Marshfield Labs™
A division of Marshfield Clinic

Immunohistochemistry (IHC) Outreach Services

- Note type of fixative used if not neutral buffered formalin.
- Note type of tissue/specimen
- Unless specified otherwise, positive and negative controls react satisfactorily.
- Antibody Classifications:
  - IVD (In Vitro Diagnosis) – No disclaimer required.
  - ASR (Analyte Specific Reagent) – must use a disclaimer on the report (See Below)

ASR required disclaimer

This test was developed and its performance characteristics determined by Marshfield Labs. It has not been cleared or approved by the U.S. Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. This test is used for clinical purposes. It should not be regarded as investigational or for research. This laboratory is certified under the Clinical Laboratory Improvement Amendments (CLIA) as qualified to perform high-complexity testing.

Available Chromogen – All markers have been validated with 3,3'-Diaminobenzidine Tetrahydrochloride (DAB) which results in a brown/black precipitate. DAB is the routine chromogen. In addition, some markers have also been validated using the Fast Red (RED), which results in a red precipitate. If available with both chromogens and one is not selected, the default will be the DAB chromogen.

Antibody	Common Applications	Staining Characteristics/Classification If Other Than IVD
Actin (muscle specific)	Smooth, skeletal & cardiac muscle	Cytoplasmic
Actin (smooth muscle)	Smooth muscle and myoepithelial cells	Cytoplasmic and membrane
Adrenocorticotropin (ACTH)	Pituitary neoplasms	Cytoplasmic
Alpha-1-Fetoprotein (AFP)	Hepatoma, germ cell tumors	Cytoplasmic
ALK Protein	ALK1 positive lymphomas	Cytoplasmic and/or nuclear
Alpha-1-Antitrypsin (A-1-AT)	Demonstrates A-1-AT in liver	Cytoplasmic
Bcl-2 Oncoprotein	Follicular lymphoma and soft tissue tumors	Cytoplasmic
Bcl-6	Follicular lymphoma	Nuclear
Ber-EP4, Epithelial Antigen	Adenocarcinoma vs. mesothelioma and epithelial tumors	Membrane and cytoplasmic. The membrane staining is preferentially basolateral.
Beta-Amyloid	Post mortem diagnosis of dementia	Extracellular deposition (amyloid plaques), vascular deposition (amyloid angiopathy)
BRST-3, (B72.3)	Adenocarcinoma vs. mesothelioma	Cell surface and cytoplasmic
CD1a	Langerhan cells, thymic T-cells, thymoma	Membrane and weakly cytoplasmic
CD3	T-cells, lymphoma/leukemia typing	Membrane
CD4	Helper/Inducer T-cells mycosis fungoides vs. cutaneous inflammatory processes, lymphoma/ leukemia typing	Membrane
CD5	T-cell, lymphoma/leukemia typing	Membrane
CD7	T-lymphocytes	Membrane
CD8	T-cell suppressor/cytotoxic, lymphoma/leukemia typing, mycosis fungoides vs. cutaneous inflammatory processes	Membrane
CD10	Lymphoma typing, metastatic carcinoma unknown primary	Cytoplasmic and Membrane
CD15	Hodgkin Lymphoma Typing, mesothelioma vs. adenocarcinoma	Reed-Sternberg cells in Hodgkin's lymphoma show cell membrane and granular paranuclear staining. ASR
CD20, B Cell	Lymphoma/leukemia typing	Cytoplasmic side of the cell surface membrane

CD23	Lymphoma/leukemia typing	Cytoplasmic/membrane
CD25, Interleukin-2 Receptor	Mast cell disease and targeted immunotherapy	Membrane and/or cytoplasmic. Mast cells can exhibit an annular, membrane-associated stain.
CD30	Anaplastic large cell lymphoma, Hodgkin lymphoma	Membrane and/or a dot like cytoplasmic staining
CD31	Endothelial Cells	Predominately cell membrane, with weaker cytoplasmic staining.
CD34	Soft tissue tumor classification, leukemia typing	Membrane/cytoplasmic
CD43	T-cell, lymphoma/leukemia typing	Predominantly confined to the cell surface
CD45 (LCA)	Lymphohematopoetic tumors	Membrane, but cytoplasmic may also occur
CD56	NK cells, tumors derived from neuroectodermal tumors such as neuroendocrine and neuroblastomas, etc.	Membrane
CD57	Lymphoma typing, neuroendocrine differentiation	Cytoplasmic and membrane
CD68, PG-M1, Macrophage	Histiocytic/monocytic marker	Cells of monocyte/macrophage lineage stain diffuse or granular cytoplasmic. Mast cells are negative.
CD79a	B-cell, lymphoma/leukemia typing	Cell Membrane and/or cytoplasm
CD99, SEE MIC2		
CD117 (c-kit)	Gastrointestinal Stromal Tumors (GIST), Mast Cells	Membrane and/or cytoplasmic
CD138 Syndecan-1	Plasma Cells (also stains endothelial cells, fibroblasts, keratinocytes, and normal hepatocytes)	Cell Membrane, pre-B cell and plasma cell marker, but is absent from mature B cells. It is a selective marker for B cell lymphoblastic leukemia and lymphoplasmocytoid leukemia. It is lost from the apoptotic myeloma cells; hence is a useful marker for viable myeloma cells.
CD163	Histiocytic Lesions	Membrane
CDX2	Colon and other GI cancers are strong & diffusely positive. Also, mucinous ovarian cancers are positive. Neg for HCC, breast, lung, head, and neck ca.	Nucleus in normal and neoplastic intestinal epithelial cells.
Calcitonin	Medullary Thyroid Carcinoma	Cytoplasmic
Calretinin	Mesothelioma vs. adenocarcinoma, sex cord stromal, adrenal tumors, & Hirschprung's cases. Please specificy Meso or Hirsch	Cytoplasmic and nuclear
Carcinoembryonic Antigen, CEA/M	Mesothelioma vs. Adenocarcinoma, metastatic carcinoma of unknown primary	Cytoplasmic. Normal colon-CEA is mainly localized at the apical border of the epithelial cells. Colon carcinoma-CEA is mainly localized at the apical border of glandular structures, whereas cytoplasmic labeling predominates in more solid parts of the tumor.
Carcinoembryonic Antigen, CEA/P	Hepatoma vs. adenocarcinoma	Cytoplasmic. In liver, predominantly bilary canaliculi are labeled. In colonic adenocarcinoma the staining reaction is localized diffusely in the cytoplasm and in the gland lumina.
Chromogranin A	Neuroendocrine differentiation	Cytoplasmic
Cyclin D1	Mantle cell lymphoma	Nuclear
Cytokeratin 5/6	Mesothelioma vs. Adenocarcinoma	Cytoplasmic

Cytokeratin 7	Metastatic carcinoma of unknown primary	Cytoplasmic. Exceptions to reactivity may occur e.g. CK-7 positive hepatocytes have been observed in patients with acute and chronic cholestasis.
Cytokeratin 20	Metastatic carcinoma of unknown primary	Cytoplasmic. May occasionally be expressed in breast and lung adenocarcinomas, and in squamous cell carcinomas. Less than 5% CK20 positive cells may be present in a number of tissues not generally considered CK 20 positive.
CK116 – MNF116	Epithelial marker	Cytoplasmic
Cytokeratin 34BE12	Prostate basal cells, squamous cells vs. adenocarcinoma	Cytoplasmic
Cytokeratin, AE1/AE3	Epithelial tumors, hepatoma vs. adenocarcinoma	Cytoplasmic
Cytokeratin, CAM5.2	Epithelial tumors	Cytoplasmic
Cytokeratin Cocktail (KerCK)	Epithelial tumors	Cytoplasmic
Cytomegalovirus RNA CISH	Cytomegalovirus	Predominantly cytoplasmic. ASR
Cytomegalovirus/IHC	Cytomegalovirus	Nuclear staining pattern in early HCMV infection, later stage, cytoplasmic staining might be observed. Does not x-react with adenovirus, herpes simplex virus, & varicella zoster virus. ASR
D2-40	Lymphatic endothelium, mesothelioma vs. adenocarcinoma	Cytoplasmic and sometimes membrane
Desmin	Smooth and skeletal muscle differentiation	Cytoplasmic, may show a fibrillary aspect.
Epstein-Barr Virus (EBV) RNA CISH	Latent EBV infection	Nuclear. Surgical/Hematopathology consultation and review of the entire case is highly recommended.
E-Cadherin	Lobular vs. ductal breast carcinoma	Cellular membrane, some cytoplasmic
Epithelial Membrane Antigen (EMA)	Metastatic carcinoma of unknown primary, lymphoma	In neoplasms, cytoplasmic and apical luminal membrane staining are the most common patterns of immunoreactivity with peripheral membrane staining or other patterns also occurring. Plasma cells stain positive. In normal breast and other secretory epithelia, labeling is predominantly localized to apical luminal membranes.
Estrogen Receptor (ERA)	Breast carcinoma prognostic marker, metastatic carcinoma of unknown primary	Nuclear, cytoplasmic is considered non-specific Occasional lymphoid tumors and non-lymphoid neoplasms such as melanomas are labeled. Follow CAP & ASCO guidelines.
Factor VIII Related Ag (Von Willebrand Factor)	Megakaryocytic and endothelial marker	Cytoplasm as diffuse or sometimes slightly granular staining
Factor XIIIa	Dermatofibroma vs. DFSP	Cytoplasmic. Order DAB or RED.
Fascin	Hodgkins cells, dendritic cells	Cytoplasmic and membrane
Follicle Stimulating Hormone, beta (FSH,b)	Pituitary neoplasms	Cytoplasmic
Gastrin	Gastrinomas	Cytoplasmic
GATA-3	Urothelial carcinoma, breast ductal epithelium, and transitional cells	Must be nuclear, strong or moderate intensity, and non-focal in urothelial carcinoma.

Glial Fibrillary Acidic Protein GFAP	Glial tumors	Cytoplasmic Acetone fixed frozen or Bouins fixed tissues label certain neuronal structures, including axons, indicting a X-rxn w/ neurofilament
Glypican-3	Hepatocellular carcinoma vs. benign hepatocellular lesions Yolk Sac Tumor, Choriocarcinoma	Granular cytoplasmic, and membranous Patterns
Gross Cystic Disease Fluid Protein-15, AP-15, GCDFP-15 (BRST-2)	Breast carcinomas (primary & metastatic lesions), sweat gland and salivary gland marker	Cytoplasmic
Helicobacter Pylori	Helicobacter pylori infection	Individual H. pylori bacterium when present on the surface of the epithelium or in the cytoplasm of the epithelial cells. ASR
Hemoglobin A	Erythoid marker	Cytoplasmic
Hepatitis B Core Antigen (HbcAg)	Hepatitis B Core	Nuclear. Antibodies to the core antigens are detected after several weeks of infection.
Hepatitis B Surface Antigen (HbsAg)	Hepatitis B Surface	Cytoplasmic. Staining may occur in seropositive as well as seronegative patients.
HepPar1 (Hep Ab)	Hepatoma, gastric carcinoma	Displays a distinct, granular cytoplasmic staining pattern, which is occasionally ring-like and is present diffusely throughout the hepatocyte cytoplasm
HER2/NEU (HercepTest, erbb2 or Neu)	HER-2/neu overexpression for invasive breast and gastric cancers.	Follow CAP and ASCO guidelines. FDA approved kit.
Herpes Simplex Virus (HSV) I & II	Herpesvirus I & II infection	Nuclear and cytoplasmic
HMB-45, Melanosome	Melanocyte marker, angiomyolipoma	Cytoplasmic. Order DAB or RED
hMLH-1	Screening for Lynch Syndrome	Nuclear – stains normal cells and non-mutant cells
hMSH-2	Screening for Lynch Syndrome	Nuclear – stains normal cells and non-mutant cells
hMSH-6	Screening for Lynch Syndrome	Nuclear – stains normal cells and non-mutant cells
Human Chorionic Gonadotropin (hCG)	Choriocarcinoma	Cytoplasmic
Human Growth Hormone (hGH)	Pituitary neoplasms	Cytoplasmic
Human Placental Lactogen (hPL)	Germ cell tumors, trophoblastic tumors	Cytoplasmic
IgG	Plasma Cell Marker, used in ratio with IgG4 for IgG4 related diseases	Cytoplasmic
IgG4	Plasma Cell Marker, used in ratio with IgG for IgG4 related diseases	Cytoplasmic
Inhibin, Alpha	Adrenal cortical, sex-cord stromal tumors	Cytoplasmic
Insulin	Pancreatic endocrine tumors	Cytoplasmic
Kappa Light Chains	Plasmacytomas, neoplastic lymphoid tumors vs. reactive proliferations	Cell membrane and/or cytoplasm
Kappa/Lambda Double or Single Stain RNA CISH	Demonstrate clonality in leukemias, plasmacytomas, and certain non-Hodgkin lymphomas	Combination of Kappa (RED) and Lambda (DAB). Cytoplasmic. ASR

Ki-67	Cell proliferation marker	Nuclear, except in mitotic cells where the chromosomes and cytoplasm are labeled Occasional labeling of tissue components in vessel walls and
KiMart	Ki-67 and Melan A. See separate antibodies.	Ki-67 nuclear DAB and Melan A cytoplasmic RED.
Lambda Light Chains	Plasmacytomas, neoplastic lymphoid tumors vs. reactive proliferations	Cell membrane and/or cytoplasm
Luteinizing Hormone, LH	Pituitary neoplasms	Cytoplasmic
Melan-A (A103)	Melanocyte marker, adrenal cortical, sex-cord stromal tumors	Cytoplasmic The Melan-A gene is also called MART-1. Order DAB or RED
Melanoma Cocktail (MelCK)	Melanocyte marker	Cytoplasmic. Combination of HMB-45, two clones of MART-1 and Tyrosinanse antibodies. Order DAB or RED.
MIC2, CD99	PNET/Ewings sarcoma	Cell membrane
Microphthalmia Transcription Factor (MITF)	Melanocyte marker	Nuclear, cytoplasmic is not considered positive, Order DAB or RED.
MOC-31	Epithelial related antigen	Membrane
MUM1	Germinal center B cells, activated T cells, plasma cells, and melanocytes	Nuclear positivity with weak to moderate cytoplasmic staining
MYC (c-MyC)	Diffuse Large B-cell lymphomas (DLBCL)	Positive is a nuclear stain in >40% of cells staining moderate to strong.
Myeloperoxidase	Myeloid marker	Cytoplasmic Occasional staining of histiocytes was observed, possibly due to phagocytosed material
MyoD1	Rhabdomyosarcoma	Nuclear. Results of a study suggest that expression in rhabdomyosarcomas is inversely related to the degree of cellular differentiation of the tumor cells. Only
Myogenin	Rhabdomyosarcoma	Nuclear. Nuclear expression has been reported to be inversely related to the degree of cellular differentiation of rhabdomyosarcoma tumor cells
Myoglobin	Rhabdomyosarcoma	Cytoplasmic
Napsin A	Pulmonary Adenocarcinoma	Cytoplasmic
Neurofilament	Neural tumors & neurons	Cytoplasmic
Neuron Specific Enolase NSE	Can be found in virtually any type of neoplasm	Cytoplasmic. Neurons are labeled in both cytoplasm and processes.
Oct-3/4	Classic Seminoma/Dysgerminoma, Embryonal Carcinoma, Gonadoblastoma, and Intratubular Germ Cell Neoplasias	Strong nuclear reactivity, with cytoplasmic staining
p16	Cervical dysplasia	Both nuclear and cytoplasmic. Look for diffuse and intense staining. Focal and sporadic is considered negative.
p40	Pulmonary squamous cell carcinomas, more specific than p63.	Nuclear
p53 Protein	p53 tumor suppressor gene product	Usually nuclear, but cytoplasmic has been reported in some cases Sections must be cut fresh, day of staining.
p57	For classification of molar pregnancy proliferating basal cells of cervix	Nuclear stain in cytotrophoblasts and decidual cells. Hydropic abortus and partial moles=positive stromal cells. Complete moles=negative stromal cells.
P63 Antibody	Basal cells in the prostate gland, myoepithelial cells in breast,	Nuclear

p63/CK5/CK14	Stains basal cells of normal and benign prostate glands, and myoepithelial cells of breast.	p63 nuclear DAB, CK5/CK14 cytoplasmic DAB.
p504S, Alpha-Methylacyl-CoA Racemace (AMACR)	Prostate adenocarcinoma and atypical adenomatous hyperplasia	Granular/Cytoplasmic Best if used in conjunction with high molecular weight cytokeratin. Order DAB or RED. ASR
PAX-5	B-cell, lymphoma/leukemia typing	Nuclear
PIN4	See separate markers	p63 nuclear DAB, CK5/CK14 cytoplasmic DAB, & P504S RED. ASR.
Placental Alkaline Phosphatase	Germ cell tumors	Cell membrane
PMS2	Screening for Lynch Syndrome	Nuclear – stains normal cells and non-mutant cells
Progesterone Receptor, PRA	Breast prognostic marker	Nuclear, cytoplasmic is considered non-specific. Follow CAP & ASCO guidelines.
Prolactin	Pituitary neoplasms	Cytoplasmic
Prostate Cocktail	Prostate carcinoma	Combo of PAP and PSA Antibodies
Prostate Specific Antigen PSA	Prostate carcinoma	Cytoplasmic. Staining is predominantly intracytoplasmic and secretions are also frequently stained positively.
Prostatic Acid Phosphastase (PAP)	Prostate carcinoma	Cytoplasmic
S100	Melanoma, neural marker	Cytoplasmic. Order DAB or RED.
Smooth Muscle Myosin Heavy Chain (SMMHC)	Myoepithelial marker, smooth muscle differentiation	Cytoplasmic
Somatostatin	Pancreatic endocrine neoplasms	Cytoplasmic
Synaptophysin	Neuroendocrine differentiation	Cytoplasmic pattern, occasionally revealing a punctuate or granular pattern
Synuclein (alpha)	Postmortem diagnosis of Parkinson's Disease and Lewy body dementia.	Cytoplasmic (Lewy bodies, Lewy neurites).
Tau	Postmortem diagnosis of Alzheimer's disease and frontotemporal dementia.	Cytoplasmic (neurofibrillary tangles, Pick Bodies).
Terminal Deoxynucleotidyl Transferase (TdT)	Elevated levels have been reported in tumor cells of lymphoblastic lymphoma (MLLB), lymphoid blast crisis of chroni myeloid leukemias	Nuclear
Thyroglobulin	Thyroid carcinomas	Staining is confined to the lumen of thyroid follicles and the apical surface of thyrocytes. In carcinomas it may also display staining of the thyrocyte cytoplasm
Tryptase	Mast cells	Granular cytoplasmic staining pattern, corresponding to the secretory granules of mast cells
TSH,b Thyroid Stimulating Hormone, beta	Pituitary Neoplasms	Cytoplasmic
TTF-1, Thyroid Transcription Factor 1	Lung & thyroid marker, also some neuorendocrine	Nuclear
Tyrosinase	Melanocytic lesions	Cytoplasmic. Order DAB or RED.
Ubiquitin – Liver	Mallory bodies in liver	Mallory bodies in liver.
Uroplakin III	Urothelial/Transitional cells and Brenner nests of the ovary	Membranous

Vimentin	Metastatic carcinoma of unknown primary, sarcomas	Cytoplasmic
Wilms' Tumor (WT1)	Wilms' Tumor, serous carcinoma, & other tumors	Nuclear