

### Peroxide Block

Peroxide Block is used to block the endogenous peroxide enzymes that naturally occur in tissue sections. Blocking of endogenous peroxidase is a necessary step when performing immunohistochemistry and utilizing a horseradish peroxidase enzyme (HRP) label. If this step is eliminated from the protocol, endogenous peroxide enzymes may cause the chromogen to precipitate, thereby causing background staining to occur.

15 mL	925B-02
50 mL	925B-03
100 mL	925B-04
200 mL	925B-05
1000 mL	925B-09

### PBS IHC Wash Buffer + Tween® 20

PBS IHC Wash Buffer + Tween® 20 is a 20X concentrated solution that is employed to rinse reagents off slides and to provide a medium for short-term storage of immunohistochemistry specimens between applications of reagents. When diluted, the ready-to-use solution is a 0.01 M phosphate buffered saline solution with a pH of 7.4 ±0.1.

200 mL, 20X	934B-06
1000 mL, 20X	934B-09

### TBS IHC Wash Buffer + Tween® 20

TBS IHC Wash Buffer + Tween® 20 is a 20X concentrated solution that is employed to rinse reagents off slides and to provide a medium for short-term storage of immunohistochemistry specimens between applications of reagents. When diluted, the ready-to-use solution is a 50mM Tris buffered solution with a pH range of 7.6 ±0.1.

200 mL, 20X	935B-06
1000 mL, 20X	935B-09

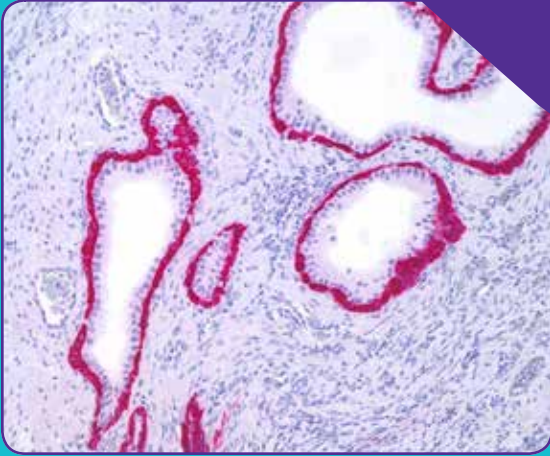
### Universal Negative Control Serum

Universal Negative Control Serum reagent is a solution of non-immune serum diluted in a buffered saline solution containing carrier protein. It aids in the identification of cells, tissues or tissue components which may non-specifically bind antibodies within tested tissues.

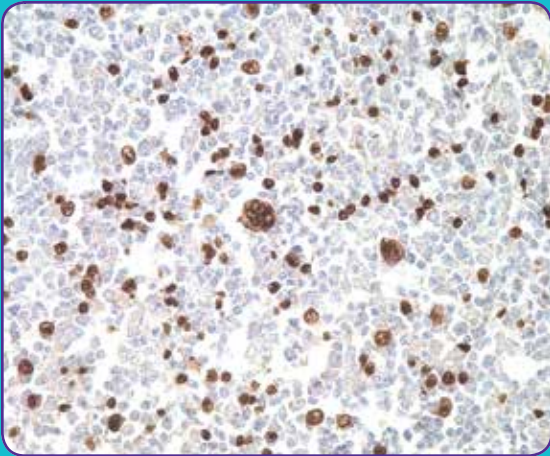
7 mL, ready-to-use	939B-01
25 mL, ready-to-use	939B-02
100 mL, ready-to-use	939B-03
1000 mL, ready-to-use	939B-09



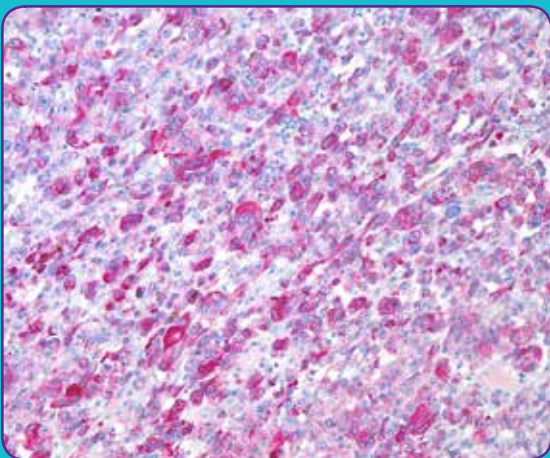
# HiDef Detection™ System



Prostate



Hodgkin lymphoma



Melanoma

HiDef Detection™ Polymer Systems are high-sensitivity visualization systems that are ready-to-use in immunohistochemical protocols. This two-step system uses an indirect method resulting in an antibody-enzyme complex that universally detects primary mouse and rabbit antibodies. The resulting chromogenic reaction can be visualized by either HRP or Alk Phos compatible chromogens using light microscopy. They are biotin-free and eliminate non-specific staining that could result from any endogenous biotin. These visualization systems consist of two detection reagents for amplifying the detection of low expressing antigens within a shorter turnaround time. These systems are compatible with both manual and automated staining platforms (subject to available software-selectable options in the latter instances).



### HiDef Detection™ HRP Polymer System

7 mL kit, Amplifier (Mouse and Rabbit) and HRP Polymer Detector	954D-10
15 mL kit, Amplifier (Mouse and Rabbit) and HRP Polymer Detector	954D-50
50 mL kit, Amplifier (Mouse and Rabbit) and HRP Polymer Detector	954D-20
100 mL kit, Amplifier (Mouse and Rabbit) and HRP Polymer Detector	954D-30
1000 mL kit, Amplifier (Mouse and Rabbit) and HRP Polymer Detector	954D-40

### HiDef Detection™ Alk Phos Polymer System

7 mL kit, Amplifier (Mouse and Rabbit) and Alk Phos Polymer Detector	962D-10
50 mL kit, Amplifier (Mouse and Rabbit) and Alk Phos Polymer Detector	962D-20
100 mL kit, Amplifier (Mouse and Rabbit) and Alk Phos Polymer Detector	962D-30

### CytoScan™ Alk Phos Detection System

The CytoScan™ Alk Phos Detection System is a two-step system which uses an indirect method resulting in an avidin-biotin-enzyme complex that universally detects primary mouse and rabbit antibodies. The resulting chromogenic reaction can be visualized by Alk Phos-compatible chromogens using light microscopy. This visualization system consists of two detection reagents and is based on the sequential application of CytoScan™ biotinylated Link followed by CytoScan™ Alk Phos Label, amplifying the detection of low expressing antigens.

1 mL kit, Alk Phos Label and Biotinylated Link	952D-10
50 mL kit, Alk Phos Label and Biotinylated Link	952D-20
200 mL kit, Alk Phos Label and Biotinylated Link	952D-30

### CytoScan™ HRP Detection System

The CytoScan™ HRP Detection System is a two-step system which uses an indirect method resulting in an avidin-biotin-enzyme complex that universally detects primary mouse and rabbit antibodies. The resulting chromogenic reaction can be visualized by HRP-compatible chromogens using light microscopy. This visualization system consists of two detection reagents and is based on the sequential application of CytoScan™ Biotinylated Link followed by CytoScan™ HRP, amplifying the detection of low expressing antigens.

1 mL kit, HRP Label and Biotinylated Link	951D-10
50 mL kit, HRP Label and Biotinylated Link	951D-20
200 mL kit, HRP Label and Biotinylated Link	951D-30



### AEC Substrate Chromogen

When in the presence of HRP, AEC produces a rust red precipitate that can be readily visualized using light microscopy.

50 mL	958D-20
200 mL	958D-30

### DAB Substrate Kit

When in the presence of HRP Polymer, DAB produces a brown precipitate that can be readily visualized using light microscopy.

15 mL kit, DAB Chromogen (1 mL) and DAB Buffer (15 mL)	957D-50
50 mL kit, DAB Chromogen (3 mL) and DAB Buffer (50 mL)	957D-20
100 mL kit, DAB Chromogen (6 mL) and DAB Buffer (100 mL)	957D-60
200 mL kit, DAB Chromogen (12 mL) and DAB Buffer (200 mL)	957D-30
500 mL kit, DAB Chromogen (30 mL) and DAB Buffer (500 mL)	957D-40

### Permanent Red Chromogen Kit

When in the presence of Alkaline Phosphatase, Permanent Red Chromogen produces a non-fading, bright red precipitate that can be readily visualized using light microscopy.

30 mL kit, 3 reagents (0.7 mL ea) and Perm. Red Buffer (30 mL)	960D-10
100 mL kit, 3 reagents (2.25 mL ea) and Perm. Red Buffer (100 mL)	960D-20

# HistoCyte Laboratories

Cell Marque™ Tissue Diagnostics is proud to be the official distributor of HistoCyte cell line controls.

Laboratories often struggle for sustainable control material. Additionally, biomarker expression can vary throughout the tissue, often due to a number of factors including, but not limited to:

- Fixation
- Process artifact
- Heterogeneity of the protein



This means that tissue selected as a control can vary to the point that makes its use redundant.

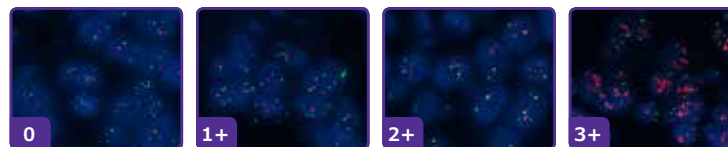
HistoCyte Laboratories cell lines are compact and typically “tissue-like”. In particular, the breast ductal carcinoma often creates “pseudo-acini” producing a more tissue-like appearance. The morphology of the cells allow better representation of how they have been treated on the slide while the assay has been conducted; it is widely apparent when the morphology is disrupted. Other cell line preparations available in the market, while performing adequately by IHC or FISH, are often sparse as well as the cellular integrity or morphology is often poor.

HistoCyte Laboratories cell lines are standardized, developed, and manufactured to provide consistent results throughout the block; this is what differentiates them from competitors and from other tissue controls. HistoCyte has *quality in control!*

## HER2 Analyte Control<sup>DR</sup> IHC



## HER2 Analyte Control<sup>DR</sup> FISH



## Dynamic Range Products

	Format	Code
<b>Breast Analyte Control<sup>DR</sup></b>	Slide(2)	HCL016
	Slide(5)	HCL017
	Block	HCL018
<b>Estrogen Receptor Analyte Control<sup>DR</sup></b>	Slide(2)	HCL029
	Slide(5)	HCL030
	Block	HCL031
<b>Progesterone Receptor Analyte Control<sup>DR</sup></b>	Slide(2)	HCL032
	Slide(5)	HCL033
	Block	HCL034
<b>HER2 Analyte Control<sup>DR</sup></b>	Slide(2)	HCL026
	Slide(5)	HCL027
	Block	HCL028
<b>HPV/p16 Analyte Control<sup>DR</sup></b>	Slide(2)	HCL001
	Slide(5)	HCL002
	Block	HCL003
<b>PD-L1 Analyte Control<sup>DR</sup></b>	Slide(2)	HCL019
	Slide(5)	HCL020
	Block	HCL021

## Standard Products

	Format	Code
<b>ALK-Lung (EML4-ALK) Analyte Control</b>	Slide(2)	HCL007
	Slide(5)	HCL008
	Block	HCL009
<b>ALK-Lymphoma (NPM-ALK) Analyte Control</b>	Slide(2)	HCL010
	Slide(5)	HCL011
	Block	HCL012
<b>Breast Analyte Control (ER, PR and HER2)</b>	Slide(2)	HCL013
	Slide(5)	HCL014
	Block	HCL015
<b>HPV/p16 Analyte Control</b>	Slide(2)	HCL004
	Slide(5)	HCL005
	Block	HCL006
<b>ROS1 Analyte Control</b>	Slide(2)	HCL022
	Slide(5)	HCL023
	Block	HCL024

# Antibody Grids



## Adenocarcinoma and Non-Epithelial Neoplasms

	CD45	CDX-2	EZH2	GATA3	GCDFP-15	Napsin A	NKX3.1	P504s	PSA	SATB2	TTF-1
Prostate Adenocarcinoma	-	-	+	-	-	-	+	+	+	-	-
Breast Carcinoma	-	-	+	+	+	-	-	-	-	-	-
Colorectal Adenocarcinoma	-	+	+	-	-	-	-	-	-	+	-
Lung Adenocarcinoma	-	-	+/-	-	-	+	-	-	-	-	+
Lymphoma	+	-	+	-/+ <sup>a</sup>	-	-	-	-	-	-	-
Sarcoma	-	-	-	-	-	-	-	-	-	-/+ <sup>b</sup>	-

<sup>a</sup> positivity observed in a subset of T-cell lymphomas, neoplastic cells from classical Hodgkin lymphoma but not those from the nodular lymphocyte-predominant Hodgkin lymphoma.

<sup>b</sup> frequently positive in osteosarcoma.

## Adrenal Neoplasms

	Calretinin	Chromogranin A	CK 8 & 18	CK Cocktail	Inhibin	MART-1	Neurofilament	STAR	Synaptophysin
Adrenocortical Adenoma	+	-	-/+	-/+	+	+	-	+	+/-
Adrenocortical Carcinoma	+	-	-/+	-/+	+	+	-	+	+/-
Pheochromocytoma	-	+	-	-	-	-	+	-	+

## Carcinomas: $\beta$ -Catenin - CK Cocktail

	$\beta$ -Catenin	Ber-EP4	BRST-2	CD10	CDX-2	CEA	pCEA	CK OSCAR	CK 5	CK 7	CK 19	CK 20	CK Cocktail
Basal Cell Carcinoma		+									-		+
Bladder Adenocarcinoma	-		-	+	+	+	+	+	-	+		+	+
Breast Carcinoma		+	+		-	-	-	+	-	+		-	+
Cervical Carcinoma	-		-		-			+	-	+		-	+
Cholangiocarcinoma		+									+		+
Colorectal Adenocarcinoma	+	+	-	+	+	+	+	+	-	-		+	+
Endometrial Adenocarcinoma			-		-	-	-	+	-	+		-	+
Gastric Carcinoma	-	+	-	-	+	+	+	+	-	+		-	+
Hepatocellular Carcinoma	-	-	-	+	-		+	-	-	-	-	-	-
Lung Adenocarcinoma	-	+	-	-/+	-	+	+	+	-	+		-	+
Lung Squamous Cell Carcinoma									+				
Merkel Cell Carcinoma		+			-						-	-	+
Ovarian Carcinoma, Mucinous			-	-	+	-	-	+	+	+		-	+
Ovarian Carcinoma, Non Mucinous			-		-				+	+		-	
Pancreatic Carcinoma	-		-	+/-	-	+	+	+	-	+		-	+
Prostate Adenocarcinoma	-		-	+			-	+	-	-		-	
Renal Cell Carcinoma			-	+			-	+	-	-		-	
Salivary Gland Carcinoma	-		+	-/+	-	+	+	+	+	+		-	+
Sarcomatoid Carcinoma		+									-		+
Spindle Cell Carcinoma			-				-	+	-	-		-	+
Squamous Cell Carcinoma	-		-	-	-	-	-	+	+	-		-	+
Sweat Gland Carcinoma	-		-	-	-	+	+	+	+	+		-	+

## Carcinomas: $\beta$ -Catenin - CK Cocktail (continued)

	$\beta$ -Catenin	Ber-EP4	BRST-2	CD10	CDX-2	CEA	pCEA	CK OSCAR	CK 5	CK 7	CK 19	CK 20	CK Cocktail
Thyroid Carcinoma			-				-	+	-	+	+/-	-	
Urothelial Carcinoma	-		-	+	-	-	-	+	+	+		+	+

## Carcinomas: CK, HMW - Villin

	CK, HMW	CK, LMW	MOC-31	ER	Hep Par-1	p63	PR	RCC	S100P	TTF-1	Villin
Basal Cell Carcinoma			+/-		-						
Bladder Adenocarcinoma	+	+		-	-	-	-	-		-	+
Breast Carcinoma	+	+	+	+	-	-	+	-	-	-	
Cervical Carcinoma				-	-	-	-	-		-	-
Cholangiocarcinoma			+		-				+		
Colorectal Adenocarcinoma	-	+	+		-	-		-		-	+
Endometrial Adenocarcinoma					-			-		-	
Gastric Carcinoma			+	-	-	-	-	-		-	+
Hepatocellular Carcinoma	-	-	-		+	-		-		+ (cytoplasmic)	-
Lung Adenocarcinoma	+	+	+	-	-	-	-	-	+	+	-
Lung Squamous Cell Carcinoma	+					+		-	-	-	-
Merkel Cell Carcinoma			+		-	-				-	-
Ovarian Carcinoma, Mucinous	+	+		-	-	-	-	-	-	-	
Ovarian Carcinoma, Non Mucinous	+	+			-			-		-	
Pancreatic Carcinoma	+/-	+		-	-	-	-	-		-	-
Prostate Adenocarcinoma	-	+			-			-	-	-	-
Renal Cell Carcinoma	-	+			-	-		+	-	-	
Salivary Gland Carcinoma	+	+		-	-	+	-	-			-
Sarcomatoid Carcinoma			-		-						
Spindle Cell Carcinoma	+				-	-		-			
Squamous Cell Carcinoma	+	+		organ specific	-	+	organ specific	-		-	
Sweat Gland Carcinoma	+	+		-/+	-	+	-/+	-			-
Thyroid Carcinoma	+	+			-	-		-		+	
Urothelial Carcinoma	+	+		-	-	+	-	-	+	-	-

## Carcinomas and Sarcomas with Epithelioid Morphology (Features)

	CD34	CAM 5.2	CK Cocktail	EGFR	PAX-8	SOX-10
Breast Carcinoma	-	+	+	+	-	-/+
Lung Carcinoma	-	+	+	+	-	-
Colorectal Adenocarcinoma	-	+	+	+	-	-
Hepatocellular Carcinoma	-	+	-	+	-	-
Renal Cell Carcinoma	-	-/+	+	+	+	-
Synovial Sarcoma	-	+	+	+	-	-
Epithelioid Sarcoma	+	+/-	+	+	-	-
Malignant Peripheral Nerve Sheath Tumor	-	+/-	+/-	+	-	+/-

## Carcinomas from Thyroid and Other Sites

	CEA	Chromogranin A	CK 19	Galectin-3	HBME-1	PAX-8	Synaptophysin	Thyroglobulin	TPO	TTF-1
Nomral Thyroid Follicles	-	-	-	-/+	-/+	+	-	+	+	+
Follicular Thyroid Carcinoma	-	-	-/+	-/+	-/+	+	+/-	+	+	+
Papillary Thyroid Carcinoma	-	-	+	+	+	+	+/-	+	+	+
Medullary Thyroid Carcinoma	+	+	-/+	-/+	-/+	-	+	-	-	+
Renal Cell Carcinoma	-/+	-	-	-	-	+	-	-	-	-
Breast Carcinoma	+/-	-	-	-	-	-	-	-	-	-
Colorectal Adenocarcinoma	+	-	-	-	-	-	-	-	-	-
Lung Adenocarcinoma	+	-	-	-	-	-	-	-	-	+

## Colon vs. Ovarian Carcinoma

	CA-125	Cadherin-17	CDX-2	CEA	CK 7	CK 20	SATB2	WT1
Ovarian Carcinoma, Serous	+	-	-	+	+	-	-	+
Ovarian Carcinoma, Mucinous	-	-	+	-	+	+	-	-
Ovarian Carcinoma, Endometrioid	+	-	-	-	+	-	-	+
Colorectal Carcinoma	-	+	+	+	-	+	+	-

## Colon vs. Prostate Adenocarcinoma

	AR	CA19-9	CDX-2	CEA	CK 20	NKX3.1	P504s	PSA	SATB2
Colon Adenocarcinoma	-	+	+	+	+	-	+	-	+
Prostate Adenocarcinoma	+	-	-	-	-	+	+	+	-

## Comparison of Immunoreactivity of PHH3 and Ki-67 in the Cell Cycle

Cell Cycle	PHH3	Ki-67
G0 phase	-	-
Interphase		
G1 phase	-	+
S phase	-	+
G2 phase	-	+
Mitosis phase		
Prophase	+	+
Metaphase	+	+
Anaphase	+	+
Telophase	+	+

## Differential Diagnosis of Adenocarcinomas from Breast, Lung and Prostate

	AR	ER	BRST-2	Mammaglobin	Napsin A	NKX3.1	PR	PSA	PSAP	TTF-1
Breast Carcinoma	-	+	+	+	-	-	+	-	-	-
Lung Carcinoma	-	-	-	-	+	-	-	-	-	+
Prostate Carcinoma	+	-	-	-	-	+	-	+	+	-

## Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics

	Arginase-1	Calretinin	CA IX	CD10	pCEA	Chromogranin A	CK 8 & 18	CK Cocktail	EMA	Hep Par-1	Inhibin
Adrenocortical Adenoma	-	+	-	-	-	-	-/+	-/+	-	-	+
Adrenocortical Carcinoma	-	+	-	-	-	-	-/+	-/+	-	-	+
Pheochromocytoma	-	-	-	-	-	+	-	-	-	-	-
Renal Cell Carcinoma	-	-	+	+	-	-	+	+	+	-	-
Hepatocellular Carcinoma	+	-	-	-	+	-	+	+	+	+	-

## Differential Diagnosis of Adrenocortical Neoplasms from their Histologic Mimics (continued)

	Ksp-cadherin	MART-1 (A103)	Neurofilament	PAX-2	PAX-8	RCC	SF-1	STAR	Synaptophysin
Adrenocortical Adenoma	-	+	-	-	-	-	+	+	+/-
Adrenocortical Carcinoma	-	+	-	-	-	-	+	+	+/-
Pheochromocytoma	-	-	+	-	-	-	-	-	+
Renal Cell Carcinoma	+	-	-	+	+	+	-	-	-
Hepatocellular Carcinoma	-	-	-	-	-	-	-	-	-

## Differential Diagnosis of Metastatic Adenocarcinomas

	Arginase-1	CA IX	Cadherin-17	CDX-2	GATA3	HBME-1	Napsin A	PAX-8	S100P	TTF-1
Breast Carcinoma	-	-	-	-	+	-	-	-	-	-
Lung Adenocarcinoma	-	+	-	-	-	-	+	-	-	+
Thyroid Carcinoma	-	-	-	-	-	+	-	+	-	+
Gastric Adenocarcinoma	-	+/-	-/+	+	-	-	-	-	-	-
Colon Adenocarcinoma	-	+/-	+	+	-	-	-	-	-	-
Pancreatic Ductal Carcinoma	-	+/-	-/+	+	-	-	-	-	+	-
Hepatocellular Carcinoma	+	-	-	-	-	-	-	-	-	-
Urothelial Carcinoma	-	-	-	-	+	-	-	-	+	-
Renal Cell Carcinoma	-	+	-	-	-	-	-/+	+	-	-

## Differential Diagnosis of Thyroid and Parathyroid Tumors

	Calcitonin	Chromogranin A	Galectin-3	PTH	PAX-8	S-100	Synaptophysin	TTF-1
Parathyroid Tumors	-	+	-	+	+/-	-	+	-
Follicular Thyroid Tumors	-	-	+	-	+	+/-	-	+
Medullary Thyroid Carcinoma	+	+	-	-	+	-	+	+



## Epithelioid Cell Neoplasms

	CD34	CK 35βH11	Desmin	DOG1	EMA	FLI-1	HMB-45	INI-1	S-100	TFE3
Epithelioid Sarcoma	+	+/-	+	-	+	-	-	+	-	-
Epithelioid Angiosarcoma	+	+	-	-	-	+	-	+	-	-
MPNST	-/+	-/+	+	-	-	-	-	+/-	+	-
Leiomyosarcoma	-/+	-/+	+	-	-	-	-	-	-	-
GIST	+	-	-	+	-	-	-	-	-	-
Endothelial Tumors	+	-	-	-	-	+	-	+	-	-
PEComa	-	-	-	-	-	-	+	-	+	-
Clear Cell Sarcoma	-	-	-	-	-	-	-	-	+	-
Alveolar Soft Part Sarcoma	-	-	-	-	-	-	-	-	-	+
Melanoma	-	-	-	-	-	-	+	-	+	-
Plasmacytoma	-	-	-	-	+	-	-	-	-	-

## Ewing Sarcoma (ES) vs. Other Small Round Cell Tumor Lesions

	CD45	CD99	CK 8 & 18	CK Cocktail	Desmin	FLI-1	Myogenin	Neurofilament	NKX2.2	PHOX2B	S-100	Synaptophysin	WT1
Ewing Sarcoma	-	+	-	-	-	+	-	-	+	-	-	-	-
Mesenchymal Chondrosarcoma	-	+	-	-	-/+	-	-	-	+	-	+/-	-	-
Olfactory Neuroblastoma	-	-	-	-	-	-	-	-/+	+	+	-	+	-
Neuroblastoma	-	-	-	-	-	-	-	+	-	+	-	+	-
Small Cell Carcinoma	-	-	+	+	-	-	-	-	-	-	-	+	-
Poorly Differentiated Synovial Sarcoma	-	+	+	+	-	-	-	-	-	-	-	-	-
Desmoplastic Small Round Cell Tumor	-	+/-	+	+	+	-	-	-	-	-	-	-	+
Small Cell Melanoma	-	-/+	-	-	-	-	-	-	-	-	+	-	-
Wilms Tumor	-	-	+/-	+/-	+	-	-	-	-	-	-	-	+
Rhabdomyosarcoma	-	-	-	-	+	-	+	-	-	-	-	-	-
Lymphoma	+	-	-	-	-	-	-	-	-	-	-	-	-

## Identification of Meningiomas from Histologic Mimics

	ALDH1A1	CD34	Claudin 1	E-cadherin	EMA	GFAP	S-100	STAT6
Meningothelial Meningioma	-	-	+	+	+	-	-	-
Atypical Meningioma	-	+	+	+	+	-	-	-
Fibrous Meningioma	-	-	-	+	+	-	+	-
Solitary Fibrous Tumor	+	+	-	-	-	-	-	+
Meningeal Hemangiopericytoma	+	+	-	-	-	-	-	-/+
Schwannoma	-	-	+/-	+	-	+	+	-

## Liver Neoplasms

	Arginase-1	Canalicular CD10	pCEA	Glypican-3	Hep Par-1
Hepatic Adenoma	+	+	+	-	+
Hepatocellular Carcinoma	+	+	+	+	+
Metastatic Adenocarcinoma	-	-	-	-	-

## Liver: Malignant vs. Benign

	A1ACT	A1AT	AFP	Arginase-1	CD34	mCEA	pCEA	Glypican-3	Hep Par-1	p53	TTF-1
Hepatocellular Carcinoma	-/+	-/+	-/+	+	+	-	+	+	+	+	+
Hepatoblastoma	+	+	+	-	-	-	+	+	+	+	-
Benign Liver Nodules	+/-	+/-	-	+	-	-	-	-	+	-	+

## Lung Small Cell Carcinoma vs. Merkel Cell Carcinoma

	CD117	CEA	Chromogranin A	CK 20	E-cadherin	Neurofilament	Synaptophysin	TTF-1
Merkel Cell Carcinoma	+	-	+	+	+	+	+	-
Lung Small Cell Carcinoma	+/-	-	-	-	-	-	+	+

## Lymph Node

	CD1a	CD14	CD21	CD35	CD68	CD163	Lysozyme	PD-1	S-100
Reactive Histiocytosis	-	+	-	-	+	-	+	-	-
Langerhans Cell Histiocytosis	+	+	-	-	+	+	+	-	+
Sinus Histiocytosis with Massive Lymphadenopathy	-	+	-	-	+	+	+	-	+
Follicular Dendritic Cell Sarcoma	+/-	-	+	+	-	-	-	-	-
Dermatopathic Lymphadenitis	+	-	-	-	-	+	+	-	+

## Lymph Node: Melanocytic Lesions vs. Interdigitating Dendritic Cells

	CK Cocktail	HMB-45	MART-1	S-100	SOX-10
Metastatic Melanoma	-	+	+	+	+
Nevus Cell	-	+	+	+	+
Interdigitating Dendritic Cells	-	-	-	+	-

## Micropapillary Carcinomas

	CK 7	CK 20	CK, HMW	EMA	ER	Mammaglobin	PAX-8	TTF-1	Uroplakin III	WT1
Bladder	+	+/-	+	-	-	-	-	-	+	-
Breast	+	-	-	+	+	+/-	-	-	-	-
Lung	+	-	-	+	-	-	-	+	-	-
Ovary	+	-	+	-	+	-	+	-	-	+

## Mucin Expression in Neoplasms

	MUC1	MUC2	MUC5AC	MUC6
Pancreatic Adenocarcinoma	+	-	+	-
Cervical Adenocarcinoma	+	-	+	-
Paget Extramammary	+	-	+	-
Cholangiocarcinoma	+	-	+/-	-
Salivary Duct Adenocarcinoma	-	+	-	+
Colon Carcinoma, Signet Ring	-	+	-	-
Prostate Carcinoma	-	+/-	-	-
Pancreatic Intraductal Papillary Carcinoma	-	+	+	+
Adrenocortical Carcinoma	-	-	-	-
Breast Carcinoma	+	-	-	-
Endometrial Carcinoma	+	-	-	-
Appendiceal Adenocarcinoma	-	+	+	-
Barrett Esophagus	+	+	+	-
Pancreatic Mucinous Cystic	-	-	+	-
Breast Colloid Carcinoma	+	+	-	+

## Mucins Expression in Organs

	MUC1	MUC2	MUC4	MUC5AC	MUC6
Stomach	+	-	+	+	+
Small Intestine	-	+	-	-	+
Colon	-	+	-	-	
Pancreas	+	-	-	-	+

## Neuroendocrine Neoplasms

NET origins	Calcitonin	CDX-2	CK Cocktail	Islet-1	Neurofilament	PAX-8	SATB2	TTF-1	Vimentin
Thyroid	+		+	+	-	+	-	+	-
Lung, Poorly Differentiated	-	-	+	+	-	-	-	+	-
Lung, Well Differentiated/ Moderately Differentiated		-	+	-	-	-	-	+	-
Stomach		-	+	-	-	-	-	-	-
Duodenum		-	+	+	-	+	-	-	-
Pancreas		-	+	+	-	+	+	-	-
Jejunioileum		+	+	-	-	-	+	-	-
Appendix	-	+	+	-	-	-	+	-	-
Colon	-	+/-	+	-	-		+	-	-
Rectum	-	+/-	+	+	-	+	+	-	-
Ovary	-	-/+	+		-			-	-
Skin	-		+	+	-	+		-	-
Paraganglioma/ pheochromocytoma	-	-	-	+	+			-	+

## Neuroendocrine Tumors from Different Anatomical Locations

	CD56	CDX-2	Chromogranin A	CK 8 & 18	CK Cocktail	Islet-1	NKX2.2	P53	Synaptophysin	TTF-1
Pancreatic	+	+	+	+	+	+	+	-	+	-
Gastrointestinal Tract	-/+	+/-	+	+	+	+/-	+	-	+	-
Bronchopulmonary, Poorly Differentiated	+	-	+/-	+	+	+	-	+	+	+
Bronchopulmonary, Moderately Differentiated	+/-	-	+	+	+	-	-	-	+	-/+
Bronchopulmonary, Well Differentiated	+/-	-	+	+	+	-	-	-	+	-

## PEComa

	Actin SM	Caldesmon	Calponin	CD63	CD68	Desmin	HMB-45	MART-1	S-100
Angiomyolipoma	+	+	+	+	+	-	+	+	-
Lymphangiomyomatosis	+	+	+	+	-	-	+	+	-
Extrapulmonary Clear Cell Tumor	+	-	-	+	-	-	+	+	+
Primary Cutaneous PEComa	-/+	-	-	+	+/-	-	+	+	-
Pulmonary Clear Cell Sugar Tumor	-	-	-	+	+/-	-	+	+	+/-

## Retroperitoneal Lesions

	Chromogranin A	CD99	GFAP	Neurofilament	NSE	PGP 9.5	S-100	Synaptophysin
Neuroblastoma	+	-	-/+	+	+	+	-	+
Ganglioneuroblastoma	+	-	+	+	+	+	+	+
Ganglioneuroma	+	-	+	+	+	+	+	+
Leiomyosarcoma	-	-	-	-	-/+	-/+	-	-
Rhabdomyosarcoma	-	-	-	-	-	+	-	-
Synovial Sarcoma	-	+/-	-	-	-	-	-/+	-

## Sex Hormone Receptors and Differential Diagnosis of Selected Carcinomas

	AR	BCA-225	BRST-2	ER	Mammaglobin	NKX3.1	PSA	PSAP	PR	TTF-1
Salivary Duct Carcinoma	+	+	+	-	-	-	-	-	-	-
Breast Carcinoma	+	+	+	+	+	-	-	-	+	-
Prostate Carcinoma	+	-	-	-	-	+	+	+	-	-
Lung Carcinoma	-	+/-	-	+	-	-	-	-	-	+

## Spindle Cell Tumors

	Actin MS	Actin SM	ALK Protein	β-Catenin	BCL2	Caldesmon	Calponin	CD34	CD56	CD117	CK Cocktail	Desmin	DOG1
Myofibroblastic Tumor	+	+	+	-	-	+	+	-	+	-	-	+	-
Spindle Cell Carcinoma	-	-	-	+/-	-	-	-	-	-	-	+	-	-
Neurofibroma	-	-	-	-	+	-	-	-	+	-	-	-	-
Rhabdomyosarcoma	+	-	-	-	+	-	-	-	-	+	-	+	-
Endometrial Stromal Tumor	+	+	-	+/-	-	-	+	-	-	-	-	-	-
Leiomyoma	+	+	-	-	-	+	+	-	-	-	-	+	-
Fibromatosis	-	+	-	+	-	-/+	-	-	-	-	-	-	-
GIST	-	-	-	-	+	+	-	+	-	+	-	-	+
Schwannoma	-	-	-	-	+	-	-	-	+	-	-	-	-
Leiomyosarcoma	+	+	-	-	-	+	+	-	+	-	-/+	+	-
MPNST	-	-	-	-	+	(focal)	-/+	-	-/+	-	-	-	-

## Spindle Cell Tumors (continued)

	EMA	Myogenin	SM Myosin	PGP 9.5	S-100
Myofibroblastic Tumor	-	-	-	-	-
Spindle Cell Carcinoma	+/-	-	-	+	-
Neurofibroma	-	-	-	+	+
Rhabdomyosarcoma	+/-	+	-	-	-
Endometrial Stromal Tumor	-	-	-	+	-
Leiomyoma	-	-	+	-	-
Fibromatosis	-	-	-	+	-
GIST	-	-	-	-	-
Schwannoma	-	-	-	-	+
Leiomyosarcoma	+/-	-	+	-	-
MPNST	-	-	-	+	+/-

## Spindle Cell Lesions

	Actin SM	CD34	CD99	Claudin 1	Desmin	EMA	GLUT1	S-100
Perineurioma	+/-	+	+	+	-	+	+	-
Neurofibroma	-	-	-	+	-	-/+	-	+
Schwannoma	-	-	-	-	-	-	-	+

## Spindle Cell Melanoma vs. Epithelioid Peripheral Nerve Sheath Tumor

	CD63	Collagen IV	HMB-45	NGFR	PNL2	S-100	SOX-10	Tyrosinase
Spindle Cell Melanoma	+	-	+	+	+	+	+	+
Peripheral Nerve Sheath Tumor	+	+	+	+	-	+	+	+

## Thymus

	BG8	CD1a	CD5	CD57	CD117	CEA	CK 5 & 6	CK 14	GLUT1	MOC-31	MUC1
Thymic Carcinoma	+	-	+	-	+	+	+	+	+	-/+	+
Thymoma	-	+	-	+	-	-	-/+	-	-/+	+	-/+

## Thyroid: Malignant vs. Benign

	Calcitonin	Diffuse CK 19	Galectin-3	HBME-1	p27	Thyroglobulin	TTF-1
Papillary Carcinoma	-	+	+	+	-/+	+	+
Follicular Carcinoma	-	-	+	+/-	-	+	+
Medullary Carcinoma	+	-	-	+	+/-	-	+
Thyroid Follicular Cells	-	-	-	-	+	+	+

## Various Germ Cell Tumor Components

	AFP	CD30	CD117	D2-40	Glypican-3	hCG	LIN28	Nanog	Oct-4	PLAP	SALL4	SOX-2
GCNIS/GNB	-	-	+	+	-	-	+	+	+	+	+	-
Seminoma/Dysgerminoma	-	-	+	+	-	-	+	+	+	+	+	-
Spermatocytic Seminoma	-	-	-/+	-	-	-	-	-	-	-	+/-	-
Embryonal Carcinoma	-/+	+	-	-	-	-	+/-	+	+	+/-	+	+
Yolk Sac Tumor	+	-	+/-	-/+	+	-	-	-	-	-/+	+	-
Choriocarcinoma	-	-	-	-	+	+	-	-	-	-	+/-	-
Teratoma	-/+	-	-	-	+/-	-	-	-	-	-	-/+	-/+

## Various Lesions with Melanocytic or Myomelanocytic Differentiation

	Actin SM	CD63	Desmin	HMB-45	KBA.62	MART-1	MiTF	MUM1	PNL2	S-100	S100B	SOX-10	Tyrosinase
Intradermal Nevus	-	-	-	-	+	+	+	+	+	+	+	-	+
Intranodal Nevus Cells	-	-	-	-	+	+	+	+	+	+	+	-	+
Junctional Nevus	-	-	-	+	+	+	+	+	+	+	+	-	+
Conventional Melanoma	-	+	-	+	+	+	+	+	+	+	+	+	+
Spindle Cell Melanoma	-	+	-	-/+	+	-/+	+/-	+		+	+	+	-/+
Desmoplastic Melanoma	-/+		-	-	+	-	-	-	-	+	+	+	-
Clear Cell Sarcoma	-	-	-	+	+	+	+	+	+	+		+	
Angiomyolipoma	+	+	+	+	-	+	+	-	+	+		+	-/+
Lymphangiomyomatosis	+	+	+	+	-/+	-/+	+	-	+	-			
PEComa	+	+	-/+	+	-	+	+/-	-	+	-		-	

## Breast Carcinoma

	CA15-3	CA19-9	CD117	CK 5	CK 7	CK 20	ER	p63	PR
Infiltrating Ductal Carcinoma	+	-	-	-	+	-	+	-	+
Adenoid Cystic Carcinoma	+	+	+	+	+	-	-	+	-

## Breast Lesion

	CK 34βE12	E-cadherin	BRST-2	Mammaglobin	p120
Lobular	+	-	+	+	+ (cytoplasmic)
Ductal	-	+	+	+	+ (membranous)

## Cervical Epithelial Neoplastic Lesions

	Ki-67	p16	p27	Stathmin
CIN I	+	+	-	-
CIN II	+	+	+	+/- (45%)
CIN III	+	+	+	+
Squamous Cell Carcinoma	+	+	+	+
Adenocarcinoma <i>in situ</i>	+/-	+	+	+
Endocervical Carcinoma	+	+	+	+
Ectocervical Mucosa	-/+	Few +	-/+	- (Basal layer +)
Endocervical Tissue	-	-	-	-

## Cervix

	BCL2	CK 17	Ki-67	MCM3
Cervical Intraepithelial Neoplasia	-	-	+	+
Tubo-Endometrial Metaplasia	+	+	-	-
Microglandular Hyperplasia	-	-	-	-

## Cervix Neoplasia

	CK 8	CK 17	p16
CIN I	-/+	-/+	+
CIN II	-/+	+	+
CIN III	+	+	+

## Non-Invasive Breast Lesions vs. Invasive Ductal Carcinoma

	Calponin	CD10	CK 5 & 6	CK 5 & 14	SM Myosin
Sclerosing Adenosis	+	+	+	+	+
Breast Carcinoma <i>in situ</i> (Myoepithelial Cells)	+	+	+	+	+
Infiltrating Breast Carcinoma	-	-	-	-	-

## Ovarian Carcinomas

	CA-125	CDKN2A	CEA	ER	PAX-8	PR	TP53	WT1
Low Grade Serous	+	-	+	+	+	+/-	-	+
High Grade Serous	+	+	+	+	+	-	+	+
Mucinous	-	-	-	-	+/-	-	+/-	-
Endometrioid	+	-	-	+	+	+	-	-
Clear Cell Carcinoma	+	-	-	-	+	-	-	-

## Placental Trophoblastic Cells

	1st Trimester		2nd Trimester		3rd Trimester	
	hCG	hPL	hCG	hPL	hCG	hPL
Cytotrophoblast	-	-	-	-	-	-
Intermediate Trophoblast	1-24%	25-49%	-/+	50-74%	1-24%	1-49%
Syncytiotrophoblast	>75%	1-24%	25-49%	50-74%	1-24%	>75%

## Placental Trophoblastic Proliferations

	CK OSCAR	hCG	hPL	p57	PLAP	Vimentin
Partial Mole	+	-/+	-/+	+	+	-
Complete Mole	+	+	-/+	-	-/+	-
Choriocarcinoma	+	+	-/+	-	-/+	-/+
Placental Site Tumor	+	+/-	+	+	+	+

## Sex Cord Stromal Tumors

	Calretinin	CD99	CK 7	CK 8 & 18	CK Cocktail	EMA	Inhibin	MART-1	Nuclear $\beta$ -Catenin	STAR	Vimentin	
Leydig Cell Tumor	+	+		-	-	-	+	+	-		+	+
Sertoli-Leydig Cell Tumor	+	+	+	+	+	-	+	+	+		+	+
Sertoli Cell Tumor	+/-	+		+	+	-	+/-	-	+		-	+
Granulosa Cell Tumor	+	+	-	-/+	-/+	-	+	-	-		+	+
Sex Cord-Stromal Tumor, NOS	+/-	+		-/+	-/+	-	+/-	-	-			+
Fibroma/Thecoma	+	-		-	-	-	+	-	-		-	+
Gynandroblastoma	+	-/+					+					+
Gonadoblastoma	+	+	-			-	+	-				+



## Uterus: Trophoblastic Proliferations

	CK Cocktail	hCG	hPL	p57	PLAP	Vimentin
Partial Mole	Strong, diffuse	Weak, diffuse	Weak, diffuse	+	+	-
Complete Mole	Strong, diffuse	Strong, diffuse	Weak, focal	-	Weak, focal	-
Choriocarcinoma	Strong, diffuse	Strong, diffuse	Weak, focal	-	Weak, focal	-/+
Placental Site Tumor	Strong, diffuse	Strong, focal	Strong, diffuse		Strong, diffuse	Strong, diffuse



## Cutaneous Epithelial Neoplasms

	Adipophilin	Ber-EP4	CK 5 + 14	CK Cocktail	EMA
Sebaceous Adenoma	+	+	+	+	+
Sebaceous Carcinoma	+	+	+	+	+
Basal Cell Carcinoma	-	+	-	+	-
Squamous Cell Carcinoma	-	-	+	+	+

## Cutaneous Lesions

	CK Cocktail	HMB-45	MART-1	S-100	SOX-10
Conventional Melanoma	-	+	+	+	+
Desmoplastic Melanoma	-	-	-	+/-	+
Squamous Cell Carcinoma	+	-	-	-/+	-
Basal Cell Carcinoma	+	-	-	-	-
Merkel Cell Carcinoma	+	-	-	-/+	-

## Cutaneous Neoplasms

	AR	BCL2	Ber-EP4	CD10	CD34	CK 15	CK 19	CK 20
Basal Cell Carcinoma	+	+	+	+	-	-	+	-
Trichoepithelioma	-	+	+	-	+	+	+	+
Merkel Cell Carcinoma	-	+	+	-	-	-	+	+
Microcystic Adnexal Carcinoma	-	+	-/+	+/-	-	+	+	-
Sebaceous Carcinoma	+	+/-	+	+/-	-	-	-	-
Sebaceous Adenoma	+	+	+	-	-	-	-	-

## Melanomas

	HMB-45	Nestin	S-100	SOX-10
Desmoplastic Melanoma	-	+	+	+
Conventional Melanoma	+	+	+	+

## Melanotic Lesions

	CD63	Factor XIIIa	HMB-45	KBA.62	MART-1	MITF	NGFR	PNL2	S-100	SOX-10	Tyrosinase	WT1
Adrenal Cortical	-	-	-	-	+	-	-	-	+	-	-	-
Adult Melanocytes	+	-	-	+	+	+	-	+	+	+	+	+
Angiomyolipoma	+	-	+	-	+	+	-	+	+	-	-	-
Dermatofibroma	-	+	-	-	-	-	-	-	-	-	-	-
Intradermal Nevus	-	-	-	+	+	+	+	+	+	-	+	+/-
Intranodal Nevus Cells	-	-	-	+	+	+	-	+	+	-	+	-
Junctional Nevus	-	-	+	+	+	+	+	+	+	-	+	+/-
Metastatic Melanoma	+	-	+	+	+	+	-	+	+	+	+	+
Primary Melanoma	+	-	+	+	+	+	-	+	+	+	+	+
Spindle Cell Melanoma	+	-	+	+	+	+	+	+	+	+	+	+

## Merkel Cell Carcinoma vs. Cutaneous Small Cell Tumors

	CD45	CD117	Chromogranin A	CK 5 & 6	CK 20	CK, pan	HMB-45	Neurofilament	S-100	Synaptophysin	TTF-1	Vimentin
Merkel Cell Carcinoma	-	+	+	-	+	+	-	+	-	+	-	-
Small Cell Carcinoma	-	+/-	+	-	-	+	-	-	-	+	+	-
Lymphoma	+	-	-	-	-	-	-	-	-	-	-	+/-
Small Cell Melanoma	-	+	-	-	-	-	+	-	+	-	-	+
Squamous Cell Carcinoma	-	-	-	+	-	+	-	-	-	-	-	-

## Neuroid Skin Lesions

	CD57	GFAP	MBP	S-100
Neuroma	+	-	+	+
Neurotised Nevi	-	-	-	+
Neurofibroma	+	-	+	+

## Skin Adnexal Tumors

	BRST-2	CD15	CK 7	CK 20	EMA	S-100
Merkel Cell Carcinoma	-	-	-	+	+	-
Sebaceous Tumor	-	+	+	-	-	-
Apocrine Tumor	+	+/-	+	-	+/-	-
Eccrine Tumor	-	-	+	-	+	+

## Skin: Basal vs. Squamous Cell Carcinoma

	BCL2	CK 8 & 18	CK Cocktail	EMA	Ep-CAM	UEA-1
Basal Cell Carcinoma	+	-/+	+	-	+	-
Squamous Cell Carcinoma	-	-	+	+	-	+

## Skin: Dermatofibrosarcoma Protuberans (DFSP) vs. Dermatofibroma Fibrous Histiocytoma (DF-FH)

	CD10	CD34	CD163	CK Cocktail	Desmin	Factor XIIIa	NGFR	p63	S-100
DFSP	+/-	+	-	-	-	-	+	-	-
DF-FH	+	-	-	-	-	+	-	-	-

## Skin: Pagetoid Tumors

	CEA	CK, HMW	CK, LMW	S-100	Vimentin
Melanoma	-	-	-	+	+
Paget's Disease	+	-	+	-/+	-
Bowen's Disease	-	+	+	-	-

## Skin Neoplasms

	CAM 5.2	CK 5	CK 7	CK 10	CK 14	CK 17	CK 19	CK 20
Skin Squamous Cell Carcinoma	+	+	+/-	+/-	+	+	+	-
Basal Cell Carcinoma	+/-	+	+/-	+/-	+	+	+/-	-
Extramammary Paget's Disease	+	-	+/-	-	-	-	+	-/+
Sebaceous Carcinoma	+/-	+	+	+/-	+	+/-	+/-	-
Merkel Cell Carcinoma	+	-	-	-	-	-	+	+
Bowen's Disease	+/-	+	-	-/+	+	+/-	+/-	-
Tricholemmal Carcinoma	-	+	-	+	+	+	-	-
Actinic Keratosis	+/-	+	+/-	+/-	+	+	+	-

## Skin: Spindle Cell Tissues and Tumors: Actin MS - D2-40

	Actin MS	Actin SM	ALDH1A1	BG8	CD10	CD31	CD34	CD99	Collagen IV	CK 8 & 18	CK Cocktail	D2-40
Angiosarcoma	-	-	-	-	-	+	+	-	+/-	-	-	+/-
Atypical Fibroxanthomas	+	+	+	-	+	-	-	+	-	-	-	-
DF-FH	-	-	-	-	+	-	-	-	-	-	-	-
DFSP	-	-	-	-	+/-	-	+	-	-	-	-	-
Glomus Tumor	+	+	-	-	-	-	+/-	-	+	-	-	-
Hemangioma	-	+	-	+	-	+	+	-	+	-	-	-
Kaposi Sarcoma	-	+	-	-	-	+	+	-	+/-	-	-	+
Kaposiform Hemangioendothelioma	-	-	-	-	-	+	+	-	-	+	-	-
Peripheral Nerve Sheath	+	-	+	-	-	-	-	+	+	-	-	+
Smooth Muscle	+	+	+	-	-	-	-	-/+	-	-	-	-
Solitary Fibrous Tumor	-	-	+	-	-	-	+	+/-	-	-	-	-

## Skin: Spindle Cell Tissues and Tumors: Actin MS - D2-40 (continued)

	Actin MS	Actin SM	ALDH1A1	BG8	CD10	CD31	CD34	CD99	Collagen IV	CK 8 & 18	CK Cocktail	D2-40
Spindle Cell Melanoma	-	-	-	-	-	-	-	-	-	-	-	+
Spindle Squamous Cell Carcinoma	-	-	-	-	-	-	-	-	-	+	+	+
Squamous Cell Carcinoma	-	-	-	-	-	-	-	-	-	-	+	+

## Skin: Spindle Cell Tissues and Tumors: Factor VIII - STAT6

	Factor VIII	Factor XIIIa	FLI-1	HHV-8	NGFR	S-100	STAT6
Angiosarcoma	+		+	-	-	-	-
Atypical Fibroxanthomas	-	+/-	-	-	-	-	-
DF-FH	-	+	-	-	-	-	-
DFSP	-	-	-	-	+	-	-
Glomus Tumor	-	-	-	-	-	-	-
Hemangioma	+		+	-	-	-	-
Kaposi Sarcoma	+	+/-	+	+	-	-	-
Kaposiform Hemangioendothelioma	-	-	+	-	-	-	-
Peripheral Nerve Sheath	-	-	-	-	+	+/-	-
Smooth Muscle	-	-	-	-	-	-	-
Solitary Fibrous Tumor	-	-	-/+	-	-	-	+
Spindle Cell Melanoma	-	-	+	-	+	+	-
Spindle Squamous Cell Carcinoma	-		-	-	-	-	-
Squamous Cell Carcinoma	-	-	-	-	-	-	-

# Gastrointestinal (GI) Pathology

## Ampullary Carcinomas

	CDX-2	CK 17	MUC1	MUC2
Intestinal Subtype	+	-	-	+
Ductal	-	+	+	-

## GIST Mutation vs. Wild Type

	CD34	CD117	DOG1
GIST, Kit Mutation	+	+	+
GIST, PDGFRA Mutation	-	-	+
GIST, Wild Type	+/-	+	+

## Liver: Primary and Metastatic Epithelial Neoplasms

	Arginase-1	CK 7	CK 19	GATA3	Glutamine Synthetase	Glypican-3	Hep Par-1	S100P
Well Differentiated HCC	+	-/+	-/+	-	+	-	+	-
Moderately Differentiated HCC	+	-/+	-/+	-	+	-/+	+	-
Poorly Differentiated HCC	+	-/+	-/+	-	+	+	+	-
Hepatic Adenoma	+	+/-	-/+	-	-	-	+	-
Hepatic Dysplastic Nodule	+	+/-	-/+	-	-	-	+	-
Intrahepatic Cholangiocarcinoma	-	+	+	-	-	-	-	+
Pancreatic Ductal Carcinoma	-	-/+	-/+	-	-	-	-	+

## Pancreatic Epithelial Tissues and Tumors

	β-Catenin	CA19-9	CD10	CD56	CDX-2	Chromogranin A	CK 7	CK 19	E-cadherin	Maspin	MUC4	pVHL	S100P	SMAD4	Synaptophysin
Ductal Carcinoma	+/-	+	+/-	-	-	-	+	-	+/-	+	+	-	+	-	-
Pancreatic Adenocarcinoma	-	+	+/-	-	-	-	+	-	-	-	+	-	-	-	-
Pancreatic Endocrine Tumor					-	+	-			-		-	-	-	+
Acinar Cell Carcinoma	+	-/+	+/-	-	-	-	-	+	+	-		-	-	-	-
Pancreatoblastoma	+	-	-	+		+		-	-		-	-	-		-
Neuroendocrine Tumor	+	+/-	-	+		+		+/-	-		-	-	-		+
Solid Pseudopapillary Tumor	+	-	+	+		-		-	+	(nuclear)					+
Islet Cells	+	-	-	+		+		-	-				-		+
Pancreatic Ducts	-	-	-	-	-	-	+	-	-	-		+	-	+	-

# Genitourinary (GU) Pathology

## Bladder Tissue

	Actin SM	Actin MS	Calponin	Smoothelin
Muscularis Mucosa	+	+	+	-
Muscularis Propria	+	+	+	+

## Bladder Urothelium: Dysplasia vs. Reactive Changes

	CD44	CK 20	CK 5 & 6	Ki-67	MCM3	p53
Carcinoma <i>in situ</i>	-	+	-	+	+	+
Reactive Atypia	+	-	+	+	+	-
Normal Urothelium	+	+	-/+	-/+	-/+	-

## Cervical Squamous Cell Neoplasms

	HSP27	p16	Stathmin
CIN I	+/-	+/-	-/+
CIN II	+/-	+/-	+/-
CIN III	+	+	+
Squamous Cell Carcinoma	+	+	+

## Germ Cell Tumors

	AFP	CD30	CD117	CK Cocktail	D2-40	EMA	Glypican-3	hCG	hPL	Inhibin	Oct-4	PLAP	SALL4	SOX-2	Synaptophysin	Vimentin
Seminoma/Dysgerminoma	-	-	+	-	+	-	-	-	-	-	+	+	+	-	-	+
Embryonal Carcinoma	-	+	-	+	-	-	-	-	-	-	+	+	+	+	-	-
Choriocarcinoma	-	-	-	+	-	+	+	+	+	-	-	+	-	-	-	-/+
Yolk Sac Tumor	+	-	-/+	+	-	-	+	-	-	-	-	-/+	+	-	-	-
Spermatocytic Seminoma	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Granulosa Cell Tumor	-	-	-	-	+/-	-	-	-	-	+	-	-	-	-	-	+
Hypercalcaemic Small Cell Carcinoma	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-
Mature Teratoma	+/-	-	-	+	-	+	-	-	-/+	-	-	+/-	-	+/-	-	+
Immature Teratoma	-	-	+/-	+	-	+	-	+/-	-/+	-	-	-	+/-	+	-	+
Carcinoid	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	+

## Gonads: Germ Cell Tumors and Small Cell Carcinoma

	AFP	CD30	CD117	CK Cocktail	D2-40	EMA	Glypican-3	hCG	hPL	Inhibin	Oct-4	PLAP	Vimentin
Seminoma	-	-	+	-	+	-	-	-	-	-	+	+	+
Embryonal Carcinoma	-	+	-	+	-	-	-	-	-	-	+	+	-
Choriocarcinoma	-	-	-	+	-	+	+	+	+	-	-	+	-/+
Yolk Sac Tumor	+	-	-/+	+	-	-	+	-	-	-	-	-/+	-
Somatic Carcinoma	-	-	-	+	-/+	+	-	-	-	-	-	-	-
Granulosa Cell Tumor	-	-	-	-	+/-	-	-	-	-	+	-	-	+

## Kidney: Epithelial Neoplasms

	CD10	CD117	CK 7	CK, HMW	GATA3	Ksp-cadherin	RCC	S100P	TFE3
Xp11 Tr RCC	+	-	-/+	-	-	+	+	-	+
Clear Cell RCC	+	-	-/+	-	-	-/+	+	-	-
Papillary RCC	+	-	+	+/-	-	-/+	+	-	-
Chromophobe RCC	+/-	+	+	-	-	+	+	-	-
Renal Oncocytoma	+	+	-/+	-/+	-	+	-	-	-
Urothelial Carcinoma	+	+/-	+	+/-	+	-	-	+	-

## Kidney Neoplasms

	CD10	CD117	CITED1	Claudin 7	CK 7	Ep-CAM	Ksp-cadherin	Parvalbumin	PAX-2	RCC	S100A1	Vimentin
Wilms Tumor	-	-	+	-	-/+	-	-	-	-	-	-	+

## Kidney Neoplasms

	CD10	CD117	CITED1	Claudin 7	CK 7	Ep-CAM	Ksp-cadherin	Parvalbumin	PAX-2	RCC	S100A1	Vimentin
Clear Cell RCC	+	-	-	-	-/+	-	-	-	+	+	+	+
Papillary RCC	-/+	+	-	-	+	-	-/+	-	-	+	+	+
Renal Oncocytoma	+	+	-	-	-/+	-	+/-	+	+	-	+	-
Chromophobe RCC	+/-	+	-	+	+	+	+	+	+	-/+	-	-

## Prostate Lesions

	CK 34βE12	CK 7	GATA3	PAX-2	p63	P504s	PSA	PSAP	Thrombomodulin	Uroplakin III
Prostate Carcinoma	-	-	-	-	-	+	+	+	-	-
Urothelial Carcinoma	+	+	+	-	+	-	-	-	+	+
Nephrogenic Adenoma	+/-	+	+	+	-	+	-	-	-	-

## Prostate: Malignant vs. Benign

	AR	CK 34βE12	CK 5 & 6	CK 14	p63	P504s	PSA	PSAP
Prostate Carcinoma	+	-	-	-	-	+	+	+
Benign Prostate	+	+	+	+	+	-/+	+	+

## Renal Cell Carcinoma vs. Hemangioblastoma

	Calretinin	CD10	CK Cocktail	D2-40	Inhibin	PAX-2
Metastatic RCC	-	+	+	-	-	+
Hemangioblastoma	+	-	-	+	+	-

## Squamous Cell Carcinoma vs. Urothelial Carcinoma

	COX-2	CK 34βE12	CK 5	CK 14	CK 7	CK 20	Desmoglein 3	GATA3	Uroplakin III
Squamous Carcinoma	-	+	+	+	-	-	+	-	-
Urothelial Carcinoma	+	+	-/+	-	+	+	-	+	+

## Squamous Cell Carcinoma vs. Urothelial Carcinoma vs. Adenocarcinoma

	CD10	CEA	CK 5 & 6	CK 7	CK 8 & 18	CK 20	Desmoglein 3	p63	TTF-1	Uroplakin III
Squamous Cell Carcinoma	-	-	+	-	+	-	+	+	-	-
Urothelial Carcinoma	+	-	+	+	+	+	-	+	-	+
Adenocarcinoma	-/+ <sup>a</sup>	+	-	+	+	-/+ <sup>b</sup>	-	-	+/- <sup>c</sup>	-

<sup>a</sup> CD10 is detected in colorectal, hepatocellular, and renal cell carcinomas.

<sup>b</sup> CK20 is detected in colon, stomach, pancreas, and biliary tract lesions but not in lung lesions.

<sup>c</sup> TTF-1 is present in most lung lesions.

## Differential Diagnosis of Thyroid and Parathyroid Tumors

	Calcitonin	Chromogranin A	Galectin-3	PTH	PAX-8	S-100	Synaptophysin	TTF-1
Parathyroid Tumors	-	+	-	+	+	-	+	-
Follicular Thyroid Tumors	-	-	+	-	+	+/-	-	+
Medullary Thyroid Carcinoma	+	+	-	-	+	-	+	+



# Hematopathology

## B-cell Lymphomas

	Annexin A1	BCL2	BCL6	BOB.1	CD5	CD10	CD11c	CD20	CD23	CD25	CD43	CD45	CD79a	Cyclin D1
Burkitt Lymphoma	-	-	+	+	-	+		+	-			+	+	-
SLL/CLL	-	+	-	-/+	+	-	-/+	+	+		+	+	+	-
DLBCL	-	+	+/-	+	-/+	-/+		+	-		-	+	+	-
Follicular	-	+	+	+	-	+		+	-	-		+	+	-
Hairy Cell Leukemia	+	+	-		-	-	+	+	-	+	-	+	+	+(weak)/-
Lymphoplasmacytic Lymphoma	-	+	-	+	-	-	-	+	-	-		+	+	-
MALT Lymphoma		+	-/+			-		+	-				+	-
Mantle Cell	-	+	-	-/+	+	-	-	+	-	+	+	+	+	+
Marginal Zone	-	+	-		-	-	+	+	-	-	+	+	+	-
Marginal Zone BCL	-	+	-	-/+	-	-		+	-				+	-
Splenic Marginal Zone	-	+	-		-	-			-				+	-

## B-cell Lymphomas (continued)

	FoxP1	IgD	Kappa	Lambda	MUM1	Oct-2	p27	PAX-5	PD-1	PU.1	T-bet	TCL1	TRAcP	ZAP-70
Burkitt Lymphoma	+	-	+/-	-/+	-	-	-	+	-		-	+	-	-
SLL/CLL	-	+	+/-	-/+	+	+	+	+	-	+	+/-	+	-	+/-
DLBCL	+	-	+/-	-/+	+/-	+	-	+	-	+	-	+	-	-
Follicular	-	+	+/-	-/+	-	+	+	+	+	+	-	+	-	-
Hairy Cell Leukemia		-	+/-	-/+			+(weak)/-	+	-		+	+	+	-
Lymphoplasmacytic Lymphoma	-	-	+/-	-/+	+	-	+		-		+	+	-	-
MALT Lymphoma	+				-							+		
Mantle Cell	-	+	+/-	-/+	-	+	+	+	-	+	-	+	-	-
Marginal Zone		+	+/-	-/+	+	+		+	-	+		-	+/-	-
Marginal Zone BCL		-/+			+	+	+	+		+	+	-	+/-	
Splenic Marginal Zone	-				+/-	+		-				-		



## c-Myc in Diffuse Large B-cell Lymphoma (DLBCL)

	BCL2	CD10	CD38	CD44	TCL1
DLBCL with c-Myc Rearrangement	-/+	+	+	-	+
DLBCL without c-Myc Rearrangement	+	+/-	-	+	-/+

## CD5 in B-cell Neoplasms

	CD5	CD10	CD20	CD23	Cyclin D1	SOX-11
Mantle Cell Lymphoma	+	-	+	-	+	+
Follicular Lymphoma	-	+	+	-	-	-
SLL/CLL	+	-	+	+	-	-
Marginal Zone Lymphoma	-	-	+	-	-	-
Lymphoblastic Lymphoma	-	+/-	+	-	-	-
Burkitt Lymphoma	-	-	+	-	-	-
DLBCL, CD5+ Variant	+	+	+	-	-	-
Mantle Cell Lymphoma, Blastoid Variant	+	-	+	-	+	+

## Cytotoxic Molecules in Mature T- and NK-cell Neoplasms

	Granzyme B	Perforin	TIA-1
NK/T Cell Lymphoma	+	+	+
Hepatosplenic T-cell Lymphoma	-	-	+
Cutaneous T-cell Lymphoma	+	+	+
EBV+ Systemic T-lymphoproliferative Disorders	+	+	+
T-cell Large Granular Lymphocytic Leukemia	+	+	+
Adult T-cell Leukemia/Lymphoma	-	-	-
Angioimmunoblastic Lymphoma	-	-	-
Anaplastic Large Cell Lymphoma	+	+	+

## Distinction between Hairy Cell Leukemia and Splenic Marginal Zone Lymphoma

	Annexin A1	CD10	CD11c	CD25	CD103	CD123	Cyclin D1	DBA44	T-bet	TRAcP
Hairy Cell Leukemia	+	-*	+	+	+	+	+(weak)/-	+/-	+	+/-
Hairy Cell Leukemia Variant	-	-	+	-	+/-	-	-	+/-	-	+/-
Splenic Marginal Zone Lymphoma	-	-	-/+	-	-	-	-	+/-	-	+/-

\* 20% of the lesions were reported to be positive for CD10.

## Erythroid

	CD71	Glycophorin A	Hemoglobin A	Spectrin
Erythroid Hyperplasia	+	+	+	+
Erythroid Hypoplasia	+	+	+	+
Acute Erythroid Leukemia	+	+	+	+
Extramedullary Hematopoiesis	+	+	+	+
Mature Erythrocytes	-	+	+	+

## Hematopoietic Neoplasms and Anaplastic Large Cell Lymphoma

	CD61	CD71	GATA1	Glycophorin A	MPO
Megakaryocytes	+	-	+	-	-
Acute Megakaryoblastic Leukemia	+	-	+	-	-
Myeloproliferative Neoplasm	+	+	+	+	+
Acute Myeloid Leukemia	-	+	+/-	-	+
Anaplastic Large Cell Lymphoma		+	-	-	-
Erythroid Precursors	-	+	+	+	-

## Histiocytic Lesions

	CD3	CD4	CD20	CD45	CD68	CD163	Factor XIIIa	Lysozyme	MPO
Histiocytic Lesions	-	+	-	+	+	+	+	+	-

## Histiocytic and Dendritic Cell Lesions

	CD1a	CD21	CD23	CD35	CD68	CD163	Langerin	Lysozyme	S-100
Langerhans Cell Histiocytosis	+	-	-	-	+/-	-	+	+/-	+
Rosai-Dorfman Disease	-	-	-	-	+	+	-	+	+
Follicular Dendritic Cell Sarcoma	-	+	+	+	-	-	-	-	-
Interdigitating Dendritic Cell Sarcoma	-	-	-	-	+/-	+	-	+	+
Histiocytic Sarcoma	-	-	-	-	+	+	-	+	+/-
Juvenile Disseminated Xanthogranuloma	-	-	-	-	+	+	-	+	+/-

## Histiocytic and Dendritic Cell Neoplasms

	CD1a	CD14	CD21	CD35	CD68	CD163	Langerin	Lysozyme	PD-1	S-100
Reactive Histiocytosis	-	+	-	-	+	-	-	+	-	-
Langerhans Cell Histiocytosis	+	+	-	-	+/-	-	+	+/-	-	+
Sinus Histiocytosis with Massive Lymphadenopathy	-	+	-	-	+	+	-	+	-	+
Follicular Dendritic Cell Sarcoma	-	-	+	+	-	-	-	-	-	-
Sinusoidal Histiocytes	-	+	-	-	-	-	-	-	-	-
Tingible Body Macrophages	-	-	-	-	+	-	-	-	-	-
Plasmacytoid Monocytes	-	-	-	-	-	-	-	-	-	-
Interdigitating Dendritic Cell	+	+/-	-	-	-	-	-	-	-	-

## Hodgkin Lymphoma: Classical (CHL) vs. Nodular Lymphocyte-Predominant (NLPHL)

	BCL2	BCL6	CD15	CD30	Cyclin D1	Granzyme B	IMP3	MUM1	PAX-5	SOX-11
CHL	+	-/+	+	+	-	-	+	+	+	-
NLPHL	+	+	-	-	-	-	+	-/+	+	-

## Hodgkin vs. Non-Hodgkin Lymphomas

	ALK	BCL6	BOB.1	CD15	CD30	CD45	CD79a	EMA	Fascin	Granzyme B	MUM1	Oct-2	PU.1
Anaplastic Large Cell Lymphoma	+	+/-	-	-	+	+	-	+	-	+	-	-	-
Angioimmunoblastic T-cell Lymphoma	-	+	-	-	-	+	-	-	-	-	-	-	-
Hodgkin Lymphoma, Classic	-	-	-	+	+	-	-	-	+	-	+	-	-
Hodgkin Lymphoma, Nodular Lymphocyte Predominant	-	+	+	-	-	+	+	+	-	-	-/+	+	+
T-cell Rich B-cell Lymphoma	-	+	+	-	-	+	+/-	-/+	-	-	+	+	-
T-cell Rich LBCL	-	+	+	-	-	+	+	-	-	-	+	+	-

## Immunoglobulin, Heavy and Light Chain

	IgA	IgD	IgG	IgM	Kappa	Lambda
Cutaneous Lymphoma	-	-	-	-	+/-	-/+
Myeloma	+	-/+	+	-/+	+/-	-/+
DLBCL	-	-	+	+	+/-	-/+
Marginal Zone Lymphoma	-	-/+	-	+	+/-	-/+
SLL/CLL	-	+	-	+	+/-	-/+

## Leukemia

	CD13	CD14	CD16	CD33	CD34	CD38	CD71	CD117	CD163	MPO
Acute Myeloid Leukemia with Minimal Differentiation	+	+	-	+	+	+	-	+	-	-
Acute Myeloid Leukemia without Maturation	+	-	-	+	+	-	-	+	-	+
Acute Myeloid Leukemia with Maturation	+	-	-	+	+	-	-	+	-	+
Acute Myelomonocytic Leukemia	+	+	+	+	+/-	-	-	+	+	+
Acute Monoblastic and Monocytic Leukemia	+	+	+	+	-/+	-	-	+/-	+	+
Acute Erythroid Leukemia	-	-	-	-	-/+	-	+	+/-	-	-
Acute Megakaryoblastic Leukemia	+/-	-	-	+/-	-	-	-	-	-	-
Acute Basophilic Leukemia	+	-	-	+	+/-	-	-	-	-	-
Acute Panmyelosis with Myelofibrosis	+	-	-	+	+	-	-	+	-	-

## Lymphoblastic Lymphomas, B-cell Type (B-LBL) vs. T-cell Type (T-LBL)

	CD1a	CD3	CD5	CD7	CD10	CD19	CD20	CD74	CD117	PAX-5	TdT
B-LBL	-	-	-	-	+/-	+	+/-	+	-	+	+
T-LBL	+/-	+	+/-	+	+	-	-	-	-	-	+

## Lymphomas and Myeloid Sarcoma

	BCL2	BCL6	c-Myc	CD3	CD7	CD10	CD20	CD43	CD79a	PAX-5	TdT
Burkitt Lymphoma	-	+	+	-	-	+	+	-	+	+	-
DLBCL	+/-	+	+/-	-	-	+/-	+	-	+	+	-
B-cell Lymphoma, Unclassifiable, Intermediate between DLBCL and Burkitt Lymphoma	+/-	+	+/-	-	-	+/-	+	-	+	+	-
MCL, Blastoid Variant	-	-	-	-	-	-	+	-	+	+	-
T-LBL	-	+/-	-	+	+	+/-	-	+/-	-/+	-	+
B-LBL	-	+/-	-	-	-	+/-	-/+	+/-	+	-	+
Myeloid Sarcoma	-	-	-	-	-	-	-	+	-	-	-/+

## Mastocytosis

	CD2	CD25	CD117	CD163	Tryptase
Mastocytosis	+	+	+	-	+
Mast Cell Leukemia	+	+	+	-	+
Reactive Mast Cells	-	-	+	+	+

## Mature B-cell and T-cell Neoplasms

	CD3	CD20	CD43	CD45R	CD45RO
Mature B-cell Neoplasms	-	+	-	+	-
Mature T-cell Neoplasms	+	-	+	-	+

## Mature B-cell Neoplasms

	Annexin A1	BCL2	CD5	CD10	CD20	CD23	Cyclin D1	HGAL	LMO2
Follicular Lymphoma	-	+/-	-	+/-	+	-	-	+	+
Diffuse Large B-cell Lymphoma	-	+	-/+	+/-	+	-	-	+	+
Small Lymphocytic Lymphoma	-	+	+	-	+	+	-	-	-
Mantle Cell Lymphoma	-	+	+	-	+	-	+	-	-
Marginal Zone Lymphoma	-	+	-	-	+	-	-	-	-
Hairy Cell Leukemia	+	+	-	-	+	-	-	-	-

## Mature B-cell Neoplasms with Reduced CD20 Expression

	CD20	CD30	CD38	CD45	CD79a	CD138	EMA	HHV-8	MUM1	PAX-5
Plasmablastic Lymphoma	-	+	+	-	+	+	+	-	+	-
Primary Effusion Lymphoma	-	+/-	+/-	+	-	+	+/-	+	+	-
Large B-cell Lymphoma arising in HHV8-associated Multicentric Castleman Disease	-/+		-/+	+	-	-		+		
Extranodal Marginal Zone Lymphoma with Plasmacytoid Differentiation	-		+	+	+	+			+	-

## NK Cell Leukemia/Lymphoma

	CD2	CD3	CD16	CD56	CD57	Granzyme B	Perforin	TIA-1
Aggressive NK-cell Leukemia	+	+	+	+	-	+	+	+
T-Cell Large Granular Lymphocytic Leukemia	+	+	+	-	+	+	+	+
Extranodal NK/T-Cell Lymphoma, Nasal Type	+	+	-	+	-	+	+	+

## Plasma Cell Neoplasm and Lymphoproliferative Neoplasms

	CD19	CD20	CD43	CD56	CD79a	CD138	Cyclin D1	EMA	MUM1
Plasma Cell Neoplasm	-	-/+	-	+	+	+	-/+	+	+
ALK+ Large B-cell Lymphoma	-	-	-/+	-	-	+	-	+	+
Plasmablastic Lymphoma	-	-	-	-	+	+	-	+	+
HHV8-associated Large B-cell Lymphoma	+/-	+/-	-	-	-	-	-	-	-
Primary Effusion Lymphoma	-	-	-	-	-	+	-	+	+
B-LBL	+	+	-	-	+	+	-	-	+/-
Splenic Marginal Zone Lymphoma	+	+	-	-	+	-/+	-	-	+/-

## Small and Medium/Large B-Cell Neoplasms

	Annexin A1	BCL6	CD5	CD10	CD23	CD103	Cyclin D1	IgD	LEF1	T-bet	ZAP-70
Small Cell											
SLL/CLL	-	-	+	-	+	-	-	+	+	+/-	+/-
Follicular Lymphoma (Grades 1/2)	-	+	-	+	-	-	-	-	-	-	-
Mantle Cell Lymphoma	-	-	+	-	-	-	+	+	-	-	-
Hairy Cell Leukemia	+	-	-	-	-	+	+	(weak)	-	+	-
MALT Lymphoma		-	-	-	-		-	-	-	+	
Marginal Zone Lymphoma, Nodal	-	-	-	-	-	-	-	-/+	-	+	-
Marginal Zone Lymphoma, Splenic	-	-	-	-	-	-	-	+	-	+	
Lymphoplasmacytic Lymphoma	-	-	-	-	-	-	-	-	-		-
Medium/Large Cell											
Burkitt Lymphoma	-	+	-	+	-		-	-	-	-	-
Follicular Lymphoma (Grade 3)	-	+	-	+	-	-	-	-	-/+	-	-
Diffuse Large B-cell Lymphoma	-	+/-	-/+	-/+	-	-	-	-	-/+	-	-

## Splenic Hematopoietic Proliferations in Neoplastic and Benign Disorders

	CD34	CD68	CD117	Hemoglobin A	MPO
Chronic Myelogenous Leukemia	-/+	+	+/-	-	+
Chronic Idiopathic Myelofibrosis	+/-		-/+	-	+
Myelodysplastic Syndrome	+		-/+	-	+/-
Myeloproliferative Disorders	-	+	-	-	+
Mastocytosis	-		+	-	+
Erythroid Disorders	-	-/+	-	+	+/-
Splenic Lymphoma	-		-	-	-/+
Acute Myeloid Leukemia	+	+	+	-	+
Polycythemia Vera	+		+	+	

## T-cell Lymphomas

	CD2	CD3	CD4	CD5	CD7	CD8	CD25	CD45	CD45RO	CD56	Granzyme B	PD-1	Perforin
Angioimmunoblastic	+	+	+	+	+	-	+	+	+		-	+	
Lymphoblastic	+/-	+	+/-	+	+	+/-	+	+	+		+/-	-	
Subcutaneous Panniculitis-Like	+	+	-	+	+	+/-	-	+	+	-	+	-	+
NK/T-cell Lymphoma	+	+	-	-	-/+	-	-	+	-/+	+	+	-	+
Cutaneous	+	+	+	-	+	-	-	+	-		+	-/+	+
Peripheral, NOS	+	+	+/-	+/-	+/-	-/+	+	+	+	-		-	
Mycosis Fungoides	+	+	+	+	-	-	+	+	+	-	+/-	-	-

## Brain: CNS Tumors

	ALDH1A1	CK	EMA	GFAP	INI-1	NGFR	Neurofilament	Olig2	PR	S-100	S100β	STAT6	Synaptophysin	Vimentin
Astrocytoma	+	-*	-	+	+	+	-	+/-	-	+	+	-	-	+
Glioblastoma	+	-*	-	+/-	+	-	-	+	-	+	+	-	-	+
Oligodendroglioma		-	-	-	+	-	-	+	-	+	+	-	-	+
Ependymoma		-*	-	+	+	+	-	-	-	+		-	-	-/+
Choroid Plexus Carcinoma		+	-	-/+	+	-	-		-	+			+	+/-
Central Neurocytoma		-	-	-	+	+	-		-	-			+	-
Neuroblastoma		-	-	+/-	+	+	+		-	+/-			+	+
Pineocytoma		-	-	-	+	-	-		-	-			+	
Meningioma	-	-	+	-	+	-	-	+/-	+	-/+		-	-	+
Schwannoma		-	-	+	+	+	-		-	+	+	-	-	+
Rhabdoid Tumors			+	+	-	-		+/-		+/-			+/-	+
Solitary Fibrous Tumors	+	-	-	-		+			-	-		+		+
Metastatic Carcinoma	-/+	+	+	-	+	-	-		-/+	-		-	-	-

\* Frequently reactive with AE1/AE3, but mostly (80% - 95%) negative for other cytokeratin antibodies including CAM 5.2.

## Meningeal Solitary Fibrous Tumor (SFT)

	ALDH1A1	CD34	Claudin 1	EMA	FLI-1	GFAP	NGFR	PR	S-100	SOX-10	STAT6
SFT	+	+	-	-	+	-	+	-	-		+
Meningioma	-	-	+	+/-		-	-	+	-/+	-	-
Schwannoma	-	-	-	-/+	-	+/-	+	-	+	+	-

## Retroperitoneal Neoplasms

	CD99	Chromogranin A	GFAP	MBP	Neurofilament	NSE	PGP 9.5	S-100	Synaptophysin
Neuroblastoma	-	+		+/-	-	+	+	-	+
Ganglioneuroblastoma	-	+		+	-/+	+	+	+	+
Ganglioneuroma	-	+		+	+	+	+	+	+

## Histiocytic Proliferation

	CD1a	CD68	CD163	Factor XIIIa	HAM-56	Lysozyme	S-100	Vimentin
Juvenile Xanthogranuloma	-	+	+	+	+	+	-	+
Langerhans Cell Histiocytosis	+	+	+	-	+	+	+	+
Dermatofibroma	-	+	-	+	-	-	-	+

## Retroperitoneal Lesions

	CD99	Chromogranin A	GFAP	Neurofilament	NSE	PGP 9.5	S-100	Synaptophysin
Neuroblastoma	-	+	-/+	+	+	+	-	+
Ganglioneuroblastoma	-	+	+	+	+	+	+	+
Ganglioneuroma	-	+	+	+	+	+	+	+
Leiomyosarcoma	-	-	-	-	-/+	-/+	-	-
Rhabdomyosarcoma	-	-	-	-	-	+	-	-
Synovial Sarcoma	+/-	-	-	-	-	-	-/+	-

## Epithelioid Mesothelioma vs. Carcinoma

	Calretinin	CAV-1	CEA	CK 5 & 6	Ep-CAM	Napsin A	Thrombomodulin	TTF-1	WT1
Epithelioid Mesothelioma	+	+	-	-	-	-	+	-	+
Lung Squamous Cell Carcinoma	-	+/-	-	+	+	+/-	-	-	-
Lung Adenocarcinoma	-	-	+	+	+	+	-	+	-
Breast Invasive Ductal Carcinoma	-	-	-	+	-/+	+	-	-	-
Renal Cell Carcinoma	-	-	+	-	-	-/+	-	-	-
Ovarian Serous Carcinoma	-	-	-	+	+/-	+	-	-	+
Hepatocellular Carcinoma	-	-	-	+	-	-/+	-	-	-

## Lung Adenocarcinoma vs. Mesothelioma

	Ber-EP4	BG8	Caldesmon	Calretinin	CEA	CK 5 & 6	D2-40	E-cadherin	HBME-1	TAG-72	TTF-1
Adenocarcinoma	+	+	-	-	+	-	-	+	-	+	+
Mesothelioma	-	-	+	+	-	+	+	-	+	-	-



## Lung Squamous Cell Carcinoma vs. Adenocarcinoma

	CK 5 & 6	Desmoglein 3	Napsin A	p63	SOX-2	TTF-1
Adenocarcinoma	-	-	+	-/+	-/+	+
Squamous Cell Carcinoma	+	+	-	+	+	-

## Pleura: Adenocarcinoma vs. Mesothelioma

	Caldesmon	Calretinin	CEA	CK 5	CK 5 & 6	D2-40	Ep-CAM	E-cadherin	HBME-1	Napsin A	TAG-72	TTF-1	TBM*	WT1
Adenocarcinoma	-	-	+	-	-	-	+	+	-	+	+	+	-	-
Mesothelioma	+	+	-	+	+	+	-	-	+	-	-	-	+	+

\* Thrombomodulin

## Thoracic Solitary Fibrous Tumor (SFT) vs. Potential Mimics

	Calretinin	CD34	CD117	CK Cocktail	Napsin A	NGFR	STAT6	TTF-1	WT1
Pleural SFT	-	+	-	-	-	+	+	-	-
Thymoma	-	-	+/-	+	-	-	-	-	-
Mesothelioma	+	-	-	+	-	-	-	-	+
Spindle Cell Carcinomas	-	-	-	+	-/+	-	-	+/-	-



## Histiocytic and Dendritic Cell Lesions

	CD1a	CD21	CD23	CD35	CD68	CD163	Langerin	Lysozyme	S-100
Langerhans Cell Histiocytosis	+	-	-	-	+	+	+	+/-	+
Rosai-Dorfman Disease	-	-	-	-	+	+	-	+	+
Follicular Dendritic Cell Sarcoma	-	+	+	+	+/-	+/-	-	-	-
Interdigitating Dendritic Cell Sarcoma	-	-	-	-	+/-	+	-	+	+
Histiocytic Sarcoma	-	-	-	-	+	+	-	+	+/-
Juvenile Disseminated Xanthogranuloma	-	-	-	-	+	+	-	+	+/-

## Kidney, Urothelial, and Soft Tissue Neoplasms

	Cathepsin K	CD34	CD117	GATA3	RCC	TFE3
XP11 Translocation RCC	+	-	-/+	-	+	+
Alveolar Soft Part Sarcoma	+	-	-	-	-	-
Rhabdomyosarcoma	+	-	-	-	-	-
Leiomyosarcoma	+	-	-	-	-	-
GIST	+	+	+	-	-	-
Melanoma	+	-	-/+	-	-	-
Renal Cell Carcinoma	-	-	+/-	-	+	-
Oncocytoma	-	-	+/-	-	-	-
Urothelial Carcinoma	-	-	-	+	-	-

## Muscle Malignant Tumors

	Actin MS	Actin SM	Caldesmon	Calponin	Myogenin	Myoglobin	PGP 9.5	Vimentin
Leiomyosarcoma	+	+	+	+	-	-	-	+
Rhabdomyosarcoma	-/+	-/+	-	-	+	+	+	+

## Neuroblastoma vs. Other Small Round Cell Tumors

	CD45	CD99	CK Cocktail	Desmin	Myogenin	Neurofilament	PHOX2B	S-100	Synaptophysin	WT1
Neuroblastoma	-	-	-	-	-	+	+	-	+	-
Differentiated Neuroblastoma/ Ganglioneuroblastoma	-	-	-	-	-	+	+	-	+	-
Small Cell Carcinoma	-	-	+	-	-	-	-	-	+	-
Wilms Tumor	-	-	+/-	+	+/-	-	-	-	-	+
Rhabdomyosarcoma	-	-	-	+	+	-	-	-	-	-
Desmoplastic Small Round Cell Tumor	-	+/-	+	+	-	-	-	-	-	+
Mesenchymal Chondrosarcoma	-	+	-	-/+	-	-	-	+/-	-	-
Poorly Differentiated Synovial Sarcoma	-	+	+	-	-	-	-	-	-	-
Ewing Sarcoma	-	+	-/+	-	-	-	-	-	-	-
Small Cell Melanoma	-	-/+	-	-	-	-	-	+	-	-
Lymphoma/Leukemia	+/-	-(LB+)	-	-	-	-	-	-	-	-

## Small Blue Round Cell Tumors

	Actin MS	Actin SM	Caldesmon	Calponin	CD45	CD57	CD99	CK Cocktail	FLI-1	INI-1	Myogenin	Myoglobin	PGP 9.5	Vimentin	WT1
Lymphoblastic Lymphoma	-	-	-		+	-	+	-	+	+	-	-		+	-
Leiomyosarcoma	+	+	+	+	-	+/-	-	-/+	-		-	-	-	+	-
Rhabdomyosarcoma	+	-	-	-	-	-	-	-	-	+	+	+	+	+	-
Neuroblastoma	-	-	-		-	+	-	-	-	+	-	-	+	+	-
Embryonal Carcinoma	-	-			-	+	-	+	-	+	-	-	+	-	-
PNET/ES	-	-		+	-	+	+	-/+	+	+	-	-	+	+	-
DSRCT	-	-			-	+/-	-	+	+	+	-	-	-	+	+
Medulloblastoma	-	-			-	+	-	-	-	+	-			-	

## Soft Tissue Neoplasms

	Actin MS	Actin SM	Calretinin	CD34	CD56	CK Cocktail	Desmin	HMB-45	S-100	TFE3
Alveolar Soft Part Sarcoma	+	+	-	-	-	-	-	-	-	+
Clear Cell Sarcoma	-	-	-	-	-	-	-	+	+	-
Leiomyosarcoma	+	+	-	-/+	+	-/+	+	-	-	-
PEComa	-	+	+	-	+	-	-	+	+	-

## Soft Tissue Tumors: Actin MS - INI-1

	Actin MS	Actin SM	ALK	Caldesmon	Calponin	Calretinin	CD34	CD99	CK Cocktail	Desmin	DOG1	EMA	FLI-1	INI-1
Alveolar Soft Part Sarcoma	+	+	-			-	-	-	-	-		-		
Clear Cell Sarcoma	-	-	-			-	-	-	-	-				+
Desmoplastic Small Round Cell	-	-	-			-	-	-	+	+		+		+
Epithelioid Sarcoma	-/+	-	-			-	+	-	+	-		+		-
Leiomyosarcoma	+	+		+	+		-/+		-/+	+	-	-/+	-	
Mesenchymal Chondrosarcoma	-	-				+	-/+	+	-					
Myxoid Chondrosarcoma	-					+	-/+		-			-		-
PEComa	-	+				+	-	-	-					
PNET/ES	-	-				-	-	+	-/+				+	+
Rhabdomyosarcoma	-/+	-/+		-	-		-		-	+	-	-	-	+
Synovial Sarcoma	-	-		-	+/-	+/-	-	+	+	-	-	+	-	-
Fibrous Histiocytoma	-	+						-	-	-				
Inflammatory Myofibroblastic Tumor	+	+	+				-	-	-					
GIST		-		+/-	+/-					+/-	+			
Schwannoma		-		-	-					-	-			
Malignant Peripheral Nerve Sheath Tumor		-		-	-					-	-			

## Soft Tissue Tumors: MyoD1 - Transgelin

	MyoD1	Myogenin	S-100	TFE3	TLE1	Transgelin
Alveolar Soft Part Sarcoma	-	-	-	+	-	
Clear Cell Sarcoma	-	-	+	-	-	
Desmoplastic Small Round Cell	-	-	-	-	-	
Epithelioid Sarcoma	-	-		-	-	
Leiomyosarcoma	-	-	-	-	-	+
Mesenchymal Chondrosarcoma	-		+/-	-	-	
Myxoid Chondrosarcoma	-			-	-	
PEComa	-		-	-	-	
PNET/ES	-	-	+	-	-	
Rhabdomyosarcoma	+	+	-	-	-	-
Synovial Sarcoma	-	-	-/+	-	+	-
Fibrous Histiocytoma	-		-	-	-+	
Inflammatory Myofibroblastic Tumor	-		-	-	-	
GIST	-	-	-		-	-
Schwannoma	-	-	+		-	-
Malignant Peripheral Nerve Sheath Tumor	-	-	+	(focal)	-/+	+

## Solitary Fibrous Tumor vs. Other Soft Tissue Tumors

	Actin SM	CD34	CD117	CK Cocktail	Desmin	DOG1	MUC4	NGFR	S-100	STAT6
Solitary Fibrous Tumor	-	+	-	-	-	-	-	+	-	+
GIST	-	+	+	-	-	+	-	-	-	-
Dermatofibrosarcoma Protuberans	-	+	-	-	-	-	-	-	-	-
Leiomyosarcoma	+	-/+	-	-	+	-	-	-	-	-
Malignant Peripheral Nerve Sheath Tumor	-	-	-	-	-	-	-	+	+/-	-
Myoepithelial Tumors	-/+	-		+	-		-		+	-
Leiomyoma	+	-	-	-	+	-	-	-	-	-
Atypical Fibroxanthoma	+	-	-	-	-	-	-	-	-	-
Low-Grade Fibromyxoid Sarcoma	-/+	-	-	-	-	-	+	-	-	-
Synovial Sarcoma	-	-	-	+	-	-	-	-	-	-
Fibrosarcoma	-	-	-	-	-	-	-	-	-	-

## Solitary Fibrous Tumor vs. Skin and Vascular Neoplasms

	ALDH1	CD31	CD34	CK 8 & 18	D2-40	ERG	Factor VIII	FLI-1	HHV-8	NGFR	STAT6
Solitary Fibrous Tumor	+	-	+	-	-		-	+	-	+	+
Dermatofibrosarcoma Protuberans	-	-	+	-			-	-	-	+	-
Melanoma	-	-	-	-	+	-	-	-	-	+	-
Hemangioma	-	+	+	-	-	+	+	+	-	-	-
Kaposi Sarcoma	-	+/-	+	-	+	+	+	+	+	-	-
Kaposiform Hemangioendothelioma	-	+	+	-/+	-	+	-	+	-	-	-
Epithelioid Hemangioendothelioma	-	+	+	-/+	+	+	+	+	-	-	-
Angiosarcoma	-	+	+	-	+/-	+	+	+	-	-	-

## Vascular Tumors

	CD34	D2-40	ERG	Factor VIII	FLI-1	HHV-8
Hemangioma	+	-	+	+	+	-
Kaposi Sarcoma	+	+	+	+	+	+
Hemangioendothelioma	+	-	+	-	+	-
Angiosarcoma	+	+/-	+	+	+	-
Colorectal Adenocarcinoma	-	-	-	-	-/+	-
Invasive Ductal Carcinoma	-	-	-	-	-/+	-

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