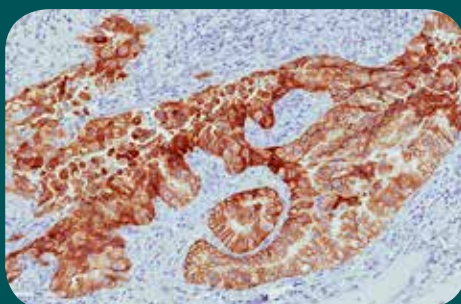




# immunohistochemistry stain offerings

TRUSTED PATHOLOGISTS.  
INVALUABLE ANSWERS.™



## ARUP LABORATORIES

As a nonprofit, academic institution of the University of Utah and its Department of Pathology, ARUP believes in collaborating, sharing knowledge, and contributing to laboratory science in ways that benefit our clients and their patients.

Our test menu is one of the broadest in the industry, encompassing more than 3,000 tests, including highly specialized and esoteric assays. We offer comprehensive testing in the areas of genetics, molecular oncology, pediatrics, and pain management, among others.

ARUP's clients include many of the nation's university teaching hospitals and children's hospitals, as well as multihospital groups, major commercial laboratories, and group purchasing organizations. We do not compete with our clients for physician office business, choosing instead to support clients' existing test menus by offering highly complex assays and accompanying consultative support so clients can provide exceptional patient care in their local communities.

Offering analytics, consulting, and decision support services, ARUP provides clients with the utilization management tools necessary to prosper in this time of value-based care. Our UM+ program helps clients control utilization, reduce costs, and improve patient care. In addition, ARUP is a worldwide leader in innovative laboratory research and development, led by the efforts of the ARUP Institute for Clinical and Experimental Pathology®.

ARUP's reputation for quality is supported by our ability to meet or exceed the requirements of multiple regulatory and accrediting agencies and organizations. ARUP participates in the CAP laboratory accreditation program and has CLIA certification through the Centers of Medicare and Medicaid Services. In December 2016, ARUP earned accreditation to the ISO 15189:2012 standard under CAP.

We believe in collaborating, sharing knowledge, and contributing to laboratory science in ways that provide the best value for the patient. Together, ARUP and its clients will improve patient care today and in the future.

**patients. answers. results.®**

A laboratory test is more than a number; it is a person,  
an answer, a diagnosis.®

ISO 15189  
**CAP**  
ACCREDITED ✓  
COLLEGE of AMERICAN PATHOLOGISTS

## IMMUNOHISTOCHEMISTRY STAIN OFFERINGS

Immunohistochemistry is a valuable tool in morphologic diagnosis and is considered required testing for standard of care. ARUP Laboratories offers a wide range of immunohistochemical stains on paraffin sections from formalin-fixed tissue or cell blocks. In addition to routine antibodies used for diagnostic differentiation, ARUP offers a broad range of esoteric antibodies not usually available to the community pathologist. Currently, more than 175 antibodies are available, with new markers constantly being evaluated. ARUP's antibody menu includes markers that help determine tumor-cell lineage, as well as prognostic and therapeutic markers.

The ARUP Immunohistochemistry Laboratory is directed by board-certified pathologists who are also faculty members of the Department of Pathology at the University of Utah School of Medicine. ARUP's pathologists are available for consultation and assistance with selecting the appropriate markers for analysis.

Additional information about immunohistochemistry and ARUP's antibody menu may be obtained by calling (800) 522-2787 and asking for the Immunohistochemistry Laboratory or by visiting [www.aruplab.com/ap-ihc](http://www.aruplab.com/ap-ihc).

## TECHNICAL PERSONNEL

**Medical Director:** Rodney R. Miles, MD, PhD

**Division Manager:** Margaret Coppin, HT(ASCP)

**Group Manager:** Amy Sandoval, MT (ASCP)

## SPECIMEN COLLECTION

**Methodology:** Immunohistochemistry

**Performed:** Monday–Friday

**Reported:** 1–3 days

### SPECIMEN REQUIRED

**Collect:** Tissue or cells

#### Specimen Preparation

- Formalin fix (10 percent neutral buffered formalin is preferred) and paraffin embed specimen (cells must be prepared into a cell block).
- Protect paraffin block and/or slides from excessive heat. Transport tissue block or five unstained (3–5 micron thick sections), positively charged slides in a tissue transport kit (ARUP supply #47808). Kit is available online through eSupply using ARUP Connect™ or by contacting ARUP Client Services at (800) 522-2787.
- Two slides minimum are required; if sending precut slides, do not oven bake.

**Storage/Transport Temperature:** Room temperature or refrigerated; ship in cooled container during summer months.

#### Unacceptable Conditions

- Specimens submitted with non-representative tissue type. Depleted specimens.
- Specimens fixed in any fixative other than 10 percent neutral buffered formalin.

#### Stability (collection to initial testing)

- Ambient: indefinite
- Refrigerated: indefinite
- Frozen: unacceptable

**Note:** The following list is available for stain-and-return service only. Slides will be returned to the client pathologist for interpretation. If interpretation is needed, please order the appropriate consultation. Stand-alone stain and interpretations are not available unless otherwise indicated.

## QUICK REFERENCE FOR STAIN AND RETURN ONLY

### Breast/Endometrium/Ovary/

#### Testes

- Estrogen
- Inhibin
- PAX8
- Progesterone

#### Differentiation Markers

- B72.3 (breast)
- Breast 2 (GCDFFP-15)
- DOG1
- Estrogen (breast, ovary, and endometrium)
- HSA (liver)
- Inhibin
- MDM2
- P40
- P504S (prostate)
- P63
- PAP (prostate)
- PAX2
- PAX8
- PD-L1
- PIN4 (prostate)
- PSA (prostate)
- RCC
- TFE3

#### Epithelial Markers

- AE1/AE3
- Ber-EP4
- Beta-Catenin
- Calretinin
- CAM 5.2 LMW
- CDX2
- CEA (monoclonal)
- CEA (polyclonal)
- CK 5/6
- CK 7
- CK 19
- CK 20
- E-cadherin
- EMA
- ERA (MOC-31)
- Keratin 903 (HMW)
- PIN4 (prostate)
- TTF-1
- WT-1 (N-terminus)

#### Germ-Cell Tumors/Placenta Markers

- Human chorionic gonadotropin (hCG)
- Human placental lactogen (HPL)
- Placental alkaline phosphatase (PLAP)
- Oct-3/4
- SALL4

### Hematopoietic Markers

- ALK-1
- BCL-2
- BCL-6
- Beta F1
- BOB-1
- CD1a
- CD2 (AB75)
- CD3
- CD4 (1F6)
- CD5
- CD7
- CD8
- CD10 (calla)
- CD14
- CD15 (Leu M1)
- CD19
- CD20 (L26, Leu16)
- CD21
- CD23
- CD25
- CD30 (Ki-1)
- CD31
- CD33
- CD34 (QBEND10)
- CD35
- CD42b
- CD43 (L60, Leu 22)
- CD45 (LCA)
- CD52 (CAMPATH-1)
- CD56 (NCAM)
- CD57 (Leu 7)
- CD61 (GPIIIa)
- CD68 (KP1)
- CD79a
- CD117 (c-kit)
- CD123
- CD138 (plasma)
- CD163
- Cyclin D1 (SP4)
- DBA.44
- Factor XIIIa (factor XIII)
- Glycophorin A
- Granzyme B
- IgA
- IgD
- IgG
- IgG4
- IgM
- IRF4/MUM1
- Kappa
- Ki-67 (MIB-1)
- Lambda
- Mast-cell tryptase
- Myeloperoxidase (MPO)
- Oct-2

- p21
- PAX-5
- PD1
- TdT
- TIA-1
- TRAP

#### Histiocytic

- CD1a
- CD68 (KP1)
- Lysozyme (muramidase)

#### Liver

- Alpha-1-antichymotrypsin (a-1-ACT)
- Alpha-1-antitrypsin (a-1-AT)
- Alpha fetoprotein (AFP)
- Arginase 1
- Glypican 3
- HSA (liver)

#### Melanocytic Markers

- HMB-45
- Melan A (MART1)
- MITF
- S-100

#### Mesenchymal Markers

- Vimentin

#### Microbial Markers

- *Helicobacter pylori*
- *Toxoplasmosis*

#### Mucinous Markers

- Muc-1 glycoprotein
- Muc-4 glycoprotein

#### Muscle Marker

- Caldesmon (h-CD)
- Desmin
- Muscle specific actin (MSA)
- Myoglobin
- Myosin
- MYF-4
- Smooth muscle actin (SMA)

#### Nervous System Markers

- ATRX
- CD56 (NCAM)
- GFAP
- IDH1
- NeuN
- Neurofilament (68kD)
- PGP 9.5
- PHF-Tau
- S-100
- aSynuclein
- Ubiquitin

### Neuroendocrine Markers

- CD56 (NCAM)
- CD57 (Leu 7)
- Chromogranin A
- NSE
- PGP 9.5
- Synaptophysin

### Oncogene/Tumor Suppressor Markers

- p16
- p53

### Pancreas

- Gastrin

### Peripheral Neuroectodermal Markers

- CD99 (O13) (Ewing sarcoma)

### Pituitary Markers

- ACTH
- Human growth hormone (HGH)
- Prolactin

### Prognostic Markers

- BAF47/Ini-1
- *ERBB2* (HercepTest)
- HercepTest (Refer to *ERBB2*)
- Ki-67 (MIB-1)
- Mismatch repair by IHC (HNPCC) (includes *MLH1*, *MSH2*, *MSH6*, and *PMS2*)—not available as stain and return
- p16
- p53
- WT-1

### Thyroid/Parathyroid Markers

- Calcitonin
- Parathyroid hormone (PTH)
- Thyroglobulin
- TTF-1

### Vascular Markers

- C4d
- Calponin
- CD31
- CD34 (QBEND10)
- Collagen IV
- D2-40
- Glut-1
- Procollagen I

### Viral Markers

- Adenovirus
- CM
- HHV8
- HSV I/HSV II
- SV40 (BK virus)

## THE FOLLOWING STAINS ARE AVAILABLE WITH INTERPRETATION

stain	test #	description
ALK (D5F3)	2007324	<ul style="list-style-type: none"> <li>The D5F3 monoclonal ALK antibody provides increased sensitivity, which can more accurately identify ALK-rearranged lung adenocarcinoma with high reproducibility, sensitivity, and specificity.</li> <li>Facilitates the routine identification of ALK-rearranged lung adenocarcinomas in clinical practice and detects lung cancers that may be responsive to ALK inhibitors</li> </ul>
ALK (D5F3) with reflex to FISH if equivocal or positive	2011431	See ALK (D5F3)
ER/PR panel	0049210	<ul style="list-style-type: none"> <li>Prognostic for breast cancer</li> <li>Predictive for response of breast cancers and endometrial cancers to hormonal therapy</li> <li>Differentiates endocervical from endometrial adenocarcinomas</li> </ul>
ERBB2 (HercepTest)	0049174	<ul style="list-style-type: none"> <li>Aids in identifying breast cancer patients eligible for Herceptin therapy</li> </ul>
ERBB2 (HercepTest) with reflex to FISH if 2+	0049178	See ERBB2.
HNPCC	0049302	See Mismatch Repair (MSI).
IDH1 (R132H) point mutation	2007357	<ul style="list-style-type: none"> <li>Distinguishes primary from secondary glioblastoma multiform (GBM)</li> <li><i>IDH1</i> mutations occur in approximately 70 percent of astrocytomas and oligodendroglial tumors</li> <li>Allows the highly sensitive and specific discrimination of various tumors, such as astrocytoma from primary glioblastomas or diffuse astrocytoma grade II from pilocytic astrocytoma or ependymoma</li> </ul>
Ki-67 (MIB-1)	2007182	<ul style="list-style-type: none"> <li>Proliferation index indicator</li> <li>Determines growth fraction</li> <li>Aids in differentiating melanoma from nevus cells for sentinel node biopsy</li> <li>Distinguishes benign and malignant adrenocortical tumors</li> </ul>
Lynch syndrome	0049302	See Mismatch Repair (MSI).
Mismatch repair (Lynch syndrome; HNPCC)	0049302	<ul style="list-style-type: none"> <li>Microsatellite Instability (MSI)</li> <li>MLH1, MSH2, MSH6, and PMS2</li> <li>Mismatch repair proteins (MMR)</li> <li>Used in the work up of Lynch syndrome (hereditary non-polyposis colorectal cancer or HNPCC)</li> </ul>
Mismatch repair with reflex to BRAF Codon 600 mutation	2002327	<ul style="list-style-type: none"> <li>Distinguishes sporadic from Lynch (HNPCC)-associated colorectal cancers with abnormal MLH1 immunostaining</li> </ul>
Mismatch repair with reflex to MLH1 promoter methylation	2005270	<ul style="list-style-type: none"> <li>Distinguishes sporadic from Lynch (HNPCC)-associated non-colorectal cancers with abnormal MLH1 immunostaining</li> </ul>
p53	0049250	<ul style="list-style-type: none"> <li>Tumor suppressor protein; prognostic indicator</li> </ul>
PD-L1 22C3 (NSCLC)	2013284	<ul style="list-style-type: none"> <li>FDA-approved test which aids in prediction of response to KEYTRUDA (pembrolizumab) for patients with non-small cell lung cancer (NSCLC)</li> </ul>
PD-L1 22C3 IHC for Gastric/GEJ with Interpretation, pembrolizumab (KEYTRUDA)	3000197	<ul style="list-style-type: none"> <li>Aid in prediction of response to pembrolizumab (KEYTRUDA) as second-line therapy for patients with gastric or gastroesophageal adenocarcinoma.</li> </ul>
PD-L1 28-8	2013684	<ul style="list-style-type: none"> <li>FDA-approved test which aids in the prediction of response to nivolumab (OPDIVO) for patients with non-squamous non-small cell lung cancer (NSCLC) or melanoma.</li> </ul>
ROS1 with reflex to FISH if equivocal or positive	2008414	<ul style="list-style-type: none"> <li>Detects ROS1 fusion proteins by immunohistochemistry (IHC) using ROS1 clone D4D6 on FFPE tumor tissue</li> <li>Reflexes to FISH for confirmation if IHC result is equivocal</li> </ul>
SDHB	2006948	<ul style="list-style-type: none"> <li>SDHB by immunohistochemistry is used as a screening tool in directing testing algorithms for SDH mutation. A negative result is highly suggestive of an SDH complex mutation but should be confirmed by molecular analysis.</li> </ul>

## THE FOLLOWING STAINS ARE AVAILABLE AS STAIN AND RETURN ONLY (NO INTERPRETATION)

antibody	test #	description
ACTH	2003427	• Adrenocorticotrophic hormone; subclassifies pituitary adenomas
Adenovirus	2003430	• Specific to all subtypes of adenovirus
AE1/AE3	2003433	• Cytokeratin antibody cocktail for acidic and basic cytokeratins
ALK-1	2003439	<ul style="list-style-type: none"> <li>• Anaplastic lymphoma kinase 1</li> <li>• Reacts with the NPM-ALK fusion protein expressed by t(2;5) positive anaplastic large-cell lymphomas as well as variant ALK translocations</li> <li>• Not for lung cancers; refer to ALK (D5F3) in the stains with interpretations section.</li> </ul>
Alpha synuclien	2003419	• aSynuclien (SNCA); demonstrates Lewy bodies in brain cells associated with Parkinson and Alzheimer disease
Alpha-1-antichymotrypsin	2003418	<ul style="list-style-type: none"> <li>• Alpha 1 ACT; aids in identifying hepatomas and some germ-cell neoplasms</li> <li>• Histiocyte marker for normal/neoplastic tissue</li> </ul>
Alpha-1-antitrypsin	2003424	<ul style="list-style-type: none"> <li>• Alpha 1 AT; expressed by cells of histolytic origin</li> <li>• Aids in identifying germ-cell and histolytic neoplasms, as well as embryonal and some lung carcinomas</li> </ul>
Alpha fetoprotein	2003436	<ul style="list-style-type: none"> <li>• Expressed by neoplastic liver and gonad tissue</li> <li>• Aids in identifying bladder carcinomas, yolk-sac tumors, some germ-cell tumors, and a high proportion of hepatocellular carcinoma</li> </ul>
Arginase-1	2011890	• Aides in the distinction of HCC from other hepatocellular and non-hepatocellular mass lesions, as well as in cases of metastatic carcinoma and other benign and malignant nonhepatocellular mimics
ATRX	2014499	<ul style="list-style-type: none"> <li>• Expression of ATRX is implicated in cancer pathogenesis and is useful in the diagnosis of astrocytic gliomas. Its specificity and prevalence in lower-grade gliomas with an IDH-mutation argue for thorough characterization of associated signaling networks to facilitate therapeutic development.</li> <li>• Mutation or loss of alpha-thalassemia/mental retardation syndrome X-linked (ATRX) expression has been described in anaplastic gliomas. ATRX loss is a hallmark of astrocytic tumors and defines a subgroup of astrocytic tumors with a favorable prognosis.</li> </ul>
B72.3	2003445	<ul style="list-style-type: none"> <li>• Tumor-associated glycoprotein (TAG.72); recognizes tumor-associated oncofetal antigen</li> <li>• Aids in identifying adenocarcinomas and breast carcinomas</li> </ul>
BAF47/INI1	2003448	<ul style="list-style-type: none"> <li>• Indicative of a tumor-suppressor role</li> <li>• Heterozygous tumors in the soft tissues of the head and neck</li> </ul>
BCL-2	2004513	<ul style="list-style-type: none"> <li>• B-cell lymphoma-2</li> <li>• Proto-oncogene</li> <li>• Overexpression increases life span in B cells</li> <li>• Aids in identifying colorectal adenomas and carcinomas</li> <li>• Distinguishes follicular lymphoma from reactive follicles</li> </ul>
BCL-6	2003457	<ul style="list-style-type: none"> <li>• Transcription factor important in germinal center formation</li> <li>• Expressed in germinal center origin lymphomas, including some large-cell lymphomas, Burkitt lymphoma, and Hodgkin lymphoma (nodular, lymphocyte predominant)</li> </ul>
Ber-EP4	2003463	<ul style="list-style-type: none"> <li>• Epithelial cell-membrane glycoprotein</li> <li>• Differentiates mesothelial from epithelial cells</li> <li>• Aids in identifying mammary Paget disease, lung adenocarcinomas, trichoepitheliomas, dermatofibromas, basal-cell carcinomas, and other carcinomas</li> </ul>
Beta-Catenin	2003454	<ul style="list-style-type: none"> <li>• Binds to cytoplasmic region of e-cadherin molecule</li> <li>• Plays a role in cell adhesion, signal transmission, and actin cytoskeleton anchoring</li> <li>• Aids in identifying skin, liver, ovary, brain, prostate, and some breast cancers, as well as endometrial, ovarian, and colon carcinomas</li> </ul>
Beta F-1	2003466	<ul style="list-style-type: none"> <li>• Beta framework 1; BF-1; recognizes T-cell receptor (TCR) beta subunit</li> <li>• Aids in characterizing alpha-beta T-cell receptors from T-cell clones or polyclonal populations of T cells</li> <li>• Aids in diagnosing T-cell lineage neoplasms</li> </ul>
BK Virus	2004137	See SV-40.
BOB-1	2003442	<ul style="list-style-type: none"> <li>• B-cell oct-binding protein 1; OBF-1; expressed in spleen and peripheral blood leukocytes, B cells, and germinal centers</li> <li>• Aids in differentiating Hodgkin lymphomas (typically weak to negative) and B-cell lymphomas</li> </ul>
Breast 2 (GCDFP-15)	2003472	<ul style="list-style-type: none"> <li>• Gross cystic disease fluid protein-15; produced by cells with apocrine function</li> <li>• Differentiation marker for mammary carcinomas</li> <li>• Extramammary Paget disease</li> </ul>



antibody	test #	description
<b>C4D</b>	2003475	<ul style="list-style-type: none"> <li>Deposits in peritubular capillary might distinguish between acute humoral rejection (AHR) and acute cellular rejection (ACR)</li> <li>AHR: deposits prominently and diffusely in the peritubular capillaries; intense staining seen in a widespread, uniform distribution</li> </ul>
<b>Calcitonin</b>	2003481	<ul style="list-style-type: none"> <li>Thyroid parafollicular cells (C cells)</li> <li>Thyroid medullary carcinomas</li> </ul>
<b>Caldesmon (h-CD)</b>	2003484	<ul style="list-style-type: none"> <li>High molecular weight isoform is H-caldesmon</li> <li>Calcium-, calmodulin-, tropomyosin-, and actin-binding protein</li> <li>Regulates smooth muscle contraction</li> <li>Aids in identifying angioleiomyomas, glomus tumors, GIST, some endometrial stromal tumors, and uterine smooth muscle tumors (benign or malignant)</li> <li>Differentiates uterine smooth muscle (usually positive) and endometrial stromal differentiation (usually negative)</li> </ul>
<b>Calponin</b>	2003487	<ul style="list-style-type: none"> <li>Can be used to characterize the differentiation process of mammary myoepithelial cells in the developing mammary gland, investigate the nature of myoepithelial cells, and study the development of human smooth muscle cells</li> <li>High expression might be used as an additional marker of vascular smooth muscle cells, myoepithelial cells in normal and benign human mammary gland, and certain stromal myofibroblasts</li> </ul>
<b>Calretinin</b>	2003490	<ul style="list-style-type: none"> <li>Calcium-binding protein</li> <li>Mesothelial cells: 89 percent sensitive and 90 percent specific for differentiating mesotheliomas from lung adenocarcinomas</li> <li>Aids in identifying mesothelial hyperplasia and epithelioid mesotheliomas</li> </ul>
<b>CAM 5.2 LMW (CK 8/18)</b>	2003493	<ul style="list-style-type: none"> <li>Cytokeratin 8/18, low molecular weight cytokeratin</li> <li>Hepatocellular and renal-cell carcinomas</li> <li>Aids in identifying neuroendocrine carcinoma, melanomas (3 percent), nuclear inclusions of rhabdoid tumors (composed of tangled intermediate filaments made up of CK8 and vimentin), and mutations associated with idiopathic cirrhosis and chronic hepatitis</li> </ul>
<b>CD1a (histiocytosis)</b>	2003502	<ul style="list-style-type: none"> <li>Non-polymorphic MHC class I-related cell-surface glycoprotein</li> <li>Expressed by interdigitating reticulum cells, cortical thymocytes, thymomas, langerhans cells, and Langerhans histiocytosis cells (histiocytosis X)</li> <li>Aids in identifying some T-cell lymphomas and leukemias</li> </ul>
<b>CD2</b>	2003505	<ul style="list-style-type: none"> <li>Mediates adhesion of activated T cells and thymocytes with antigen-presenting and target cells</li> <li>Expressed by T lymphocytes and cortical thymocytes</li> <li>Aids in identifying natural killer cells and most malignant cells of T-cell origin</li> </ul>
<b>CD3</b>	2003508	<ul style="list-style-type: none"> <li>Binds to the non-glycosylated epsilon chain of CD3 complex</li> <li>Present in T-lymphocytes, thymocytes, and early thymocytes</li> <li>Expressed on normal and neoplastic T cells</li> </ul>
<b>CD4</b>	2003511	<ul style="list-style-type: none"> <li>Present on a subset of helper/inducer T cells, thymocytes, and at a lower level on monocytes</li> <li>Aids in identifying cutaneous T-cell lymphoma, including mycosis fungoides and HTLV-1-associated adult T-cell leukemia and lymphoma</li> </ul>
<b>CD5</b>	2003514	<ul style="list-style-type: none"> <li>Expressed in T lymphocytes, thymocytes, and subset of B lymphocytes in lymph nodes</li> <li>Aids in identifying T-cell leukemias, most B-cell chronic lymphocytic leukemias (B-CLL), and mantle-cell lymphomas/T- and B-cell lymphomas</li> </ul>
<b>CD7</b>	2003517	<ul style="list-style-type: none"> <li>Earliest T-cell-specific antigen to be expressed in lymphocytes</li> <li>Present in thymocytes, most peripheral T lymphocyte, and most natural killer cells</li> <li>Aids in identifying T-cell lymphomas and leukemias of T-cell origin</li> </ul>
<b>CD8</b>	2003520	<ul style="list-style-type: none"> <li>Expressed on a cytotoxic/suppressor subset of T-lymphocyte natural killer cells, thymocytes, and on a subpopulation of null cells</li> <li>Aids in identifying T-cell lymphomas/leukemias</li> </ul>
<b>CD10 (CALLA)</b>	2003523	<ul style="list-style-type: none"> <li>Common acute lymphoblastic leukemia antigen (CALLA)</li> <li>Aids in identifying lymphoblastic lymphoma, Burkitt lymphoma, follicular lymphoma, and CML</li> <li>Aids in differential diagnosis of small B-cell lymphomas and subtyping of lymphoblastic leukemias</li> </ul>
<b>CD14</b>	2003526	<ul style="list-style-type: none"> <li>Acts as a co-receptor for the detection of bacterial lipopolysaccharide (LPS)</li> <li>Expressed on cells of myelo-monocytic lineage, including monocytes, macrophages, and Langerhans cells</li> </ul>
<b>CD15 (Leu M1)</b>	2003529	<ul style="list-style-type: none"> <li>Hapten X; present in Reed-Sternberg cells, 90 percent of granulocytes, and 30–60 percent of monocytes</li> <li>Absent from lymphocytes</li> <li>Expressed by some non-Hodgkin lymphomas, mycosis fungoides, and some leukemias</li> </ul>

antibody	test #	description
CD19	2005114	<ul style="list-style-type: none"> <li>CD19 is to be used in a panel of antibodies to aid in the characterization of B-cell malignancies. The pattern or reactivity is membranous</li> <li>In normal tissues, the CD19 (clone BT51E) detects protein expressed on the membrane of cells of the B-cell lineage; staining is seen in the mantle zones and germinal centers of tonsil and tissue infiltrating B-lymphocytes</li> <li>CD19 is detected in hematological malignancies: 95 percent of B-cell lymphomas, including small lymphocytic lymphoma, chronic lymphocytic lymphoma, mantle cell lymphoma, follicular lymphoma, Burkitt lymphoma, marginal zone lymphoma, diffuse large B-cell lymphoma, T-cell-rich B-cell lymphoma, and lymphoblastic lymphoma, and 75 percent of B-cell leukemias, including small lymphocytic leukemia, chronic lymphocytic leukemia, and hairy-cell leukemia</li> </ul>
CD20 (L26)	2003532	<ul style="list-style-type: none"> <li>Expressed on B-cell precursors and mature B cells, but lost following differentiation into plasma cells</li> <li>B lymphocytes but not T cells, plasma cells, or histiocytes</li> <li>Aids in identifying common acute lymphoblastic leukemia, pre-B acute lymphoblastic leukemia, CLL, pro-lymphocytic leukemia, hairy-cell leukemia, and B-cell lymphomas, including Burkitt, lymphoplasmacytic, follicular, and diffuse large B cell</li> <li>May show some membrane staining of Reed-Sternberg cells in Hodgkin lymphoma</li> </ul>
CD21	2003535	<ul style="list-style-type: none"> <li>C3D receptor, CR2 and EBV receptor; expressed by follicular dendritic cells, mature B cells, some types of epithelial cells, reactive hyperplasia, and plasma cells</li> <li>Low expression on T-cell ALL cells, subset of normal thymocytes and mature T cells, lymphocytes in the mantle zone, sinus-lining cells, and monocytoid B cells</li> <li>Aids in identifying B-cell CLL, follicular lymphoma, low-grade <i>MALT</i>-type B-cell lymphoma, primary salivary gland and gastric lymphoma, T-cell and histiocyte-rich B-cell lymphoma, angioimmunoblastic T-cell lymphoma, nodular lymphocyte-predominant Hodgkin lymphoma, follicular dendritic sarcoma, and some Reed-Sternberg cells not expressing other B- or T-cell-associated markers</li> </ul>
CD23	2003541	<ul style="list-style-type: none"> <li>Expressed by activated B lymphocytes, activated macrophages, and a portion of follicular dendritic cells</li> <li>Aids in differentiating small lymphocytic lymphoma (+) and mantle-cell lymphoma (-)</li> </ul>
CD25	2003544	<ul style="list-style-type: none"> <li>Interleukin-2 receptor; TAC</li> <li>Mediates helper, suppressor, and cytotoxic functions</li> <li>Expressed on T cells, HTLV-1-transformed T and B cells, EVB-transformed B cells, myeloid precursors, and oligodendrocytes</li> <li>Aids in the study of inflammatory and malignant conditions</li> </ul>
CD30 (Ki-1)	2003547	<ul style="list-style-type: none"> <li>Ki-1-positive lymphoma</li> <li>Ber-H2</li> <li>Expressed by activated B and T lymphocytes, and Reed-Sternberg cells</li> <li>Aids in identifying Hodgkin lymphoma, lymphomatoid papulosis, anaplastic large-cell lymphoma, and some peripheral pleomorphic T-cell lymphomas (both HTLV-1 positive and negative), including those of angioimmunoblastic and Lennert type, and embryonal carcinoma</li> </ul>
CD31	2003550	<ul style="list-style-type: none"> <li>Platelet-endothelial cell-adhesion molecule; expressed by endothelial cells</li> <li>Glycoprotein in platelets</li> <li>Aids in evaluating vascularization in normal and neoplastic tissue and demonstrating endothelial cell-derived tumors</li> </ul>
CD33	2003553	<ul style="list-style-type: none"> <li>Expressed on the membrane and in the cytoplasm in earliest myeloid progenitor cells</li> <li>Useful to type M4 and M5 AMLs</li> </ul>
CD34 (QBEND10)	2003556	<ul style="list-style-type: none"> <li>Human progenitor-cell antigen; present in immature hematopoietic cells and vascular endothelial cells</li> <li>Expressed by some acute myeloid leukemias, undifferentiated leukemias, and acute lymphoblastic leukemias</li> </ul>
CD35	2003559	<ul style="list-style-type: none"> <li>Mediates neutrophil and monocyte phagocytosis of particles coated with C3b and/or C4b</li> <li>Shows strong staining pattern on follicular dendritic cells</li> <li>Aids in characterization of histiocytic/dendritic-cell neoplasms and follicular dendritic-cell sarcomas</li> </ul>
CD42b	2003565	<ul style="list-style-type: none"> <li>Platelet glycoprotein Ib; expressed on platelets and megakaryocytes in bone marrow</li> <li>Aids in phenotyping megakaryoblastic leukemias</li> <li>Absence of CD42b on platelets may indicate Bernard-Soulier syndrome</li> </ul>
CD43 (L60, Leu 22)	2003568	<ul style="list-style-type: none"> <li>Expressed on T lymphocytes, B lymphocytes, and granulocytes</li> <li>Aids in identifying cells of lymphoid lineage, T-cell lymphomas, and mantle-cell lymphomas</li> </ul>
CD45 LCA	2003574	<ul style="list-style-type: none"> <li>Leukocyte common antigen; expressed on the majority of leukocytes</li> <li>Aids in differentiating lymphoid from non-lymphoid neoplasms</li> <li>Typically negative in Reed-Sternberg cells of Hodgkin lymphoma</li> </ul>
CD52 (CAMPATH-1)	2003586	<ul style="list-style-type: none"> <li>Expressed by lymphocytes, monocytes, eosinophils, thymocytes, and macrophages</li> <li>Expressed by most lymphoid-derived malignancies</li> <li>Variable expression on myeloma cells</li> </ul>
CD56	2003589	<ul style="list-style-type: none"> <li>Neural-cell adhesion molecule (NCAM); expressed on natural killer cells and most neuroectodermal tissues</li> <li>Retinoblastoma, medulloblastoma, astrocytoma, neuroblastoma, and rhabdomyosarcoma</li> <li>Expressed on some myeloid leukemias and malignant plasma cells</li> </ul>



antibody	test #	description
CD57	2003592	<ul style="list-style-type: none"> <li>Leu-7, HNK1; expressed by a subset of natural killer cells and some T lymphocytes</li> <li>Reacts with myelin-associated glycoprotein in neuroectodermal tissue</li> <li>Aids in identifying small-cell lung carcinoma, NK lymphocyte-mediated cytotoxicity, AIDS and AIDS-related complex (ARC), NK and T-cell subset tumors, and neural-tissue neoplasms</li> </ul>
CD61 (GP1IIa)	2003595	<ul style="list-style-type: none"> <li>Platelet glycoprotein IIIa; expressed on platelets and megakaryocytes</li> <li>Specific for cells showing megakaryoblastic differentiation</li> <li>Aids in identifying megakaryocytic/megakaryoblastic leukemias</li> </ul>
CD68 (KP1)	2003598	<ul style="list-style-type: none"> <li>KP1; expressed by macrophages, blood monocytes, mast cells, and the cell population known as "plasmacytoid T cells" in reactive lymph nodes</li> <li>Strong to moderate staining in acute myeloid leukemia (AML), chronic myeloid leukemia (CML), true histiocytic neoplasia, melanoma, and some B-cell neoplasms (usually small lymphocytic lymphoma [SLL])</li> <li>Weak staining in hairy-cell leukemia</li> </ul>
CD79a	2003800	<ul style="list-style-type: none"> <li>Expressed on all B cells from pre-B cells until plasma-cell stage</li> <li>Found as intracellular component in plasma cells</li> <li>Aids in identifying acute leukemia of precursor B-cell type (common ALL), B-cell lymphomas, and some myelomas</li> </ul>
CD99 (O13)	2004055	<ul style="list-style-type: none"> <li>MIC2 gene products</li> <li>Glycoprotein HBA 71 antigen</li> <li>Aids in identifying primitive peripheral neuroectodermal tumors, peripheral neuroepitheliomas, Ewing sarcoma, and lymphoblastic lymphoma</li> </ul>
CD117 (c-kit)	2003806	<ul style="list-style-type: none"> <li>Proto-oncogene</li> <li>Inhibitor of apoptotic cell death</li> <li>Aids in identifying small- and large-cell lung carcinomas, GIST, AML, CML (in blast crisis), breast carcinomas, glioblastomas, and melanomas</li> </ul>
CD123	2003809	<ul style="list-style-type: none"> <li>A marker of dendritic cell precursors: expressed by plasmacytoid monocytes, dendritic cells, and plasmacytoid dendritic cells</li> </ul>
CD138 (syndecan-1)	2003812	<ul style="list-style-type: none"> <li>Transmembrane heparin sulphate glycoprotein</li> <li>Expressed by normal lymphoid cells, IgG plasma cells, pre-B cells, and immature B cells</li> <li>Co-receptor for differentiation growth factors</li> <li>Differentiates squamous cell carcinomas, postgerminal-center B cells, and plasma cells</li> <li>Expressed in plasma cells of CLL, plasmacytoid lymphomas, and myelomas</li> </ul>
CD163	2003815	<ul style="list-style-type: none"> <li>Restricted in its expression to the monocytic/macrophage lineage</li> <li>Present on all circulating monocytes and most tissue macrophages, except those found in mantle zone and germinal centers of lymphoid follicles, interdigitating reticulum cells, and Langerhans cells</li> </ul>
CD200	2012844	<ul style="list-style-type: none"> <li>Primarily aids the distinction between CLL/SLL and mantle cell lymphoma where CD200 is usually positive in CLL/SLL and negative in mantle cell lymphoma</li> <li>CD200 is also positive in other B-cell lymphoproliferative disorders</li> </ul>
CDK4	2005534	<ul style="list-style-type: none"> <li>CDK4 distinguishes well-differentiated liposarcoma (positive) from benign adipose tumors (negative) and dedifferentiated liposarcoma (positive) from poorly differentiated sarcomas (negative); CDK4 is more specific but less sensitive than MDM2</li> </ul>
CDX2	2003821	<ul style="list-style-type: none"> <li>Exclusively marks nuclei of colonic epithelial cells and colorectal cancers</li> <li>May be involved in the regulation of proliferation and differentiation in intestinal epithelial cells</li> <li>May be used in identifying metastatic colon carcinoma</li> </ul>
CEA (monoclonal)	2003824	<ul style="list-style-type: none"> <li>Carcinoembryonic antigen</li> <li>Specific marker for colon carcinoma</li> <li>Associated with other cancers: breast, stomach, and lung (see CEA polyclonal)</li> </ul>
CEA (polyclonal)	2003827	<ul style="list-style-type: none"> <li>CD56e; biliary glycoprotein 1</li> <li>Reacts with CEA and CEA-like proteins</li> <li>Normal colon: small intestinal crypts and apical surfaces of epithelial cells, small intestinal goblet-cell mucin (not intracytoplasmic)</li> <li>Breast: some epithelial cell membranes expressed</li> <li>Liver: biliary tract; hepatocytes are positive</li> <li>Lung adenocarcinomas or mesotheliomas: 85 percent sensitive and 96 percent specific for lung adenocarcinoma, diffuse cytoplasmic staining with membrane enhancement</li> <li>Hepatocellular or non-hepatocellular carcinomas: canalicular pattern has 50–90 percent sensitivity for hepatocellular carcinoma and greater than 95 percent specificity</li> <li>Present also with lung adenocarcinoma, medullary thyroid carcinoma, colonic adenocarcinoma, pancreatic adenocarcinoma, and hepatocellular carcinoma</li> </ul>
Chromogranin A	2003830	<ul style="list-style-type: none"> <li>Expressed in neuronal cells and in secretory granules of endocrine cells: parathyroid gland, adrenal medulla, anterior pituitary gland, islet cells of the pancreas, and C cells of the thyroid</li> <li>Aids in identifying neuroendocrine tumors: pituitary adenomas, islet-cell tumors, pheochromocytomas, medullary thyroid carcinomas, Merkel-cell tumors, and carcinoids</li> </ul>

antibody	test #	description
CK 5/6	2003851	<ul style="list-style-type: none"> <li>Cytokeratins 5 and 6; stratified squamous epithelial cytokeratin</li> <li>Aids in diagnosing low-differentiated pavement epithelium carcinoma, adenocarcinoma, and mesothelioma</li> <li>Differentiates epithelial mesotheliomas (positive-cytoplasmic staining with perinuclear enhancement) from lung adenocarcinoma (89 percent sensitive and 95 percent specific)</li> </ul>
CK 7	2003854	<ul style="list-style-type: none"> <li>Cytokeratin 7; reacts with most glandular and transitional epithelia: breast, lung, bladder, female genital tract (endometrium and fallopian tube), gastrointestinal tract (gallbladder, hepatic ducts, and pancreatic ducts), urinary tract, and bile duct</li> <li>Present with subtypes of ovarian, pulmonary, and breast adenocarcinomas, transitional-cell carcinomas, tumors of female genital tract (endometrium and fallopian tube), urothelial carcinomas, breast carcinomas, and lung carcinomas</li> </ul>
CK 19	2003845	<ul style="list-style-type: none"> <li>Reacts with a large number of epithelial cell types, including many ductal and glandular epithelia</li> <li>Aids in identification of many benign and malignant epithelial lesions</li> </ul>
CK 20	2003848	<ul style="list-style-type: none"> <li>Cytokeratin 20; expressed in intestinal epithelium, gastric foveolar epithelium, some endocrine cells of the upper portions of the pyloric glands, urethelium, and Merkel cells in epidermis</li> <li>Aids in identifying colorectal carcinoma, adenomas of the gallbladder and bile ducts, ductal cell adenocarcinomas of the pancreas, mucinous ovarian tumors, transitional-cell carcinomas, and Merkel-cell carcinomas of the skin</li> <li>Gastrointestinal adenocarcinomas express CK20 to a lesser degree</li> </ul>
c-MET	2008652	<ul style="list-style-type: none"> <li>Tumors derived from c-Met expressing epithelia are usually positive; these include colorectal carcinomas, gastric adenocarcinomas, and non-small cell lung carcinomas</li> <li>In gastric cancer and non-small cell lung carcinoma, it has been determined that c-MET drives the cancer</li> <li>It has also been found that c-MET is a resistance pathway in lung cancer for EGFR inhibitors -This antibody may be used to aid in the identification of normal and neoplastic c-MET expressing cells. The pattern of reactivity is cytoplasmic/membranous</li> </ul>
CMV	2003833	<ul style="list-style-type: none"> <li>Cytomegalovirus; reacts with the delayed and early DNA-binding protein p52</li> <li>Does not crossreact with other herpesviruses or adenoviruses</li> </ul>
c-MYC	2008317	<ul style="list-style-type: none"> <li>c-MYC expression has been described in a variety of cancers including breast cancer, prostate cancer, lymphoma, lung, and colon cancers.</li> <li>The c-MYC antibody may be used to characterize lymphomas. The pattern of reactivity is nuclear.</li> </ul>
Collagen IV	2003839	<ul style="list-style-type: none"> <li>Reacts with basement membranes in kidney, skin, striated and smooth muscle, spleen, lymph node, lung, placenta, and tendon</li> </ul>
CXCL13	2008622	<ul style="list-style-type: none"> <li>B-lymphocyte chemoattractant / B-Cell attracting chemokine-1 (BLC/BCA-1)</li> <li>CXC chemokine family controlling the organization of B cells within follicles of lymphoid tissues such as spleen, lymph nodes, and Peyer's patches.</li> <li>In T-lymphocytes, CXCL13 expression is thought to reflect a germinal center origin of the Tcell.</li> <li>Useful marker in the diagnosis of angioimmunoblastic T-cell lymphoma; when used in a panel it can differentiate it from other proliferative T-cell lymphoma.</li> </ul>
Cyclin D1 (SP4)	2003842	<ul style="list-style-type: none"> <li>B-cell lymphoma-1</li> <li>Mantle-cell lymphoma, various carcinomas (strong staining in carcinomas), multiple myelomas, some parathyroid adenomas, and parathyroid carcinomas</li> </ul>
D2-40	2003857	<ul style="list-style-type: none"> <li>High sensitivity and specificity for lymphatic endothelium</li> <li>Can be used as a reliable lymphatic endothelial-cell marker in the evaluation of lymphatic involvement in tumors</li> </ul>
DBA.44 (Hairy Cell Leukemia)	2003860	<ul style="list-style-type: none"> <li>Developed against the B-cell antigen</li> <li>Aids in identifying hairy-cell leukemia (particularly hairy cytoplasmic processes), some follicular center-cell lymphomas, high-grade B-cell lymphomas, and splenic lymphomas with villous lymphocytes</li> </ul>
Desmin	2003863	<ul style="list-style-type: none"> <li>Intermediate filament present in smooth and striated muscle</li> <li>Expressed in reactive mesothelial cells, myoblasts, myofibroblasts (variable), endometrial stroma, and smooth muscle cells</li> <li>Aids in identifying smooth muscle tumors (leiomyosarcomas), myogenic sarcomas, striated muscle tumors (rhabdomyosarcoma), PNET, neuroblastomas, and intra-abdominal desmoplastic small round-cell tumors</li> </ul>
DOG1	2010168	<ul style="list-style-type: none"> <li>Shown to be highly specific and sensitive in the diagnosis of GIST</li> <li>Approximately 4–15% of GIST will stain weakly or be negative for CD117 by IHC; in the vast majority of these cases, DOG1 is expressed by IHC.</li> </ul>
E-cadherin	2003869	<ul style="list-style-type: none"> <li>Cellular adhesion molecule; loss associated with invasive carcinoma</li> <li>Differentiates LCIS from DCIS in indeterminate breast carcinoma</li> <li>Reduced expression in invasive bladder cancer and ductal carcinoma</li> <li>No expression in lobular carcinoma and LCIS</li> </ul>
EMA	2003872	<ul style="list-style-type: none"> <li>Epithelial membrane antigen; prognostic</li> <li>Expressed by almost all glandular and ductal epithelial cells, including breast and pancreas, activated T cells, monocytes, some B cells, follicular dendritic cells, and perineurial cells</li> <li>Aids in identifying most adenocarcinomas, anaplastic large-cell lymphomas, epithelioid sarcomas, meningiomas, some mesotheliomas, myelomas, Paget disease, plasmacytomas, squamous-cell tumors, and metastatic carcinomas</li> <li>Associated with invasion in pancreatic tumors</li> </ul>

antibody	test #	description
ERA (MOC-31)	2003875	<ul style="list-style-type: none"> <li>Epithelial-related antigen (MOC-31); aids in identifying adenocarcinomas, squamous-cell carcinomas, adenomas, small-cell lung cancers, carcinoids, adenocystic carcinomas, and carcinosarcomas</li> </ul>
ERBB2 (HercepTest)	2007332	<ul style="list-style-type: none"> <li>This test code is for stain-and-return service only; see above in available stains with interpretation section for alternate test code.</li> <li>Aids in identifying breast cancer patients eligible for Herceptin therapy</li> </ul>
ERG	2012555	<ul style="list-style-type: none"> <li>Prostate marker</li> <li>May be used to aid in the identification of prostate adenocarcinomas through the detection of truncated ERG</li> </ul>
Estrogen	2004516	<ul style="list-style-type: none"> <li>Estrogen receptor-alpha; prognostic for breast cancer</li> <li>Predictive for response of breast cancers to hormonal therapy</li> <li>Differentiates endocervical from endometrial adenocarcinomas</li> </ul>
Factor XIIIa	2003878	<ul style="list-style-type: none"> <li>Blood pro-enzyme identified in platelets, megakaryocytes, and fibroblast-like mesenchymal or histiocytic cells present in the placenta, uterus, and prostate</li> <li>Present in monocytes, macrophages, and dermal dendritic cells</li> <li>Aids in differentiating dermatofibromas, dermatosarcoma protuberans, and desmoplastic malignant melanomas</li> <li>Positive in capillary hemangioblastomas, hemangiopericytomas, hepatocellular carcinomas, hemangiopericytomas, xanthogranulomas, glomus tumors, and meningiomas</li> </ul>
Gastrin	2003896	<ul style="list-style-type: none"> <li>Expressed in G cells of the pyloric antrum</li> <li>Aids in identifying G-cell hyperplasia and gastrin-secreting tumors</li> </ul>
GATA3	2012558	<ul style="list-style-type: none"> <li>Breast marker</li> <li>Can be used in a panel of antibodies for diagnosis of unknown primary carcinoma when carcinomas of the breast or bladder are a possibility. The pattern of reactivity should be nuclear.</li> </ul>
GFAP	2003899	<ul style="list-style-type: none"> <li>Glial fibrillary acidic protein; expressed in astrocytes and some CNS ependymal cells</li> <li>Identifies astrocytomas and ependymomas</li> <li>Many neural tumors, such as neuroblastomas, schwannomas, and extra-CNS tumors, do not stain</li> </ul>
GLUT-1 (Glucose Transporter-1)	2003905	<ul style="list-style-type: none"> <li>Involved in glucose transport across epithelial and endothelial barrier tissues</li> <li>Stains the membrane of normal erythrocytes in various normal and neoplastic tissues</li> </ul>
Glycophorin A	2003908	<ul style="list-style-type: none"> <li>Expressed in erythroid cells</li> <li>Identifies M6 subtype of acute myeloblastic leukemia, erythroleukemia, and erythroblasts</li> </ul>
Glypican 3	2011925	<ul style="list-style-type: none"> <li>Useful tumor marker for the diagnosis of hepatocellular carcinoma (HCC), hepatoblastoma, melanoma, testicular germ cell tumors, and Wilms' tumor</li> </ul>
Granzyme B	2007173	<ul style="list-style-type: none"> <li>Granzyme B has been found to be expressed in the neoplastic counterparts of cytolytic CTL and NK-cells; therefore, granzyme B may be a valuable tool in the diagnosis of T-cell/NK-cell lymphomas with cytotoxic phenotypes. High percentages of cytotoxic T-cells have been shown to be an unfavorable prognostic indicator in Hodgkin disease.</li> </ul>
HBME-1	2003914	<ul style="list-style-type: none"> <li>Anti-mesothelial cell; has been demonstrated to immunostain the membrane and cytoplasm of normal plural and peritoneal mesothelial cells and of neoplastic epithelial mesothelioma cells</li> <li>Although both the membrane and cytoplasm of epithelial mesothelioma cells stain positive, the thick membrane staining pattern is found to be a more diagnostically useful marker of malignant mesothelioma.</li> </ul>
<i>Helicobacter pylori</i>	2003941	<ul style="list-style-type: none"> <li><i>Campylobacter pylori</i>; reacts with antigens of the <i>H. pylori</i> organism</li> </ul>
HercepTest		See ERBB2 (HercepTest).
HHV8	2003932	<ul style="list-style-type: none"> <li>Human herpes virus type 8 (latent nuclear antigen); aids in identifying multicentric Castleman disease, angioimmunoblastic lymphadenopathies, and Kaposi sarcoma</li> </ul>
HMB45 (Melanoma Antibody)	2003935	<ul style="list-style-type: none"> <li>Melanoma-specific antigen; expressed in junctional cells, blue-nevus cells, and fetal and neonatal melanocytes</li> <li>Reacts with the majority of melanomas and other tumors with melanoma/melanocytic differentiation, including melanotic schwannoma clear-cell sarcoma</li> </ul>
HSA	2003923	<ul style="list-style-type: none"> <li>Hepatocyte specific antigen: Hep Par-1; expressed in hepatocytes</li> <li>Differentiates hepatocellular carcinomas and metastatic carcinomas</li> <li>Differential diagnosis of hepatocellular carcinomas, cholangiocarcinomas, and hepatoblastomas</li> </ul>
HSV I/HSV II	3000101	<ul style="list-style-type: none"> <li>Reacts with antigens common to HSV types 1 and 2; reacts with all the major glycoproteins present in the viral envelope.</li> <li>HSV I/II by IHC will aid in identifying tissue infected with the herpes simplex virus</li> </ul>
Human chorionic gonadotropin	2003920	<ul style="list-style-type: none"> <li>Beta-hCG; expressed on placental trophoblasts</li> <li>Aids in identifying trophoblastic germ-cell tumor</li> </ul>
Human growth hormone	2003929	<ul style="list-style-type: none"> <li>HGH; identifies somatotroph cells of the human adenohypophysis</li> <li>Subclassifies pituitary adenomas</li> <li>Identifies adenocarcinomas, squamous-cell carcinomas, and large-cell carcinomas of non-pituitary origin</li> </ul>
Human placental lactogen	2003938	<ul style="list-style-type: none"> <li>HPL; reacts with placental syncytiotrophoblastic cells</li> <li>Identifies placental-site trophoblastic tumors and exaggerated placental sites</li> </ul>

antibody	test #	description
<b>IDH1 R132H</b>	2005857	<ul style="list-style-type: none"> <li>Distinguishes primary from secondary glioblastoma multiform (GBM)</li> <li><i>IDH1</i> mutations occur in approximately 70 percent of astrocytomas and oligodendroglial tumors</li> <li>Allows the highly sensitive and specific discrimination of various tumors, such as astrocytoma from primary glioblastomas or diffuse astrocytoma grade II from pilocytic astrocytoma or ependymoma</li> </ul>
<b>IgA</b>	2003957	<ul style="list-style-type: none"> <li>Alpha chains of Ig</li> </ul>
<b>IgD</b>	2003960	<ul style="list-style-type: none"> <li>Delta chains of IgD</li> </ul>
<b>IgG</b>	2003963	<ul style="list-style-type: none"> <li>Gamma chains of IgG</li> </ul>
<b>IgG4</b>	2005844	<ul style="list-style-type: none"> <li>Differentiates IgG4-related sclerosing disease from mimicking lymphomas</li> <li>Clinical manifestations apparent in the pancreas, bile duct, gallbladder, lacrimal gland, salivary gland, retroperitoneum, kidney, lung, breast, thyroid, and prostate</li> </ul>
<b>IgM</b>	2003966	<ul style="list-style-type: none"> <li>Mu chains of IgM</li> </ul>
<b>Inhibin</b>	2003969	<ul style="list-style-type: none"> <li>Expressed in Sertoli cells, granulosa cells, and prostate, brain, and adrenal cells</li> <li>Present in sex-cord stromal tumors (including Sertoli-cell tumors), adrenocortical tumors, placental and gestational trophoblastic lesions, granular-cell tumors of gallbladder and extrahepatic bile ducts, and some carcinomas</li> </ul>
<b>IRF4/MUM1</b>	2003975	<ul style="list-style-type: none"> <li>Transcription factor required for B- and T-cell development</li> <li>Expressed in a subset of diffuse large B-cell lymphomas and used in cell of origin classification</li> <li>Aids in the differential diagnosis of PEL among other lymphomas involving the serous body cavities</li> </ul>
<b>Kappa</b>	2003981	<ul style="list-style-type: none"> <li>Reacts with free kappa chains and those in intact immunoglobulin molecules</li> <li>Restricted expression suggests monoclonality and neoplastic process</li> </ul>
<b>Keratin 903 (HMW)</b>	2003978	<ul style="list-style-type: none"> <li>High molecular weight keratin, 34βE12; specific to prostate basal cells</li> <li>Rules out prostatic adenocarcinoma</li> <li>High-grade PIN demonstrates K 903 staining</li> <li>Identifies squamous-cell carcinomas, urothelial carcinomas, adenocarcinomas of ductal origin (breast, pancreas), and small benign acinar lesions of the prostate</li> <li>Aids in differentiating mesotheliomas from lung adenocarcinomas</li> </ul>
<b>Ki-67 (MIB-1)</b>	2004519	<ul style="list-style-type: none"> <li>Proliferation index indicator</li> <li>Determines growth fraction</li> <li>Aids in differentiating melanoma from nevus cells for sentinel-node biopsy</li> <li>Distinguishes benign and malignant adrenocortical tumors</li> </ul>
<b>Lambda</b>	2003984	<ul style="list-style-type: none"> <li>Reacts with free lambda chains and those in intact immunoglobulin molecules</li> <li>Restricted expression suggests monoclonality and neoplastic process</li> </ul>
<b>Langerin</b>	2013802	<ul style="list-style-type: none"> <li>Indicated as an aid in the identification of Langerhans cells in the clinical differential diagnosis where Langerhans cell histiocytosis is suspected</li> </ul>
<b>Lynch syndrome</b>		<ul style="list-style-type: none"> <li>See mismatch repair (MSI).</li> </ul>
<b>Lysozyme (muramidase)</b>	2003990	<ul style="list-style-type: none"> <li>Histiocytic and bacteriolytic enzyme</li> <li>Present in granulocytes, monocytes, macrophages, histiocytes, normal hematopoietic cells, and some epithelial cells</li> <li>Present in myeloid leukemias</li> </ul>
<b>Mast cell tryptase</b>	2003993	<ul style="list-style-type: none"> <li>Present in secretory granules of mast cells</li> <li>Present with inflammatory diseases</li> </ul>
<b>Melan A</b>	2003996	<ul style="list-style-type: none"> <li>MART-1 antigen; expressed in melanocytes, steroid-producing cells of the adrenal cortex, ovary, and testis</li> <li>Identifies melanomas, adrenocortical tumors, Leydig tumors of the testis, and Sertoli-Leydig ovarian tumors</li> </ul>
<b>MITF</b>	2011998	<ul style="list-style-type: none"> <li>Used in the identification of melanotic lesions, such as malignant melanoma and melanotic neurofibroma</li> </ul>
<b>MDM2</b>	2005848	<ul style="list-style-type: none"> <li>Amplified in soft tissue sarcomas, osteosarcomas, and gliomas</li> <li>Distinguishes well-differentiated liposarcoma (positive) from benign adipose tumors (negative)</li> <li>Distinguishes de-differentiated liposarcoma (positive) from poorly differentiated sarcomas (negative)</li> <li>CDK4 is more specific but less sensitive than MDM2</li> </ul>
<b>Muc-1 glycoprotein</b>	2004002	<ul style="list-style-type: none"> <li>Expressed in mucin-secreting epithelial cells of normal endometrium, kidney, lung, pancreas, and stomach</li> <li>Utilized in the detection of Muc-1 glycoprotein in benign and malignant tumors</li> </ul>
<b>Muc-4 glycoprotein</b>	2004008	<ul style="list-style-type: none"> <li>Stains stomach, colon, and the endothelial cells of small blood vessels and capillaries</li> <li>Strong positive staining in colon polyps, colon carcinoma, and gastric adenocarcinoma</li> <li>Positive staining also demonstrated in lung adenocarcinoma and ovarian mucinous adenocarcinoma</li> </ul>
<b>Muscle specific actin</b>	2004011	<ul style="list-style-type: none"> <li>Present in skeletal, cardiac, smooth muscle, and myoepithelial cells</li> <li>Identifies soft tissue tumors with muscle differentiation (leiomyomas, leiomyosarcomas, and rhabdomyosarcomas), some pleomorphic liposarcomas, the majority of glomus tumors, occasional desmoid tumors, and myofibroblasts in some lesions</li> </ul>

antibody	test #	description
<b>Myeloperoxidase</b>	2004014	<ul style="list-style-type: none"> <li>• MPO; reacts with myeloperoxidase from granulocytes</li> <li>• Aids in differentiating lymphoid leukemias from myeloid leukemias</li> <li>• Identifies granulocytic sarcomas</li> </ul>
<b>Myf-4</b>	2004017	<ul style="list-style-type: none"> <li>• Myogenin; expressed early in skeletal muscle differentiation</li> <li>• Is a sensitive and specific marker for rhabdomyosarcoma</li> <li>• Is more specific than desmin and muscle-specific actin and more sensitive than myoglobin</li> </ul>
<b>Myoglobin</b>	2004031	<ul style="list-style-type: none"> <li>• Oxygen-binding protein</li> <li>• Expressed by striated muscle (cardiac and skeletal)</li> <li>• Present in rhabdomyosarcoma and other tumors with skeletal-muscle differentiation</li> </ul>
<b>Myosin</b>	2004034	<ul style="list-style-type: none"> <li>• Contractile protein; expressed in smooth muscle (non-sarcomeric) and skeletal muscle (sarcomeric) forms</li> <li>• Aids in muscle differentiation</li> </ul>
<b>Napsin A</b>	2008716	<ul style="list-style-type: none"> <li>• Napsin A is highly specific in adenocarcinomas of lung and is useful in distinguishing primary lung adenocarcinomas from adenocarcinomas of other organs.</li> <li>• The pattern of reactivity is cytoplasmic.</li> </ul>
<b>NeuN</b>	2004046	<ul style="list-style-type: none"> <li>• Aids in the definitive identification of neuronal elements in ganglion-cell tumors or hamartomas, in which a distinction between atypical glial cells and neurons may be difficult</li> <li>• May be used, similarly, for the study of neuronal loss in epilepsy, neurodegenerative diseases, or other conditions</li> </ul>
<b>Neurofilament (68kD)</b>	2004049	<ul style="list-style-type: none"> <li>• Cytoskeletal element in nerve axons/dendrites</li> <li>• Reacts with neurons, neuronal processes, peripheral nerves, sympathetic ganglion cells, and adrenal medulla</li> <li>• Identifies neuroblastoma and gangliomas</li> </ul>
<b>NSE</b>	2004052	<ul style="list-style-type: none"> <li>• Neuron-specific enolase; expressed by neuronal or neuroendocrine cells and their tumors: neuroblastomas and retinoblastomas</li> <li>• May label non-neuronal tumors: meningiomas, medulloblastomas, astrocytomas, glioblastomas, oligoastrocytomas, oligodendrogliomas, pituitary adenomas, schwannomas, ependymomas, meningiosarcomas, gliosarcomas, small-cell lung cancer, melanomas, and germ-cell tumors</li> </ul>
<b>Oct-2</b>	2004061	<ul style="list-style-type: none"> <li>• Octamer-binding transcription factor 2; aids in differentiating Hodgkin lymphomas (typically weak to negative) and B-cell lymphomas</li> </ul>
<b>Oct-3/4</b>	2004058	<ul style="list-style-type: none"> <li>• Octamer transcription factors 3 and 4; expressed by embryonic stem cells and germ cells</li> <li>• Has been reported to be expressed in germ-cell tumors and their metastases, which exhibit features of pluripotentiality, including seminoma/dysgerminoma/germinoma and embryonal carcinoma</li> <li>• Has been proposed as a useful marker for germ-cell tumors and to assist in establishing a germ-cell origin for some metastatic tumors of uncertain primary origin</li> </ul>
<b>p16</b>	2004064	<ul style="list-style-type: none"> <li>• F-12; negative regulator of the cell cycle</li> <li>• Prognostic significance (breast, colon, stomach, lung, and pituitary)</li> </ul>
<b>p21</b>	2004067	<ul style="list-style-type: none"> <li>• <i>WAF1-CIP1</i>; inhibits and blocks cell-cycle progression</li> <li>• Present in melanomas, pancreatic carcinomas, cervical carcinomas, thymomas, thyroid carcinomas, breast carcinomas, head and neck carcinomas, colon carcinomas, and Hodgkin lymphoma</li> </ul>
<b>p40</b>	2010142	<ul style="list-style-type: none"> <li>• Recognizes an epitope unique to the p40 protein and may have applications in cases where p63 has traditionally been used</li> <li>• Frequently used for lung squamous cell carcinoma, bladder, breast, prostate, and head and neck cancers</li> </ul>
<b>p53</b>	2004522	<ul style="list-style-type: none"> <li>• Tumor-suppressor protein; prognostic indicator</li> </ul>
<b>p57</b>	2005542	<ul style="list-style-type: none"> <li>• Used as an aid in identification of complete hydatidiform mole (CHM) (no nuclear labeling of cytotrophoblasts) from partial hydatidiform mole (PHM) and hydropic abortion</li> </ul>
<b>p63</b>	2004073	<ul style="list-style-type: none"> <li>• Differentiates prostatic adenocarcinoma and benign prostatic tissue</li> <li>• Also distinguishes poorly differentiated squamous-cell carcinoma from small-cell carcinoma or adenocarcinoma</li> </ul>
<b>P504S (AMACR)</b>	2004076	<ul style="list-style-type: none"> <li>• Prostate</li> <li>• <math>\alpha</math>-Methylacyl-CoA racemase (AMCAR)</li> <li>• Specific for prostate adenocarcinomas</li> <li>• Detected in two premalignant lesions: high-grade prostatic intraepithelial neoplasia (PIN) and atypical adenomatous hyperplasia</li> </ul>
<b>PAP</b>	2004079	<ul style="list-style-type: none"> <li>• Prostate acid phosphatase; reacts with prostatic epithelial cells and hyperplastic prostate</li> <li>• Present in carcinomas of the prostate and metastatic cells of prostate carcinoma, bladder carcinomas, and carcinoid tumors</li> </ul>
<b>Parathyroid Hormone</b>	2004118	<ul style="list-style-type: none"> <li>• PTH; reacts with parathyroid epithelial cells</li> <li>• Present in adenomas and primary and secondary hyperplasias</li> </ul>
<b>PAX5</b>	2004082	<ul style="list-style-type: none"> <li>• Member of the paired box family</li> <li>• B-cell-specific activator protein (BSAP)</li> <li>• Expressed in pro-, pre-, and mature B cells, but not in plasma cells</li> <li>• Present in pre B-cell acute lymphoblastic leukemias and classical Hodgkin lymphomas (typically weak)</li> <li>• Aids in differential diagnosis of lymphoplasmacytic lymphomas or plasmacytomas</li> </ul>

antibody	test #	description
PAX8	2010787	<ul style="list-style-type: none"> <li>Expressed in a high percentage of ovarian serous, endometrioid, and clear cell carcinomas, but only rarely in primary ovarian mucinous adenocarcinomas</li> <li>Important marker of ovarian cancer and a useful marker for the differential diagnosis in lung and neck tumors, or tumors at distant sites where primary lung carcinoma, breast carcinoma, or thyroid carcinoma are possibilities.</li> </ul>
PD1	2004085	<ul style="list-style-type: none"> <li>Angioimmunoblastic T-cell lymphomas are the only hematopoietic tumors that are positive for PD1 protein.</li> <li>In tonsil and lymph tissues, the protein is expressed on T cells and some B cells of the light zone of germinal centers.</li> </ul>
PD-L1	2011158	<ul style="list-style-type: none"> <li>Clone E1L3N</li> <li>Expressed in several tumor types, including melanoma, ovary, colon, lung, breast, and renal cell carcinoma</li> <li>Additional research links PD-L1 expression to cancers associated with viral infections</li> </ul>
PHF-Tau	2004094	<ul style="list-style-type: none"> <li>Paired helical filament-tau; tau abnormally phosphorylated in Alzheimer disease</li> <li>Main component in paired helical filaments (PHFs) and neurofibrillary tangles</li> </ul>
PIN4	2010045	<ul style="list-style-type: none"> <li>Prostate multiplex stain containing basal cell cocktail (34βE12/p63) and AMACR (P504s)</li> <li>Has been reported to provide advantages in sensitivity over the use of p63 or anti-keratin (34βE12) alone in the detection of prostatic basal cells</li> <li>The two components of this cocktail not only augment but also complement each other in basal cell detection.</li> </ul>
PGP 9.5	2004091	<ul style="list-style-type: none"> <li>Protein gene product 9.5; expressed in neurons, neuroendocrine cells, and melanocytes</li> <li>Present in neuronal neoplasias (carcinoid tumors)</li> </ul>
Placental alkaline phosphatase	2004097	<ul style="list-style-type: none"> <li>PLAP; expressed by placenta</li> <li>Present in most germ-cell tumors, and breast, lung, stomach, pancreas, and ovarian carcinomas</li> </ul>
Procollagen I	2004106	<ul style="list-style-type: none"> <li>Secreted by fibroblasts into the extracellular matrix, where it is cleaved to form collagen</li> <li>Expression and secretion of procollagen are important features of the wound-healing and tissue-repair processes to which the desmoplastic stroma of malignancy have sometimes been compared</li> </ul>
Progesterone	2004525	<ul style="list-style-type: none"> <li>Identifies A and B forms of progesterone</li> <li>Predictive of response to hormone therapy for breast carcinoma and endometrial cancer</li> <li>Aids in differentiating endocervical from endometrial adenocarcinomas</li> </ul>
Prolactin	2004109	<ul style="list-style-type: none"> <li>Produced in the anterior pituitary gland</li> <li>Subclassifies pituitary adenomas</li> </ul>
Prostate Triple Stain	2010045	<ul style="list-style-type: none"> <li>Prostate multiplex stain containing basal cell cocktail (34βE12/p63) and AMACR (P504s)</li> <li>Has been reported to provide advantages in sensitivity over the use of p63 or anti-keratin (34βE12) alone in the detection of prostatic basal cells</li> <li>The two components of this cocktail not only augment but also complement each other in basal cell detection.</li> </ul>
PSA	2004112	<ul style="list-style-type: none"> <li>Prostate-specific antigen; expressed by prostatic glandular epithelial cells and periurethral and perianal glands</li> <li>Present in prostatic carcinomas, tumors of the colon, liver, lung, parotid, adrenal, and ovary, and, rarely, in metaplasias of the bladder walls</li> </ul>
RCC	2004124	<ul style="list-style-type: none"> <li>Renal-cell carcinoma; localized along the brush border of the pars-convolute and pars-recta segments of the proximal tubule and focally along the luminal surface of Bowman capsule</li> <li>In normal tissues, localized along the luminal surface of breast lobules and ducts, the luminal surface of the epididymal tubular epithelium, within the cytoplasm of the parathyroid parenchymal cells, and focally within the colloid of thyroid follicles</li> </ul>
S-100	2004127	<ul style="list-style-type: none"> <li>Brain protein composed of S-100a and S-100b; expressed in neural crest (Schwann cells, melanocytes, and glial cells), chondrocytes, adipocytes, myoepithelial cells, macrophages, Langerhans cells, and dendritic cells</li> <li>Present in 95 percent of melanomas (including desmoplastic and spindle-cell tumors), 50 percent of malignant peripheral nerve-sheath tumors, clear-cell sarcomas, and occasional breast and undifferentiated carcinomas</li> </ul>
SALL4	2005432	<ul style="list-style-type: none"> <li>Sal-like 4; highly sensitive marker for gonadal seminoma/dysgerminoma, embryonal carcinomas, and yolk sac tumor as well as their metastatic form, including those metastasizing to the CNS</li> <li>An immunohistochemical panel, including SALL4, OCT4, and CD30, helps solve this diagnostic difficulty; germinoma will be positive for both SALL4 and OCT4 but negative for CD30, whereas embryonal carcinoma will show SALL4+/OCT4+/CD30+ profile, and yolk sac tumor will show SALL4+/OCT4-/CD30- profile.</li> </ul>
STAT6	2013251	<ul style="list-style-type: none"> <li>Aids in diagnosis of solitary fibrous tumor</li> </ul>
Smad4	2006403	<ul style="list-style-type: none"> <li>May be useful in the diagnosis of pancreatic cancer, juvenile polyposis syndrome, and hereditary hemorrhagic telangiectasia syndrome.</li> <li>The pattern of reactivity is mostly cytoplasmic but sometimes nuclear expression is seen in many cell types with highest expression levels in placenta and gastrointestinal tract.</li> </ul>
Smooth muscle actin	2004130	<ul style="list-style-type: none"> <li>SMA; reacts with the alpha-smooth muscle isoform</li> <li>Present in smooth muscle cells of vessels, parenchymes, myoepithelial cells, pericytes, and some stromal cells in the intestine, testis, and ovary</li> <li>Aids in differentiating leiomyosarcoma from rhabdomyosarcoma</li> </ul>



antibody	test #	description
SOX11	2012561	<ul style="list-style-type: none"> <li>Lymphoma/hematopoietic marker</li> <li>Will stain those cases of Mantle-cell lymphoma that are negative for the cyclin D1 stain, thereby aiding in a more timely diagnosis of MCL.</li> </ul>
SV-40	2004137	<ul style="list-style-type: none"> <li>Simian virus 40; closely related to BK virus and JC virus</li> <li>Used to identify all polyomavirus infections due to cross-reactivity between SV-40 and BK or JC virus</li> </ul>
Synaptophysin	2004139	<ul style="list-style-type: none"> <li>Labels neuroendocrine cells and neurons in the brain, spinal cord, and retina</li> <li>Present in neuroendocrine tumors and neuroendocrine tumors of epithelial type</li> </ul>
TdT	2004142	<ul style="list-style-type: none"> <li>Used in subtyping of blastic leukemias</li> <li>Positive in all acute lymphoblastic leukemia (ALL) except Burkitt and B-cell FAB L-3</li> <li>Positive in lymphoblastic crisis of chronic myelogenous leukemia (CML-BC-ALL) and lymphoblastic lymphoma</li> <li>Some non-lymphocytic leukemias express positivity, but there is less intensity and greater variability</li> </ul>
TFE3	2010688	<ul style="list-style-type: none"> <li>Indicated in the clinical diagnosis of malignancy as an aid in the recognition of Xp11 translocation in renal cell carcinoma and alveolar soft-part sarcoma.</li> <li>Also reported in transitional renal cell carcinoma, lung adenocarcinoma, papillary thyroid carcinoma, melanoma, and mesothelioma.</li> </ul>
Thyroglobulin	2004145	<ul style="list-style-type: none"> <li>Protein synthesized by the follicular epithelial cells of the thyroid; aids in the localization of thyroglobulin in hyperplastic and neoplastic thyroid and in monitoring of patients after treatment for follicular carcinomas</li> </ul>
TIA-1	2004148	<ul style="list-style-type: none"> <li>T-cell intracytoplasmic antigen; reacts with 50–60 percent of CD8 lymphocytes, 10 percent of CD4 lymphocytes, monocytes, granulocytes, activated CD4 T cells, activated NK cells, and con A-activated thymocytes</li> <li>Aids in differentiating T-cell leukemias and lymphomas from B-cell leukemias and lymphomas</li> </ul>
Toxoplasma gondii	2004157	<ul style="list-style-type: none"> <li>Detects the presence of <i>Toxoplasma gondii</i> in infected tissues</li> </ul>
TRAP	2004160	<ul style="list-style-type: none"> <li>Tartrate-resistant acid phosphatase; found in hairy cells, osteoclasts, activated macrophages, and giant cells</li> <li>Useful as a marker for hairy-cell leukemia in bone marrow</li> </ul>
TTF-1	2004166	<ul style="list-style-type: none"> <li>Thyroid transcription factor-1; expressed in lung and thyroid epithelial cells</li> <li>Present in pulmonary small-cell carcinomas, some pulmonary non-small-cell carcinomas, papillary carcinomas, follicular carcinomas and goiter, thyroid medullary carcinomas, and thyroid papillary carcinomas</li> <li>Aids in differentiating pulmonary adenocarcinomas from breast carcinomas</li> </ul>
Ubiquitin	2004169	<ul style="list-style-type: none"> <li>Detects intracellular ubiquitinated filamentous inclusions in the periphery of senile plaques, neuro-fibrillary tangles in Alzheimer disease, and Lewy bodies in Parkinson disease</li> </ul>
Vimentin	2004181	<ul style="list-style-type: none"> <li>Aids in identifying melanomas and schwannomas</li> </ul>
WT-1 (N-terminus)	2004184	<ul style="list-style-type: none"> <li>Aids in identifying Wilms' tumor and mesotheliomas</li> </ul>



[www.aruplab.com](http://www.aruplab.com) | [www.arupconsult.com](http://www.arupconsult.com)

**ARUP LABORATORIES**

500 Chipeta Way  
Salt Lake City, UT 84108-1221  
Phone: (800) 522-2787  
Fax: (801) 583-2712  
[www.aruplab.com](http://www.aruplab.com)

*ARUP is a nonprofit enterprise of the University of Utah  
and its Department of Pathology.*

© 2018 ARUP Laboratories  
BD-TS-004, Rev 13, June 2018

