

glycogen	Best's carmine PAS with and without diastase digestion	pink to red glycogen is PAS positive (pink) before but not after diastase digestion
<i>Histoplasma capsulatum</i>	Giemsa	reddish blue
leishmania bodies	Giemsa	reddish blue
iron	Perl's potassium ferrocyanide Prussian blue Turnbull blue Gomori's iron reaction	blue
lipids	oil-red O Sudan black B Scharlack R	orange to bright red black bright red
mast cells	Giemsa Toluidine blue Leder	metachromatic granules: magenta and blue
melanin	Fontana-Masson	black granules
mucin	miucicarmine	red
mucoprotein with acid mucopolysaccharides	Alcian blue toluidine blue mucicarmine colloidal iron PAS with diastase digestion	blue magenta red blue to light green pink; no change after diastase digestion
with neutral mucopolysaccharides		
muscle	Masson trichrome PTAH	red blue to purple
mycobacteria	acid-fast stains: Ziehl-Neelsen, Putt-Fite Kinyoun's carbol fuchsin Wade-Fite	bright red used for <i>M. leprae</i>
nerves	Bodian osmium tetroxide	axons: black myelin: black
<i>Nocardia</i>	Gram stains: Brown-Brenn Gram-Weigert MacCallam-Goodpasture GMS acid-fast stains: Ziehl-Neelsen, Putt-Fite	irregularly blue black bright red
plasma cells	Giemsa methyl green-pyronin (MGP)	cytoplasm: blue cytoplasm: red
reticulum fibers (type III collagen)	Foot Wilder Gridley	reticulum fibers, melanin, nerves: black black
<i>Rickettsia</i>	Giemsa	blue to violet
spirochetes	modified Steiner Warthin-Starry Dieterle	black

Stain

Uses

acid orcein (Pinkus')	elastic fibers: dark brown, melanin: black, hemosiderin: dark green amyloid: light blue
Alcian blue	pH 0.5-stains strongly acidic substances such as sulfated glycosaminoglycans;

	chondrotin sulfate, dermatan sulfate, and heparin pH 2.5- blue color with glycosaminoglycans and sialomucins, less intense with nucleic acids
aldehyde-fuchsin (Gomori's)	stains elastic tissue, mucosubstances pH<1 stains sulfated acid mucosubstances, not hyaluronic acid pH 1.7 stains sialomucins, elastic fibers, mast cell granules, mucins, cartilage, some fungi: blue-purple
Alizarin red S	specific reaction for Ca ⁺⁺ staining: orange-red can cross react with Ba, Cd, Sr, Pb Ca ⁺⁺ oxalate gives (-) reaction; converted to (+) with incineration
alpha-1-antichymotrypsin	histiocytes
aniline blue	muscle: red collagen: blue
ATPase	Langerhans cells, indeterminate cells, dendritic cells
auramine O immunofluorescent	acid fast bacilli
Calcofluor white	detects fungi in tissue sections and histologically
CAM 5.2	anticytokeratin
carbol fuchsin	acid fast organisms: red
cathepsin B	histiocytes
colloidal iron	binding of colloidal iron by acidic groups; carboxyl and sulfate groups of nucleic acids. AMPS: blue nuclei: red
De Galantha	urate crystals
Dieterle stain	spirochetes
dylon	amyloid
Fite	acid-fast bacilli: red leprosy: useless
Fontana-Masson silver (argentaftin)	melanin, some nerves and reticulum fibers: black nuclei: red cross reacts with argentaftin granules, formalin pigment, iron, lipofuscin
Giemsa	AMPS, mast cell granules: metachromatic purple eosinophils, leishmaniasis, Donovan bodies: red bacteria: blue
gold chloride	Langerhans cells
Gomori's methenamine-silver nitrate	fungus walls: black
Gram (Brown-Brenn)	Gram-positive bacteria: blue-purple Gram-negative bacteria: red
Gridley	<i>Coccidioides immitis</i> ***
gross cystic disease protein	apocrine cells (Paget's d.)
hematoxylin and eosin	nuclei, Ca ⁺⁺ : blue cytoplasm, collagen, nerve, fibrin: red muscle: dark red
Leder (chloracetate esterase)	naphtol-ASD-chloracetate-esterase mast cells and PMNs: red
Leib	amyloid
lipids	bromine-silver, osmic acid, PAS, sudan black: cholesterol esters and triglycerides: blue-black, P-L: gray Oil red O (unsaturated lipids: red, P-L: pink, stains unsaturated and saturated (frozen section only) If negative with bromine-silver but positive with Sudan dye, then you know lipid is exogenous such as paraffin oil granuloma
M241	Langerhans cells, endothelial cells
MAC-1	Langerhans cells
Mallory's phosphotungstic acid and hematoxylin	fibrin, inclusions of infantile digital fibromatosis
Masson's trichrome	hematoxylin, acid fuchsin, and methylene blue collagen, nuclei: blue cytoplasm, muscles, fibrin: red
Movat's pentachrome	nuclei: black elastic fibers: dark purple to black collagen: yellow ground substance: blue to bluish green fibrinoid: intense red muscle: red
mucicarmine	epithelial mucins and capsule of cryptococcus/rhinosporidosis: red (pink) acid mucopolysaccharides, Paget's cells
PAS (periodic acid-Schiff)	reactions with glycogens, starches, cellulose, mucosaccharides, glycolipids, unsaturated

	lipids, phospholipids. Reactive sites become non-reactive after previous treatment with diastase specific for glycogen. No reaction with hyaluronic acid. Stains basement membranes, fungi: red
Perls	ferric iron
Phorwhite BBU	amyloid
phosphotungstic acid-hematoxylin	nuclei: red will not demonstrate Fe ⁺⁺ (ferrous), ferritin, or Hb
RIT cardinal red #9	amyloid
RIT scarlet #5	amyloid
scarlet red, Sudan red, Sudan IV, Sudan black	lipid stains
silver bromide/osmium tetroxide	unsaturated lipids (not exogenous oils)
silver nitrate (argyrophilic) Bodian/Gomori's	melanin, reticulum fibers, nerves: black
sirus red	amyloid
thionine	acid mucopolysaccharides
Toluidine blue	AMPS, nucleic acids, mast cell granules: metachromatic purple pH 3.0 most acid mucosubstances show metachromasia pH 1.5 only sulfated substances show metachromasia
Verhoeff-van Gieson	elastic fibers: black collagen: red nuclei: blue muscles, nerves: yellow
von Kossa	Not specific for Ca ⁺⁺ . Based on recombination of silver with anion salt, carbonate, phosphate, oxalate, and reduction to metallic silver (black) with light. Ca ⁺⁺ salts usually only salt left after routine processing but urates and uric acids sources of error, can be removed by dissolving in lithium carbonate
Wade stain	atypical mycobacteria
Warthin-Starry	spirochetes and Donovan bodies: black
Ziehl-Neelson	acid fast bacilli: red

Immunofluorescence

biopsy, distant normal skin	leukocytoclastic vasculitis
biopsy, lesional recommended	EM, lichen planus
biopsy, perilesional recommended	bullous lupus erythematosus, bullous pemphigoid, cicatricial pemphigoid, dermatitis herpetiformis, EBA, herpes gestationis, linear IgA dermatosis, pemphigus, PCT
bullous pemphigoid	IgG, complement in homogenous linear pattern at dermoepidermal junction
cicatricial pemphigoid	1. IgG, complement in homogenous linear pattern at dermoepidermal junction 2. multiple Igs, complement, and/or fibrin in homogenous linear pattern at dermoepidermal junction
dermatitis herpetiformis	granular, focal IgA at dermoepidermal junction
EB simplex	anti BP ag: dermal base anti laminin: dermal base anti type IV collagen, anti-LDA-1: dermal base
EB, dystrophic	anti BP ag: epidermal roof anti laminin: epidermal roof anti type IV collagen, anti-LDA-1: epidermal roof
EB, junctional	anti BP ag: epidermal roof anti laminin: dermal base anti type IV collagen, anti-LDA-1: dermal base
EBA	1. IgG, complement in homogenous linear pattern at dermoepidermal junction 2. multiple Igs, complement, and/or fibrin in homogenous linear pattern at dermoepidermal junction
erythema multiforme	intravascular IgM, complement, &/or fibrin in granular pattern
herpes gestationis	IgG, complement in homogenous linear pattern at dermoepidermal junction
IgA	DH, linear IgA dermatosis, chronic bullous dermatosis of childhood
IgA dermatosis	IgA at epidermal cell surface

IgG	pemphigus, BP, HG, CP, EBA, LE, LP, PCT
lichen planus	multiple Igs , complement, &/or fibrin in cytooid bodies in upper dermis
lupus erythematosus, bullous	multiple Igs, complement, and/or fibrin in homogenous linear pattern at dermoepidermal junction
pemphigus	IgG, complement at epidermal cell surface
porphyria cutanea tarda	multiple Igs , complement, &/or fibrin in interstitial peivascular &/or dermoepidermal junction
split skin findings	dermis only: EBA, bullous SLE, cicatricial pemphigoid (some) epidermis & dermis: BP (rare) epidermis only: BP, cicatricial pemphigoid (some), chronic bullous dermatosis of childhood
vasculitis	intravascular IgM, complement, &/or fibrin in granular pattern

Immunohistochemistry

κ & λ chains	bone-marrow derived
AACT	bone-marrow derived
adnexal carcinoma	sweat gland keratinocyte; keratin, CEA, EMA
AE1/AE3	cytokeratin; malignant peripheral nerve sheath tumor
ALL	CD10
B-cell marker	CD10, CD19, CD20, CD22, CD45RA, light chains
bcl-2	melanocyte
Ber-H2	large cell lymphoma
bone marrow derived	CD68, CD45, CD30, CD20, CD22, CD68, κ & λ chains, CD1-5, 7, 8, HAM56, MAC 387, lysozyme, AACT
CALLA	<i>see CD10</i>
CAM 5.2	Merkel cell
carcinoma	cytokeratin +
CD1	bone-marrow derived
CD1a (T6)	thymocyte and Langerhan's cells
CD2	pan T-cell antigen
CD3	pan T-cell antigen
CD4	bone-marrow derived; T cell & macrophages, T helper cells
CD5	T-cell antigen, bone-marrow derived; B-cell subsets
CD7	bone-marrow derived; precursor T cells, T cell subsets, natural killer cells
CD8	bone-marrow derived; T cell subsets, natural killer cells, T suppresser cells
CD10 (CALLA)	precursor B cells, granulocytes; follicular cell lymphoma, ALL
CD19	pan B-cell antigen marker
CD20	pan B-cell antigen, bone-marrow derived
CD22	pan B-cell antigen, bone-marrow derived
CD25	activation & proliferation antigen
CD30 (Ki-1)	activation & proliferation antigen, bone-marrow derived; large cell lymphoma
CD34	DFSP
CD43 (Leu-22)	T cells, macrophages, granulocytes
CD45	bone-marrow derived
CD45RA	pan B-cell marker
CD68	bone-marrow derived
dermal cells	factor XIIIa, vimentin
DFSP	CD34 +, smooth muscle specific actin +/-, smooth muscle actin +/-
EMA	sweat gland keratinocyte, sebocyte
endothelium	CD34, factor VIII-related antigen, ulex europaeus, CD31

epithelial membrane antigen	perineuroma
factor XIIIa	dermal cells; DFSP
fibrous histiocytoma	CD34 +/-, smooth muscle specific actin +/-, smooth muscle actin +/-
follicular center cell lymphoma	CD10
glomus tumor	smooth muscle actin, smooth muscle specific actin +/-
HAM 56	bone-marrow derived
HHF-35	smooth muscle specific actin
HLA-DR	activation & proliferation antigen
keratinocyte, epidermal	cytokeratin, AE-1
keratinocyte, sweat gland	keratin, CEA, EMA
Ki-1	<i>see CD30</i> ; large cell lymphoma
Ki-1/CD 30 +	anaplastic large cell lymphoma, Reed-Sternberg cells of Hodgkin's d., lymphomatoid papulosis, angioimmunoblastic lymphadenopathy, peripheral T-cell lymphoma, large cell lymphoma, PLEVA, regressing atypical histiocytosis, lymphocytes exposed to phytohemagglutinin, EBV, human T-cell leukemia virus, S. aureus
Ki-67	activation & proliferation antigen
Langerhan's cells	S100, Mab 010, CD1a (OKT-6) monoclonal Ab stain, Birbeck granules (electron micrograph), S-100 Ab
Langerhans cell histiocytosis	Langerhans cell; S100, Mab 010
L26	evaluate & confirm B cell presence
large cell lymphoma	Ber-H2
leiomyosarcoma	muscle; actin, desmin
Leu-22	<i>see CD43</i>
light chains	monotypic plasma cells
lymphoma	LCA +
lymphoma panels	fixed tissue: suspected T-cell lymphoma; UCHL-1, CD30, L26, light chains frozen tissue: suspected T-cell lymphoma; CD1a, CD2, CD4, CD7, CD8, CD30, CD43 suspected B-cell lymphoma; CD2, CD20, CD22, kappa, lambda
lysozyme	bone-marrow derived
MAC 387	bone-marrow derived
malignant peripheral nerve sheath tumor	cytokeratin +/-, smooth muscle specific actin +/-, smooth muscle actin +/-, desmin +/-
mast cells	toluidine blue, Giemsa, conjugated avidin
melanocyte	S100 protein, HMB45, cathepsin D, bcl-2
melanoma	melanocyte; S100, HMB45, cathepsin D, bcl-2
Merkel cell	neuron-specific enolase, CAM 5.2, neurosecretory markers
Merkel cell carcinoma	Merkel cell; neuron-specific enolase, CAM 5.2, neurosecretory markers
metastatic cells	thyroglobulin, prostatic acid phosphatase, serotonin
muscle	actin, desmin
myoepithelial cell, myofibroblasts	muscle specific actin, vimentin, glial fibrillary acidic protein
nerve	S100 protein, Leu 7, myelin basic protein
neurofibroma	S100 +/-
neuron-specific enolase	Merkel cell; Merkel cell carcinoma, small cell carcinoma
perineuroma	epithelial membrane antigen
prostatic acid phosphatase	metastatic cells-prostatic carcinoma
rhabdomyosarcoma	muscle; actin, desmin
S-100	adipocytes, apocrine glands, carcinoid, chondrocytes, chondrosarcoma, chondroblastoma, clear

	cell sarcoma, choroma, eccrine glands (both myoepithelial cells & luminal cells), epithelial sarcoma, folliculostellate cells of adenophypophysis, glial cells, gliomas, Langerhan's cells, liposarcoma, leiomyosarcoma, melanocytes, metastatic breast carcinoma, myxomatous neurothekioma, nerve, nevus cells, osteosarcoma, Schwann cells, synovial sarcoma (some spindle cells)
SCC, poorly differentiated	cytokeratin, AE-1
sebaceous neoplasms	sebocyte; lipase, EMA
sebocyte	lipase, EMZ
serotonin	metastatic cells-carcinoid
schwannoma	S100
small cell carcinoma	neuron-specific enolase, CAM 5.2, neurosecretory markers
solitary fibrous tumor	CD34 +, smooth muscle specific actin +/-, smooth muscle actin +/-
T6	<i>see CD1a</i>
TdT	immature B & T cells
thyroglobulin	metastatic cells-thyroid carcinoma
UCHL-1	pan T-cell marker; evaluate & confirm T-cell presence, best marker in paraffin sections
vimentin	dermal cells; DFSP