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Барнаул (3852)73-04-60
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Чита (3022)38-34-83
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Ярославль (4852)69-52-93

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ATLAS ANTIBODIES

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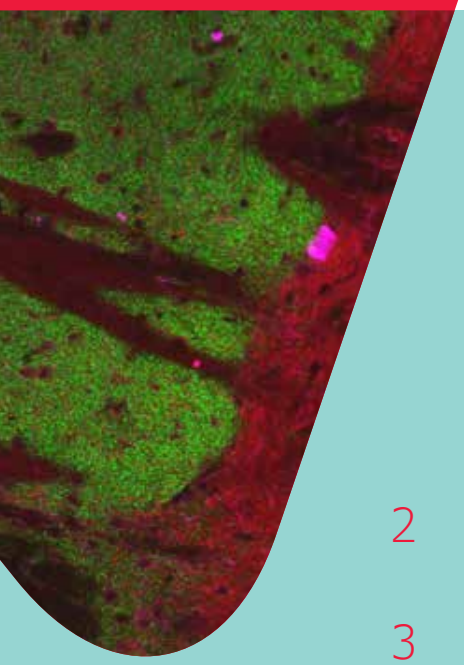
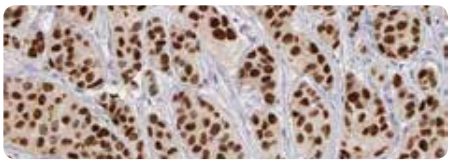
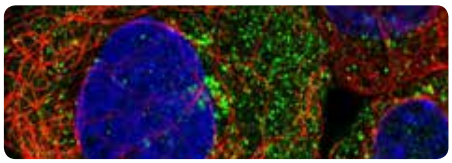


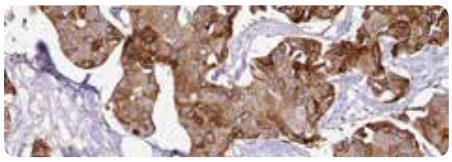
The Human Protein Atlas



Tissue Atlas



Cell Atlas



Cancer Atlas

The Human Protein Atlas is Characterizing the Human Proteome

The Human Protein Atlas project has created a complete map of protein expression in all major organs and tissues in the human body[1,2]. To accomplish this, highly specific antibodies have been developed to all protein coding human genes and protein profiling is established in a multitude of tissues and cells using tissue arrays.Applications applied are immunohistochemistry(IHC), Western blot(WB) analysis, protein array assay and immunofluorescent based confocal microscopy (ICC-IF).

The antibodies developed within the Human Protein Atlas project are carefully designed and manufactured to achieve the very highest level of specificity, reproducibility and versatility. You will find them in our catalog as Prestige Polyclonals.

The Human Protein Atlas (HPA) project was initiated in 2003 by Swedish researchers, headed by Professor Mathias Uhlén, and funded by the Knut and Alice Wallenberg foundation. It is a unique world leading effort performing systematic exploration ofthe human proteome using antibodies.

The Human Protein Atlas is divided into three major parts, the Tissue Atlas, Cell Atlas and Cancer Atlas. In different ways, the atlases show gene and protein expression data and make it easy to access, search and navigate.

The Tissue Atlas

For all proteins represented in the Tissue Atlas, the expression profiles are based on IHC analysis on a large number of human tissues. All IHC image scan be viewed in high resolution on the Tissue Atlas. The presentation of protein expression data in correlation to RNA sequencing data for each gene is included.
Tissue microarrays containing samples from 44 different normal human tissues and from 20 different cancer types are utilized within the project. The 44 normal tissues are present in triplicate samples and annotated in 76 different cell types. All normal tissue images have undergone pathology-based annotation of expression levels and are displayed on the normal Tissue Atlas presenting information regarding the expression profiles of human genes both on mRNA and protein level. The mRNA expressiondata is derived from deep sequencing of RNA (RNASeq) from 37 major different normal tissue types.

The Cell Atlas

The Cell Atlas presents subcellular localization by confocal microscopy. The results are displayed as high resolution, multicolor images of immunofluorescently stained cells. Three human cell lines for each antibody are selected for the immunofluorescence analysis. Two cell lines from a cell line panel are chosen based on RNA sequencing data and the third cell line is always U-2 OS.

The Cancer Atlas

The Cancer Atlas contains gene expression data based on protein expression patterns in a multitude of human cancer specimens. Altogether 216 different cancer samples, corresponding to the 20 most common forms of human cancer, have been analyzed for all included genes. All cancer tissue images have been manually annotated by pathologists and just as for the normal Tissue Atlas, protein data includes protein expression levels corresponding to over 15,000 genes for which there are available antibodies.

Validation in Human Neuro Tissues and Cell Lines

IHC images from human cerebellum, hippocampus, lateral ventricle wall and cerebral cortex tissues are available for the antibodies, as well as from stainings in the following brain cell lines: D341 Med, SH-SY5Y, U-138 MG, U-251 MG, U-87 MG. Malignant glioma tumor samples from up to 12 patients are presented for each antibody in the Cancer Atlas. In addition to IHC images, there are available immunofluorescence (ICC-IF) images from staining in U-251 MG cells for subcellular location information of the proteins.

HPA Mouse Brain Atlas

The protein atlas of the mouse brain project is a new addition to the Human Protein Atlas with the aim to increase the knowledge on protein expression and distribution in the mammalian brain. The basic architecture and organization of the brain, sequence of functional domains within proteins and expression of genes are largely preserved throughout mammalian evolution. This enabled a successful expansion of the current data on protein expression in 4 brain regions (cerebral cortex, lateral ventricle, hippocampus and cerebellum) in the human to over 120 brain regions and subfields containing additional cell types in the much smaller mouse brain using the same antibodies raised against human proteins.

The first release of the HPA Mouse Brain Atlas contains protein expression profiles of 80 genes selected based on global expression (brain vs. peripheral organs), differential expression in the brain (brain regions), cellular expression (neurons, glia and others) and function (physiology, development or disease).

Prestige Polyclonals

The uniqueness and low cross reactivity of Prestige Polyclonals to other proteins are due to a thorough selection of antigen regions, affinity purification on the recombinant antigen, validation using several methods and a stringent approval process.

Development

The Prestige Polyclonals are developed against recombinant human Protein Epitope Signature Tags (PrESTs) of approximately 50 to 150 amino acids. These protein fragments are designed, using a proprietary software, to contain unique epitopes present in the native protein suitable for triggering the generation of antibodies of high specificity. This is achieved by a complete human genome scanning to ensure that PrESTs with the lowest homology to other human proteins are used as antigens.

Approval

The approval of the Prestige Polyclonals relies on a combined validation of the experimental results using IHC, WB or ICC-IF, from RNA sequencing and from information obtained via bioinformatics prediction methods and literature. Since the literature is often inconclusive, an important objective of the HPA project has been to generate paired antibodies with non-overlapping epitopes towards the same protein target, allowing the results and validation of one antibody to be used to validate the other one.

Prestige Polyclonal catalog

Today, there are more than 21,000 Prestige Polyclonals and new antibodies are added each year.

The antibodies developed and characterized within the Human Protein Atlas project are supplied by Merck under the brand name Prestige Polyclonals. The product numbers of Prestige Polyclonals start with “HPA”

Prestige Monoclonals

We also provide a selected number of mouse monoclonal antibodies, under the brand name Prestige Monoclonals. The Prestige Monoclonals catalog is regularly expanding with new products every year.

Unique Features

Special care is taken in offering clones recognizing only unique non-overlapping epitopes and/or isotypes. Using the same stringent PrEST production process and characterization procedure as for the Triple A, the Prestige Monoclonals offer outstanding performance in approved applications, together with defined specificity, secured continuity and stable supply. In general they also permit high working dilutions and contribute to more standardized assay procedures.

Clone Selection

Functional characterization is performed on a large number of ELISA positive cell supernatants to select the optimal clones for each application prior to subcloning and expansion of selected hybridomas.

Epitope Mapping

Clones are epitope-mapped using synthetic overlapping peptides in a bead-based array format for selection of clones with non-overlapping epitopes only.

Isotyping

All Prestige Monoclonals antibodies are isotyped to allow for multiplexing using isotype-specific secondary antibodies.

Hybridoma Cell Cultivation

In-vitro methods are used for the production scale up phase thus replacing the use of mice for production of ascites fluid.

Antibody Characterization

The characterization of Prestige Monoclonals starts with an extensive literature search to select the most relevant and clinically significant tissues to use for IHC characterization. Often there are more than one tissue type displayed in the IHC application data for each antibody. In addition to positive stained tissue, a negative control tissue staining is also displayed and if relevant, clinical cancer tissue staining.

The Western blot (WB) characterization includes results from endogenous human cell or tissue protein lysates or optionally recombinant full-length human protein lysates.

Each Prestige Monoclonal is thus supplied with the most relevant characterization data for its specific target.

Prestige Monoclonals are developed based on the knowledge from the Human Protein Atlas with careful antigen design and extended validation of antibody performance. With precise epitope information following all monoclonals, these precise, accurate and targeted antibodies are denoted Prestige Monoclonals.

The neuroscience marker panel consists of Prestige Monoclonals antibodies designed to recognize the main anatomical and neurochemical cell types in rodent and human nervous system.

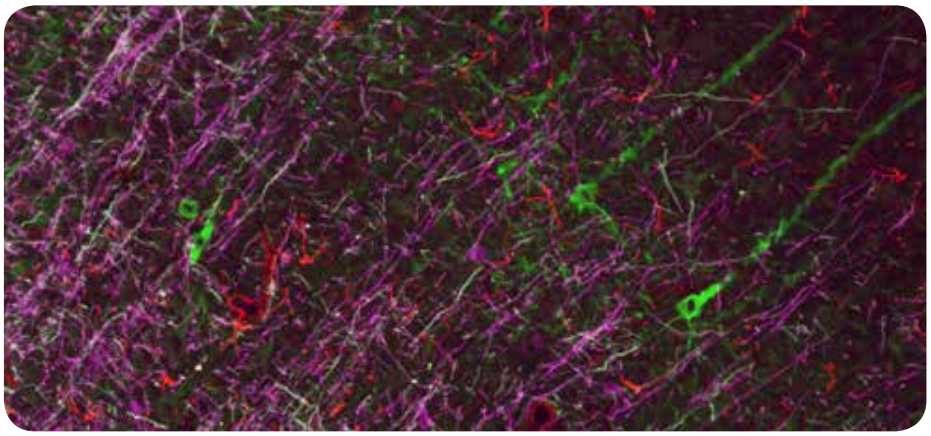


Figure 1. Multiplexed IHC-IF staining of a coronal section of rat brain visualizing neurons in green, olygodendrocytes in magenta and astrocytes in red. Anti-NEFM antibody of isotype IgG2b (AMAb91030 is used to show neurons and their processes, olygodendrocytes are detected by Anti-CNP antibody of isotype IgG2a (AMAb91068) and astrocytes by Anti-GFAP antibody of isotype IgG1 (AMAb91033).

We have taken great care to be able to offer these markers as tools for mapping the structures and cell types in the central and peripheral nervous system.

- Selected target proteins are expressed only by a single cell type
- IHC-validation in rat, mouse and human tissues
- WB-validation in mouse and human tissue lysates for the majority of the markers
- Antibodies of different isotypes, allowing for multiplexing experiments

Markers for Neural Lineage and Signaling

The Neuroscience Marker panel consists of 34 antibodies targeting neural lineage markers and signaling markers. The panel includes neural lineage markers for neurons, astrocytes and oligodendrocytes/ Schwann cells. Signaling markers target the glutamate, GABA, acetylcholine, noradrenaline, dopamine and serotonin systems.

Figure 1 shows coronal section of rat brain labeled with markers for three different cell types, including neurons, olygodendrocytes and astrocytes. The antibodies used are Anti-NEFM (AMAb91030), Anti-CNP (AMAb91068) and Anti-GFAP (AMAb91033) respectively.

In **Figure 2,** some of the major brain neurotransmitter systems are shown on sagittal mouse brain section. The image demonstrates the GABAergic system, glutamatergic system and acetylcholine system, here visualized by the Anti-GAD1 (AMAb91076), Anti-VGLUT1(AMAb91041) and Anti-CHAT (AMAb91129) antibodies respectively.

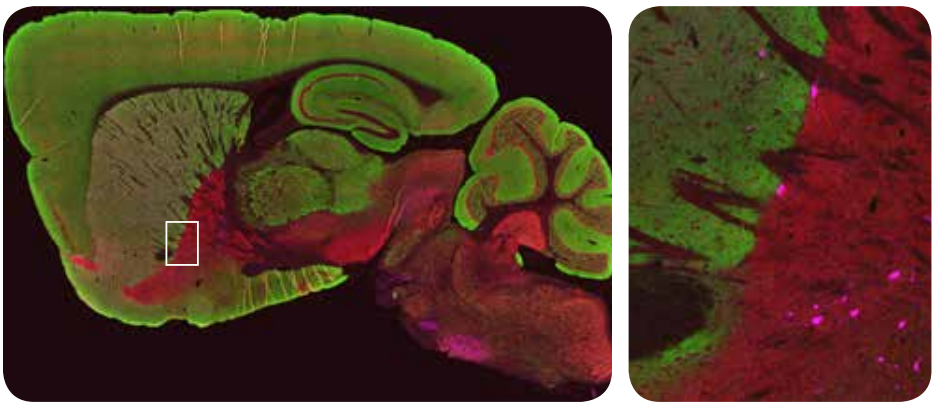


Figure 2. Left: Multiplexed IHC-IF staining of sagittal mouse brain section showing the GABAergic system in red, glutamatergic system in green and acetylcholine system in magenta. The Anti-GAD1 antibody of isotype IgG2a (AMAb91076) is used as marker for the GABAergic system, Anti-VGLUT1 antibody of isotype IgG2b (AMAb91041) for the glutamatergic system and Anti-CHAT antibody of isotype IgG1 (AMAb91129) is used to visualize the acetylcholine system. Right: High-power image demonstrates the three systems in the basal forebrain (caudate putamen/globus pallidus), using the same antibodies.

High Specificity and Interspecies Reactivity

Prestige Monoclonals Neuroscience markers show high specificity and selectivity for their target proteins. On the right, there is an example of the Anti-NET (AMAb91116) monoclonal antibody. This antibody recognizes the norepinephrine/noradrenaline transporter (NET, SLC6A2) and can be used to detect both noradrenergic cell bodies and processes in rat, mouse and human nervous system. The Anti-NET antibody AMAb91116 is highly-specific and does not show any cross-reactivity with e.g. dopamine transporter (SLC6A3, DAT).

Figure 3 shows specific staining of noradrenergic cell bodies and fibers in rat locus coeruleus (A), noradrenergic fibers in mouse cerebral cortex (B) and noradrenergic cell bodies and fibers in human locus coeruleus (C). The specificity of the AMAb91116 is further demonstrated on image D. It shows a coronal section of rat brain at the level of caudate putamen stained with Anti-NET (AMAb91116) in green and Anti-DAT (AMAb91125) in magenta. The caudate putamen is virtually devoid of noradrenaline fibers, only single ones can sometimes be observed (in green), while a dense network of thin dopamine fibers is seen in caudate putamen (in magenta).

The product numbers of Prestige Polyclonals start with ”HPA” and of Prestige Monoclonals with ”AMAb”.

Table 1. Prestige Monoclonals Neuroscience Markers

Marker for	Product Name	Product Number	Validated Applications	Isotype
Neurons	Anti-NEFM (NF160)	**AMAb91027**	IHC*, WB*	IgG1 K
Neurons	Anti-NEFM (NF160)	**AMAb91028**	IHC*, WB*	IgG1 K
Neurons	Anti-NEFM (NF160)	**AMAb91029**	IHC*, WB*	IgG2a K
Neurons	Anti-NEFM (NF160)	**AMAb91030**	IHC*, WB*	IgG2b K
Neurons	Anti-NEFH (NF200)	**AMAb91025**	IHC, WB	IgG1 K
Neurons	Anti-UCHL1 (PGP9.5)	**AMAb91145**	IHC*, WB*	IgG1
Astrocytes	Anti-GFAP	**AMAb91033**	IHC*, WB*	IgG1 K
Astrocytes	Anti-S100B	**AMAb91038**	IHC*, WB	IgG1 K
Astrocytes	Anti-GLUL	**AMAb91101**	IHC*, WB*	IgG1
Astrocytes	Anti-GLUL	**AMAb91102**	IHC*, WB*	IgG1
Astrocytes	Anti-GLUL	**AMAb91103**	IHC*, WB*	IgG2a K
Schwann cells, oligodendrocytes	Anti-MBP	**AMAb91062**	IHC*, WB*	IgG2a K
Schwann cells, oligodendrocytes	Anti-MBP	**AMAb91063**	IHC*, WB*	IgG1
Schwann cells, oligodendrocytes	Anti-MBP	**AMAb91064**	IHC*, WB*	IgG1
Oligodendrocytes	Anti-MOG	**AMAb91066**	IHC*, WB	IgG1
Oligodendrocytes	Anti-MOG	**AMAb91067**	IHC*, WB	IgG1
Oligodendrocytes	Anti-CNP	**AMAb91068**	IHC*, WB*	IgG2a K
Oligodendrocytes	Anti-CNP	**AMAb91069**	IHC*, WB*	IgG1
Oligodendrocytes	Anti-CNP	**AMAb91072**	IHC*, WB*	IgG2b K
Acetylcholine neurons	Anti-CHAT	**AMAb91130**	IHC*	IgG2b
Acetylcholine neurons	Anti-CHAT	**AMAb91129**	IHC*	IgG1
Glutamate neurons	Anti-SLC17A7 (VGLUT1)	**AMAb91041**	IHC*, WB	IgG2b K
Glutamate neurons	Anti-SLC17A6 (VGLUT2)	**AMAb91081**	IHC*	IgG1
Glutamate neurons	Anti-SLC17A6 (VGLUT2)	**AMAb91086**	IHC*	IgG1
GABA neurons	Anti-SLC32A1 (VGAT)	**AMAb91043**	IHC*	IgG1 λ
GABA neurons	Anti-GAD1 (GAD67)	**AMAb91076**	IHC*, WB	IgG2a K
GABA neurons	Anti-GAD1 (GAD67)	**AMAb91078**	IHC*, WB	IgG1
GABA neurons	Anti-GAD1 (GAD67)	**AMAb91079**	IHC*, WB*	IgG2b K
GABA neurons	Anti-GAD2 (GAD65)	**AMAb91048**	IHC*, WB*	IgG1 K
Dopamine neurons	Anti-SLC6A3 (DAT)	**AMAb91125**	IHC*	IgG1
Dopamine neurons	Anti-DDC	**AMAb91089**	IHC*, WB	IgG1
Noradrenaline neurons	Anti-SLC6A2 (NET)	**AMAb91116**	IHC*	IgG1
Dopamine and noradrenaline neurons	Anti-TH	**AMAb91112**	IHC*	IgG1
Serotonin neurons	Anti-TPH2	**AMAb91108**	IHC*	IgG1

* Validated for human and rodent samples

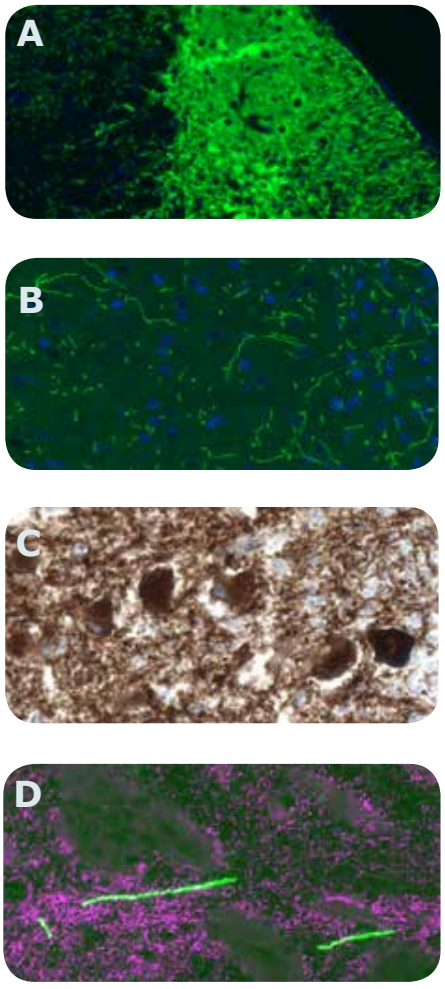
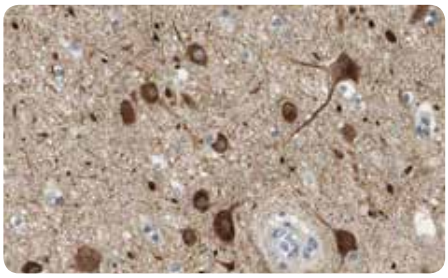


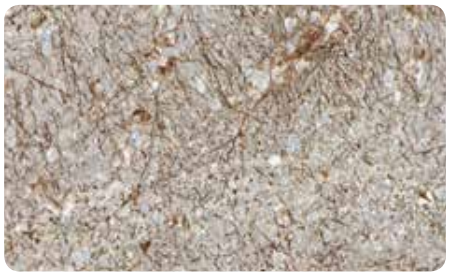
Figure 3. IHC-IF (A, B, D) and bright-filed (C) IHC staining demonstrating specificity and selectivity of Anti-NET antibody (AMAb91116) in rat (A, D), mouse (B) and human (C) brain. Staining with Anti-NET (AMAb91116) is shown in green (A, B, D) and in brown (C). DAT immunoreactivity is visualized in magenta using Anti-DAT antibody (AMAb91125).

Signaling

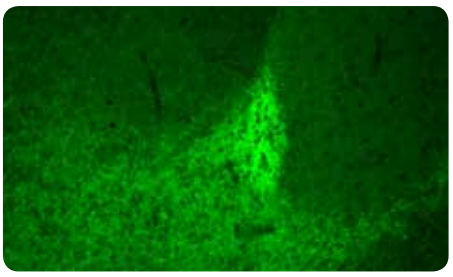
Immunohistochemical staining of rat brain (left) and mouse cholinergic basal fore-brain (right) using Anti-CHAT antibody (HPA048547) shows strong immunoreactivity in cholinergic cell bodies and terminals. High power image in the lower right corner demonstrates ChAT immunoreactivity in the motor end-plates in rat skeletal muscle. ChAT=choline O-acetyltransferase, enzyme catalyzing biosynthesis of acetylcholin.



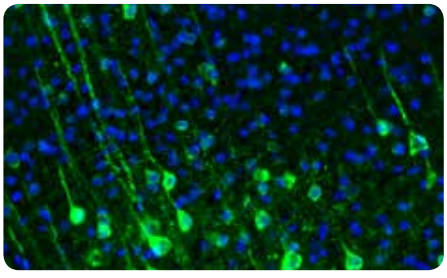
The Anti-MGLUR1 antibody (HPA015701) against glutamate receptor, metabotropic 1 strongly labels cortical perikarya, shown by IHC in human cerebral cortex tissue.



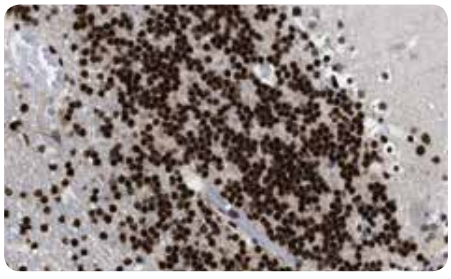
The Anti-KIF11 antibody (HPA010568) against Kinesin family member 11 strongly labels fibers in human hippocampus tissue.

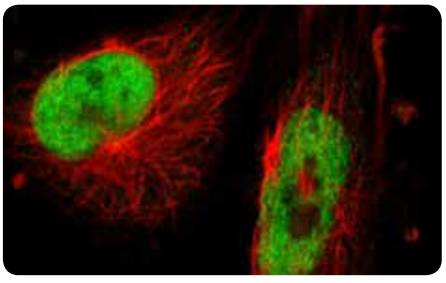


The gamma-aminobutyric acid (GABA) A receptor, alpha 3 (Anti-GABRA3) antibody (HPA000839) strongly labels fibers in various brain regions including the rat central amygdala.



Calmodulin-dependent protein kinase II beta is expressed in various neuron populations in the mouse brain including pyramidal neurons in the somatosensory cortex. This is illustrated using the Anti-CAMK2B antibody (HPA026307).





The cAMP responsive element binding protein 1 is strongly expressed in the granular layer of the cerebellum and in human neuronal glioblastoma U251 cells. This is illustrated using the Anti-CREB1 antibody (HPA019150).

Product Name	Product Number	Applications	Antigen seq identity to mouse/rat
Anti-ATF2	HPA022134	IHC,WB*,ICC-IF	99 / 99%
Anti-ATF3	AMAb90909	IHC	92 / 92%
Anti-ATF3	HPA001562[1-3]	IHC,WB*,ICC-IF	92 / 92%
Anti-ATP1B1	HPA012911[4]	IHC,WB	93 / 93%
Anti-ATP1B2	HPA010698[5]	IHC	96 / 88%
Anti-CAMK2B	HPA026307	IHC,WB*	96 / 96%
Anti-CAMK2D	HPA026281	IHC	100 / 97%
Anti-C-FOS	HPA018531[6]	IHC,WB*,ICC-IF	94 / 94%
Anti-CHAT	AMAb91130	IHC	96 / 96%
Anti-CHAT	HPA048547	IHC	96 / 96%
Anti-CHRM1 (M1 mAChR)	HPA014101[7]	IHC	98 / 97%
Anti-CHRM2 (M2 AChR)	HPA029795	IHC	88 / 86%
Anti-CLIC4	HPA008019[8,9]	IHC,WB,ICC-IF	98 / 97%
Anti-CREB1	HPA019150	IHC,WB*,ICC-IF	100 / 100%
Anti-DAT	HPA013602	IHC	85 / 85%
Anti-DDC	AMAb91089	IHC,WB	90 / 88%
Anti-DDC	HPA017742	IHC,WB*,ICC-IF	90 / 88%
Anti-EAAC1	HPA020086	IHC	77 / 79%
Anti-EAAT2	HPA009172	IHC	87 / 89%
Anti-GABRA3	HPA000839[10]	IHC,WB*	91 / 93%
Anti-GABRB1	HPA051297	IHC	97 / 100%
Anti-GABRG1	HPA035622[11]	IHC	96 / 94%
Anti-GAD1 (GAD67)	AMAb91076	IHC,WB	
Anti-GAD1	HPA058412	IHC,WB	94 / 94%
Anti-GAD2	AMAb91048	IHC,WB*	
Anti-GAD2	HPA044637	IHC	84 / 88%
Anti-GAT1		IHC	98 / 98%
Anti-GAT3	HPA013341	IHC,WB	85 / 87%
Anti-GLUR2 (AMPA2)	HPA037981	IHC	100 / 100%
Anti-HTR2A	HPA008441[12,13]	IHC	95 / 97%
Anti-KCC4	HPA014011	IHC,WB*	84 / 82%
Anti-KCNJ5 (KIR3.4)	HPA041652	IHC,WB	89 / 89%
Anti-KCNN2 (KCA2.2)	HPA017353[14]	IHC	96 / 97%
Anti-KIF11	HPA010568[15]	IHC,WB*,ICC-IF	88 / 83%
Anti-KIF17	HPA032085	IHC,ICC-IF	85 / 82%
Anti-KIF18A	HPA039312[16]	IHC,WB,ICC-IF	80 / 82%
Anti-KIF1A	HPA005442	IHC	95 / 96%
Anti-KIF1C	HPA024602	IHC,WB*,ICC-IF	81 / 83%
Anti-KIF21B	HPA027249	IHC	91 / 93%
Anti-KIF26B	HPA028562	IHC,ICC-IF	88 / 80%
Anti-KIF4A (KIF4A & B)	HPA034745	IHC,WB,ICC-IF	64 / 63%
Anti-KIF5A	HPA004469	IHC,WB*	91 / 88%
Anti-KIF5C	HPA035210	IHC,WB,ICC-IF	100/100%
Anti-KIF7	HPA043145	IHC,WB	69 / 69%

* WB both in human and rodent samples

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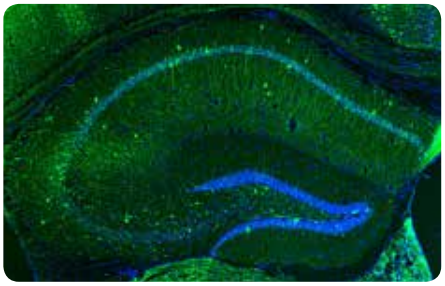
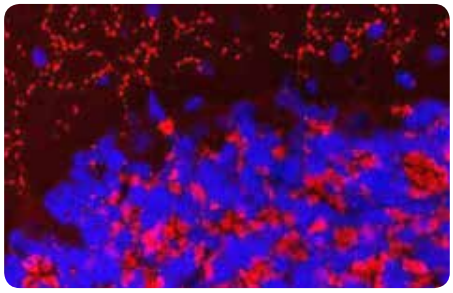
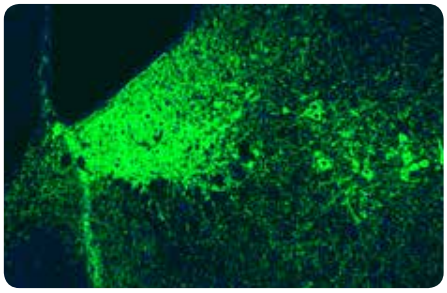
Signaling (continued)



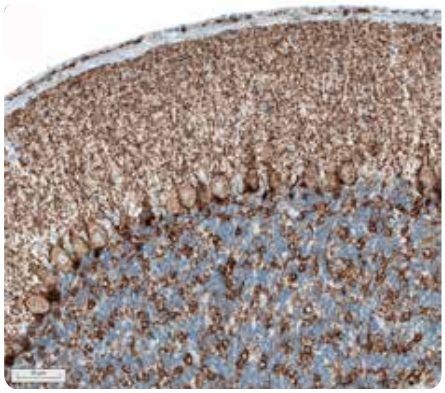
The GTPase-activating protein RAP1GAP is expressed in a subset of neurons including hippocampal interneurons in the mouse brain. This is illustrated using the Anti-RAP1GAP antibody (HPA001922).

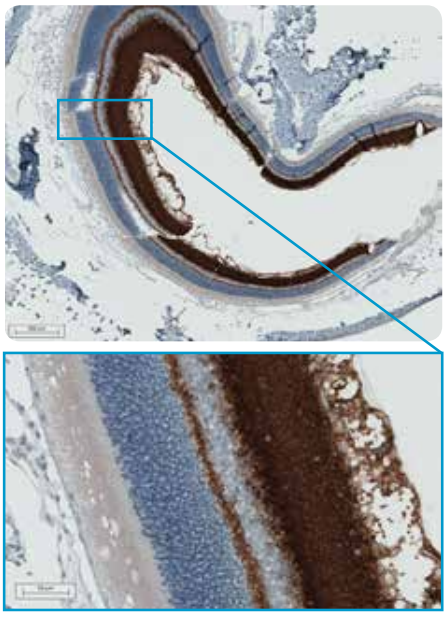


Vesicular glutamate transporter 2 (SLC17A6/VGluT2) mediates the uptake of glutamate into synaptic vesicles at presynaptic nerve terminals. Here shown using the Anti-SLC17A6 antibody (HPA039226) on rat cerebellum section.

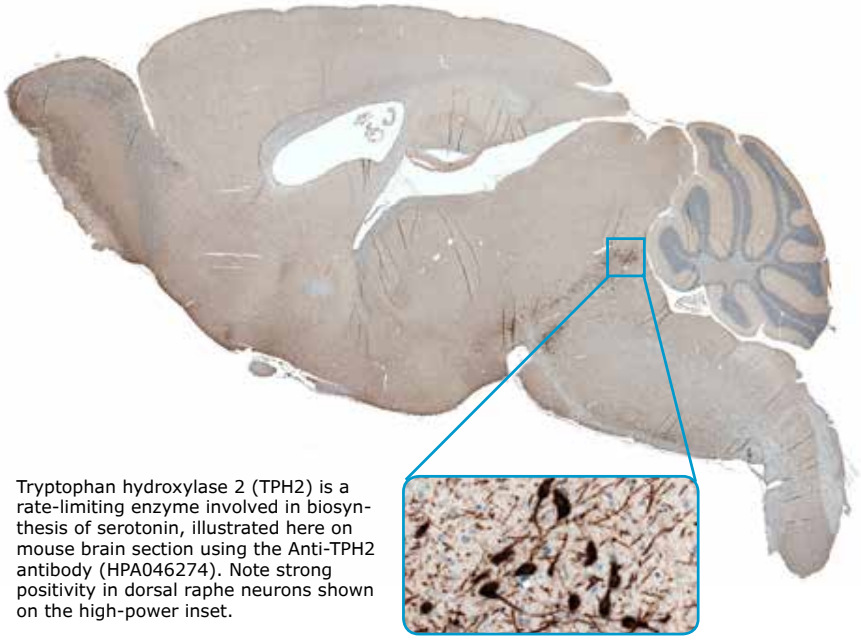


The noradrenaline transporter (NET/SLC6A2) is responsible for reuptake of noradrenaline into presynaptic nerve terminals and stains noradrenergic fibers throughout the brain and labels noradrenergic neurons in the rat locus coeruleus. Illustrated here by the Anti-SLC6A2/NET antibody (AMAb91116).

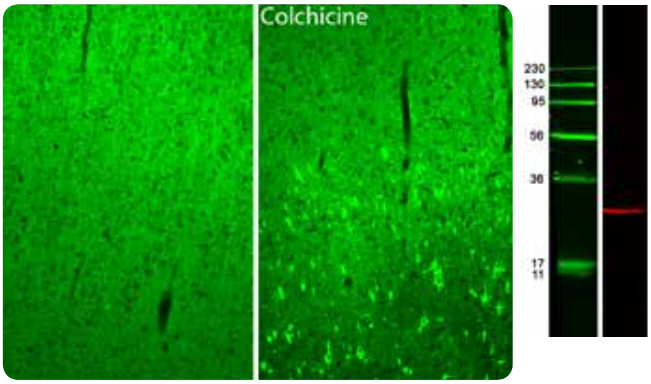




Vesicular inhibitory amino acid transporter SLC32A1 is crucial for uptake of the inhibitory neurotransmitters GABA and glycin into the synaptic vesicles. The micrographs show strong immunoreactivity in rat cerebellar cortex and retina using the Anti-SLC32A1 antibody (HPA058859).



Tryptophan hydroxylase 2 (TPH2) is a rate-limiting enzyme involved in biosynthesis of serotonin, illustrated here on mouse brain section using the Anti-TPH2 antibody (HPA046274). Note strong positivity in dorsal raphe neurons shown on the high-power inset.



The Anti-SNAP25 antibody (HPA001830)against synaptosomal-associated protein 25 strongly labels the synaptic field in the rat somatosensory cortex. Inhibition of axonal transport with colchicine arrests SNAP25 in perikarya.

In Western Blot, the HPA001830 antibody recognizes a band of expected target size (23 kDa).

Product Name	Product Number	Applications	Antigen seq identity to mouse/rat
Anti-KIFAP3	HPA023742	IHC	100 / 100%
Anti-KCNC2	HPA019664	IHC,WB	71 / 99%
Anti-MAPK1 (ERK)	HPA030069	IHC,WB,ICC-IF	100 / 100%
Anti-MAPK3 (ERK1)	HPA005700	IHC,WB*	98 / 98%
Anti-MGLUR1	HPA015701	IHC	80 / 80%
Anti-MGLUR8	HPA051481	IHC	95 / 90%
Anti-NCS1	HPA019713	IHC,WB,ICC-IF	100 / 100%
Anti-PRKCA	HPA006563	IHC,WB*,ICC-IF	99 / 99%
Anti-PRKCH	HPA053709	IHC,ICC-IF	97 / 64%
Anti-PNMT	HPA051005	IHC,WB	89 / 92%
Anti-PRKACB (PKACB)	HPA029754	IHC	73 / 76%
Anti-PRKCZ	HPA021851	IHC,WB	94 / 94%
Anti-RAB3A	HPA003160	IHC	99 / 99%
Anti-RAP1GAP	HPA001922[17]	IHC,WB*	92 / 91%
Anti-RAP1GAP2	HPA022896[18]	IHC,WB*,ICC-IF	94 / 95%
Anti-SLC17A6 (VGLUT2)	AMAb91981	IHC	85 / 85%
Anti-SLC17A6 (VGLUT2)	HPA039226	IHC,WB	85 / 85%
Anti-SLC17A7 (VGLUT1)	AMAb91041	IHC,WB	94 / 94%
Anti-SLC17A7 (VGLUT1)	HPA063679	IHC,WB	94 / 94%
Anti-SLC22A2	AMAb90792	IHC	84 / 77%
Anti-SLC22A2	HPA008567[19]	IHC,WB	84 / 77%
Anti-SLC32A1 (VGAT)	AMAb91943	IHC	95 / 93%
Anti-SLC32A1 (VGAT)	HPA058859	IHC	95 / 93%
Anti-SLC6A2 (NET)	AMAb91116	IHC	
Anti-SLC6A3 (DAT)	AMAb91125	IHC	85 / 85%
Anti-SLC6A3 (DAT)	HPA013602	IHC,WB	85 / 85%
Anti-SNAP25	HPA001830[20-22]	IHC,WB,ICC-IF	100 / 100%
Anti-SNAP29	HPA031823	IHC	89 / 92%
Anti-SST (SOM)	HPA019472	IHC,WB	98 / 98%
Anti-STXBP1	HPA008209	IHC,WB*,ICC-IF	100 / 100%
Anti-STXBP6	HPA003552	IHC,WB	99 / 99%
Anti-SYNGR1	HPA029673	IHC	90 / 88%
Anti-SYNPR	HPA061671	IHC,WB	97 / 97%
Anti-SYP	HPA002858	IHC,WB	83 / 83%
Anti-SYT1	HPA008394	IHC,WB	100 / 100%
Anti-SYT12	HPA011006	IHC,WB*	96 / 98%
Anti-SYT13	HPA046224	IHC	96 / 93%
Anti-SYT16	HPA004199	IHC,WB	95 / 95%
Anti-TGFA	HPA042297	IHC,WB	93 / 93%
Anti-TH	AMAb91112	IHC	88 / 88%
Anti-TH	HPA061003	IHC	88 / 88%
Anti-TPH2 (NTPH)	AMAb91108	IHC	100 / 100%
Anti-TPH2 (NTPH)	HPA046274	IHC	100 / 100%
Anti-VAMP4	HPA050418	IHC,WB,ICC-IF	100 / 100%
Anti-VAMP7	HPA036733[23]	IHC,ICC-IF	98 / 93%

* WB both in human and rodent samples

16. Stadler C *et al.* Immunofluorescence and fluorescent-protein tagging show high correlation for protein localization in mammalian cells. *Nat Methods,* 2013 Apr; 10(4):315-23. Epub 2013/02/24.

17. Mulder J *et al.* Tissue Profiling of the Mammalian Central Nervous System Using Human Antibody-based Proteomics. *Mol Cell Proteomics,* 2009 Jul; 8(7):1612-1622. Epub 2009/04/7.

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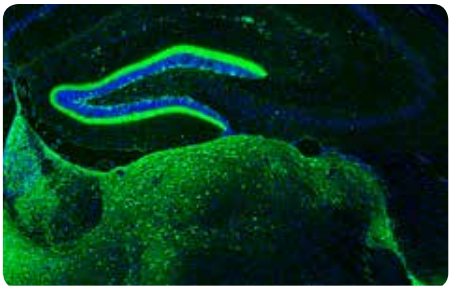
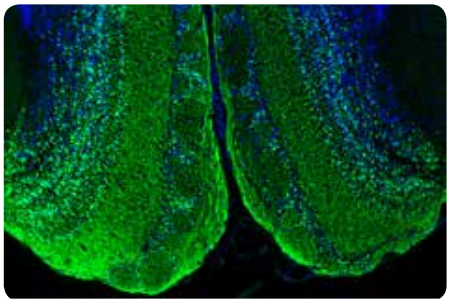
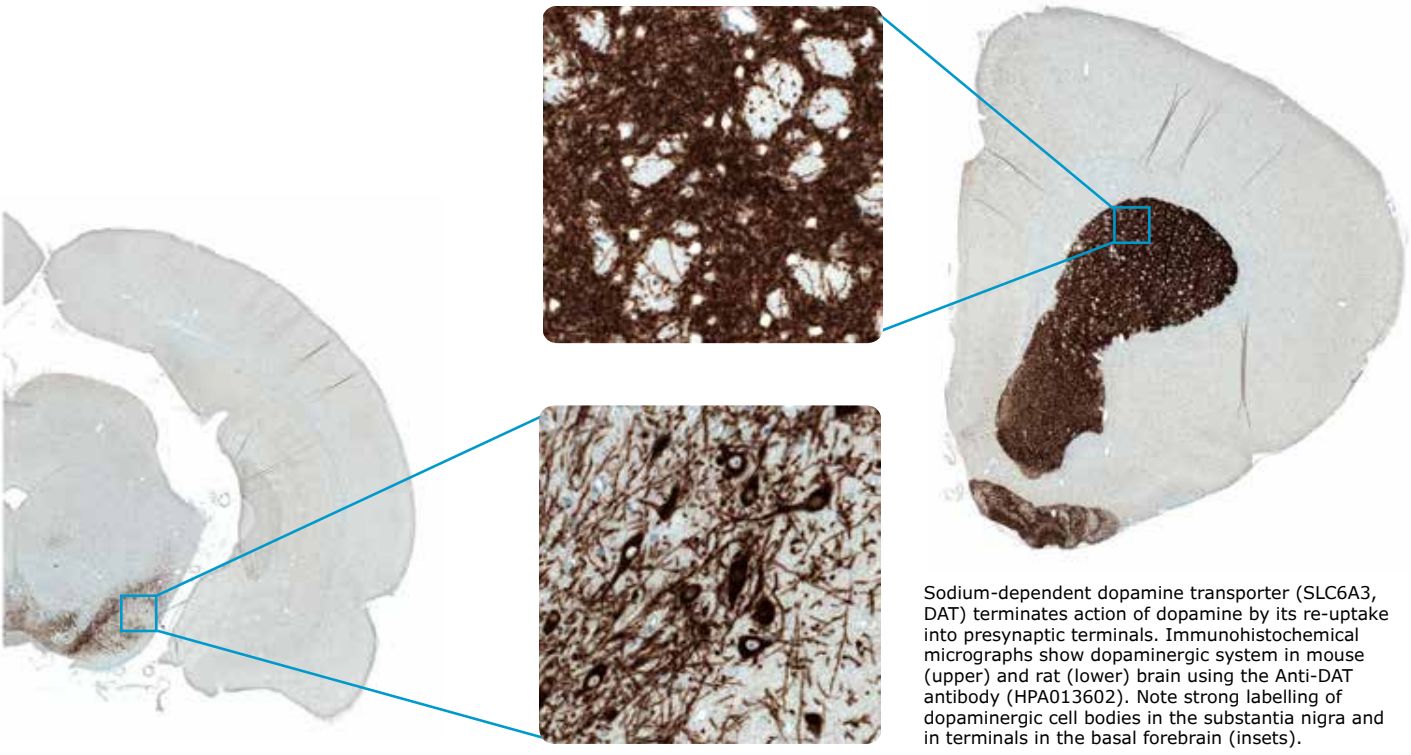
Signaling (continued)



Calretinin is a neuron specific EF-hand calcium binding protein expressed in subsets of neurons throughout the nervous system. The image shows the labeling of a mouse hippocampus and dorsal thalamus using the Anti-CALB2 antibody HPA007305. Note the strong labeling in the dentate gyrus.



Secretagogin is a newly discovered EF-hand calcium binding protein strongly expressed in the mouse olfactory bulb. Here visualized using the Anti-SCGN antibody HPA006641.



Sodium-dependent dopamine transporter (SLC6A3, DAT) terminates action of dopamine by its re-uptake into presynaptic terminals. Immunohistochemical micrographs show dopaminergic system in mouse (upper) and rat (lower) brain using the Anti-DAT antibody (HPA013602). Note strong labelling of dopaminergic cell bodies in the substantia nigra and in terminals in the basal forebrain (insets).

Neural Lineage Markers

Product Name	Product Number	Subcategory	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-ACTN1	HPA006035[1]	cytoskeleton	IHC,WB*	98 / 99%
Anti-ACTN4	HPA001873	cytoskeleton	IHC,WB*,ICC-IF	99 / 98%
Anti-AIF	HPA049234[2]	microglia	IHC	84 / 84%
Anti-CALB1 (CB)	HPA023099	calcium binding protein	IHC,WB,ICC-IF	98 / 99%
Anti-CALB2 (CR)	HPA007305	calcium binding protein	IHC,WB*,ICC-IF	100 / 100%
Anti-CD68	AMAb90874	microglia	IHC,WB	76 / 76%
Anti-CD68	HPA048982[3]	microglia	IHC	76 / 76%
Anti-CNP	AMAb91068	oligodendrocytes	IHC,WB*	76 / 77%
Anti-CNP	HPA023280	oligodendrocytes	IHC,WB,ICC-IF	76 / 77%
Anti-EZR	AMAb90976	astroglia	IHC,WB,ICC-IF	93 / 93%
Anti-EZR	HPA021616[4,5]	astroglia	IHC,WB*,ICC-IF	93 / 93%
Anti-GFAP	AMAb91033	astrocytes	IHC,WB	98 / 100%
Anti-GFAP	HPA056030	astrocytes	IHC,WB	98 / 100%
Anti-GLUL	AMAb91101	astrocytes	IHC,WB*	95 / 53%
Anti-GLUL	HPA007316[6,7]	astrocytes	IHC,WB	95 / 53%
Anti-ICAM5	HPA009083	adhesion molecule	IHC,ICC-IF	85 / 86%
Anti-INA	HPA008057	cytoskeleton	IHC,WB*,ICC-IF	83 / 84%
Anti-ITGAM (CD11b)	AMAb90911	microglia	IHC,WB	67 / 68%
Anti-ITGAM 11920(CD11b)	HPA002274[8,9]	microglia	IHC,WB	67 / 68%
Anti-MAP1A	HPA039064	cytoskeleton	IHC	60 / 52%
Anti-MAP1B	HPA022275[10]	cytoskeleton	IHC,ICC-IF	85 / 86%
Anti-MAP2	HPA008273[11]	cytoskeleton	IHC,ICC-IF	96 / 96%
Anti-MBP	AMAb91062	Schwann cells	IHC,WB	97 / 97%
Anti-MBP	HPA049222	Schwann cells	IHC,WB	97 / 97%
Anti-MCAM	HPA008848	adhesion molecule	IHC	75 / 73%
Anti-MKI67 (Ki67)	AMAb90870	progenitors	IHC	68 / 68%
Anti-MKI67 (Ki67)	HPA000451[12.13]	progenitors	IHC,ICC-IF	66 / 67%
Anti-MOG	AMAb92066	oligodendrocytes	IHC,WB	91 / 89%
Anti-MOG	HPA021873	oligodendrocytes	IHC,WB	91 / 89%
Anti-MYO5A	HPA001356	cytoskeleton	IHC,ICC-IF	99 / 98%
Anti-NCAM2	HPA030900[13]	adhesion molecule	IHC,ICC-IF	89 / 91%
Anti-NECAB1	AMAb90801	calcium binding protein; interneurons	IHC,WB	98 / 98%
Anti-NECAB1	HPA023629[14]	calcium binding protein; interneurons	IHC,WB	98 / 98%
Anti-NECAB2	AMAb90808	calcium binding protein; interneurons	IHC	85 / 84%
Anti-NECAB2	HPA013998[14]	calcium binding protein; interneurons	IHC,ICC-IF	98 / 97%

* WB both in human and rodent samples

1. Stadler C *et al.* Immunofluorescence and fluorescent-protein tagging show high correlation for protein localization in mammalian cells. *Nat Methods* , 2013 Apr; 10(4):315-23. Epub 2013 Feb 24.

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Nature June 01, 2015.

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Nature June 01, 2015.

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12. Pohler E *et al*. Haploinsufficiency for AAGAB causes clinically heterogeneous forms of punctate palmoplantar keratoderma. *Nat Genet* 2012 Oct 14;44(11):1272-6.

13. Li S *et al*. Endothelial VEGF Sculpts Cortical Cytoarchitecture. *J Neurosci* 2013 Sep 11; 33(37):14809-14815.

Neural Lineage Markers (continued)

13. Rodrigues RM *et al.* Human Skin-Derived Stem Cells as a Novel Cell Source for In Vitro Hepatotoxicity Screefning of Pharmaceuticals. *Stem Cells Dev* 2014/01/01 23(1):44-55. Epub 2013/08/17.

14. Zhang MD *et al.* Neuronal calcium-binding proteins 1/2 localize to dorsal root ganglia and excitatory spinal neurons and are regulated by nerve injury. *Proc Natl Acad Sci USA* 2014 Mar 25;111(12):E1149-58.

15. Häggmark A *et al.* Plasma profiling reveals three proteins associated to amyotrophic lateral sclerosis. *Ann Clin Transl Neurol,* 2014/08/01; 1(8):544-553. Epub 2014/07/14.

16. Bachmann J et al. Affinity Proteomics Reveals Elevated Muscle Proteins in Plasma of Children with Cerebral Malaria. *PLoS Pathog* 1/01/01 10(4):e1004038. Epub 2014/04/17.

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18. Bergmann O *et al.* The age of olfactory bulb neurons in humans. *Neuron* 2012 May 24;74(4):634-9.

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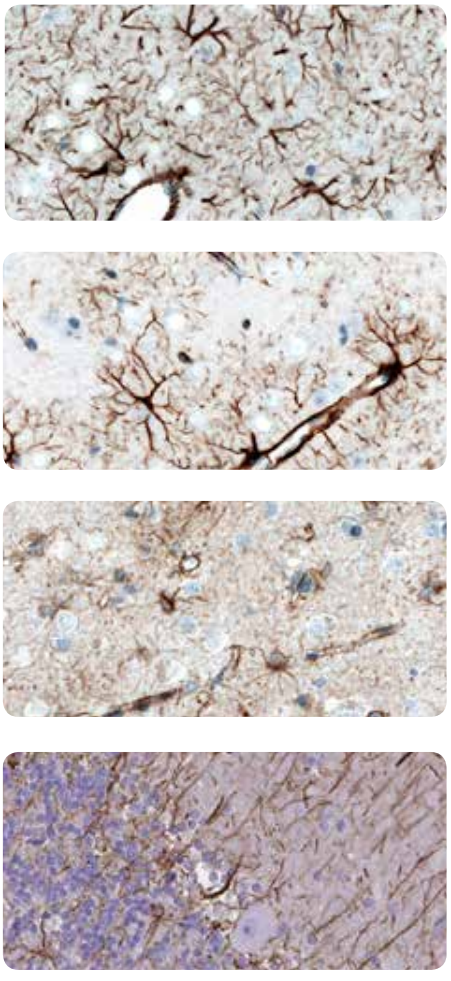
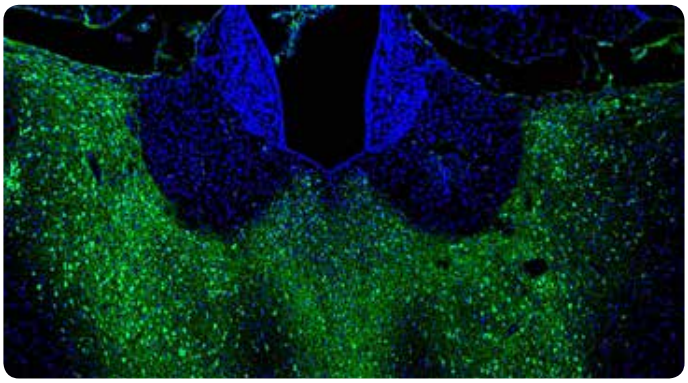
Product Name	Product Number	Subcategory	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-NEFH (NF200)	AMAb91025	neurons	IHC,WB	88 / 94%
Anti-NEFH (NF200)	HPA061615	neurons	IHC,ICC-IF	88 / 94%
Anti-NEFM (NF160)	AMAb91027	neurons	IHC,WB*	98 / 98%
Anti-NEFM (NF160)	HPA022845[15,16]	cytoskeleton	IHC	98 / 98%
Anti-NLGN1	HPA006680	adhesion molecule	IHC,WB	98 / 98%
Anti-PBK	HPA005753	progenitors	IHC,WB*,ICC-IF	91 / 94%
Anti-PTPRC	AMAb90518	microgila	IHC,WB	35 /37%
Anti-PTPRC	HPA000440[17]	microgila	IHC,WB	35 /37%
Anti-RBFOX3	HPA030790[18,19]	neuron nuclear marker	IHC,WB,ICC-IF	93 / 94%
Anti-S100A8	HPA024372	macrophages	HC,WB	56 / 60%
Anti-S100B	AMAb91038	astrocytes	IHC,WB	99 / 98%
Anti-S100B	HPA015768[20-22]	S100 calcium binding protein B	IHC,WB,ICC-IF	99 / 98%
Anti-SCGN	AMAb90630[23]	calcium binding protein;interneu-rons	IHC,WB	96 / 96%
Anti-SCGN	HPA006641[14,24,25]	calcium binding protein;interneu-rons	IHC	96 / 96%
Anti-UCHL1	AMAb91145	neurons	IHC,WB*	97 / 97%
Anti-UCHL1	HPA005993[27,28]	neurons	IHC,WB*,ICC-IF	97 / 97%

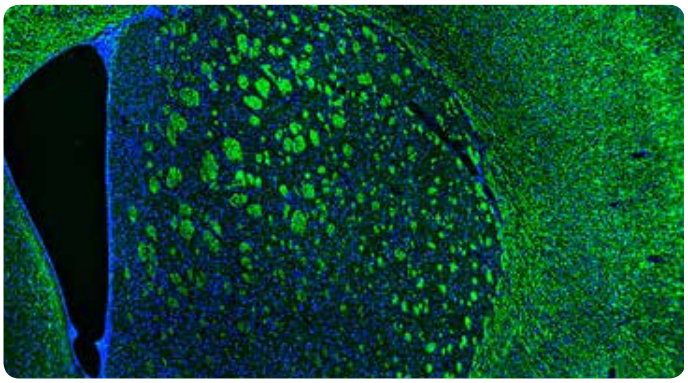
* WB both in human and rodent samples



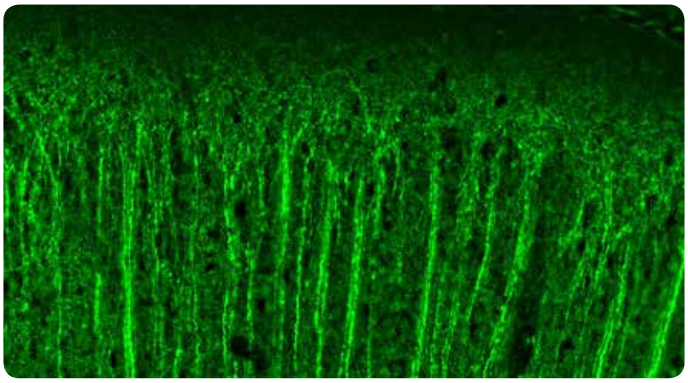
Glial fibrillary acidic protein (GFAP) is a cell-specific marker for astrocytes. Here illustrated by the Anti-GFAP antibody HPA056030 in rat cerebral cortex (upper left), mouse cerebral cortex (upper right), human cerebral cortex (lower left) and human cerebellum (lower right) tissue.



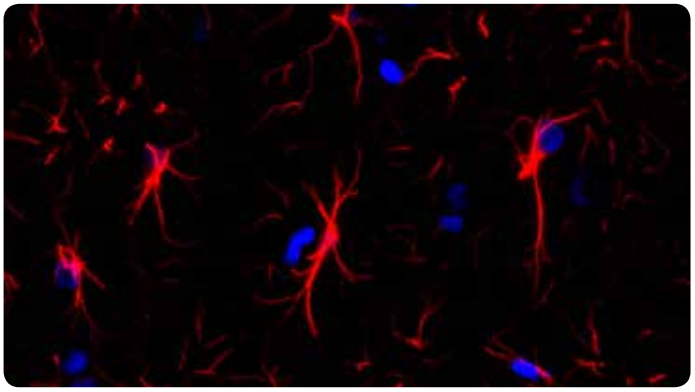
Distribution of NECAB1 (green) in the mouse dorsal medial thalamus. The Prestige Monoclonal Anti-NECAB1 antibody AMAb90801 strongly labels neurons and their processes in the paraventricular and mediodorsal thalamic nuclei. Blue is the nuclear staining Hoechst.



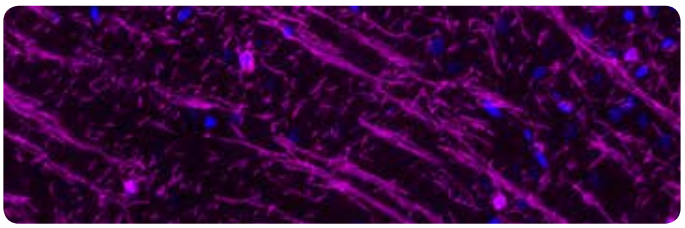
The image shows Anti-INA antibody (HPA008057) targeting internexin neuronal intermediate filament protein alpha (INA). Note the strong labeling of axons in striatal nerve bundles in the mouse brain.

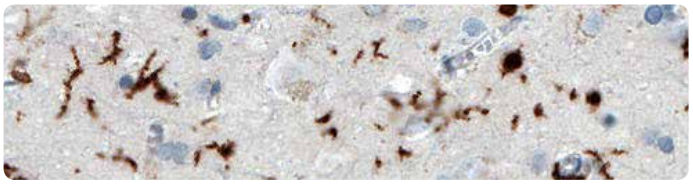


Anti-MAP2 antibody (HPA008273) against microtubule-associated protein 2 (MAP2) strongly labels dendrites in the mouse cortex.

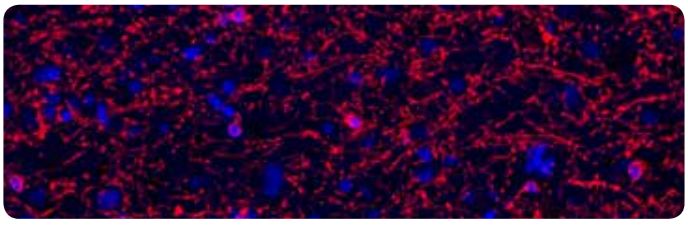


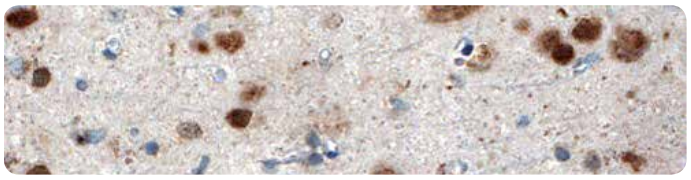
Glial fibrillary acidic protein (GFAP) is a cell specific marker distinguishing astrocytes from the other glial cells in the central nervous system. Labelling with the Anti-GFAP antibody HPA056030 shows astrocytes in rat cerebral cortex.



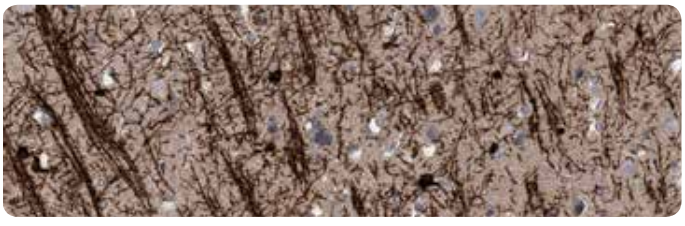


The Anti-Allograft inflammatory factor 1 (AIF1) antibody (HPA049234) shows immunoreactivity in the microglia cells in human cortex.

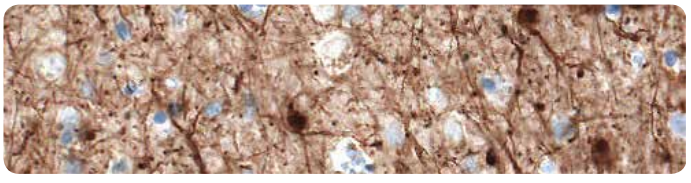




RBFOX3 (=NeuN) is a neuronal specific nuclear protein which can be used to distinguish neurons from glial cells in tissue cultures and sections. Illustrated here by staining with the Anti-RBFOX3 antibody (HPA030790) in human cerebral cortex.

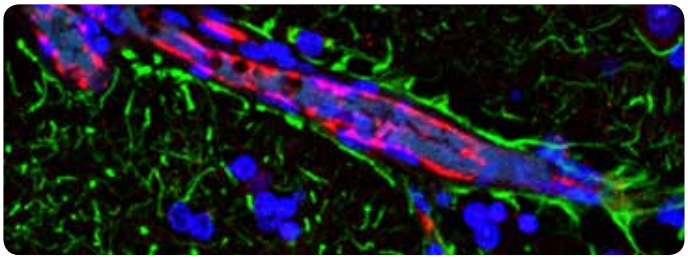


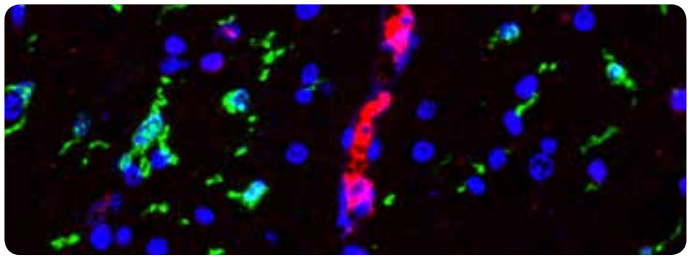
2’,3’-cyclic-nucleotide 3’-phosphodiesterase (CNP) is a marker for oligodendrocytes in the central nervous system. Illustrated here by the Anti-CNP antibody HPA023280 (IHC) and HPA023266 (IF) in human cerebral cortex (left, middle) and in rat cerebral cortex (right).



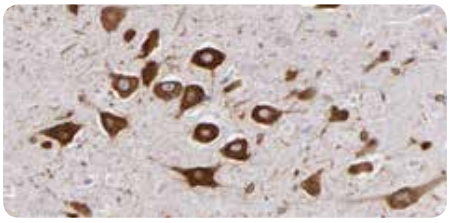
The Anti-Neurofilament medium polypeptide (NEFM) antibody (HPA022845) shows positivity in a subset of neuronal cells in human cerebral cortex.

Aging and Neurological Disorders

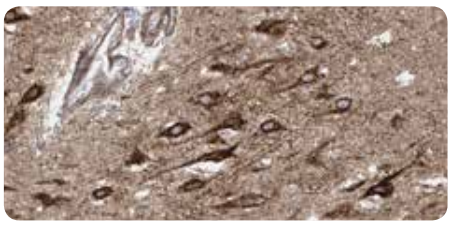


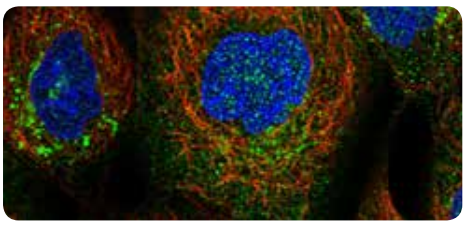


Complement component C3 plays an important role in the activation of complement system and has been associated with neuro-inflammation. The Anti-C3 antibody (HPA020432) strongly labels capillaries in MS affected brain tissue. (Blue = Hoechst, Green = IBA1 or GFAP (clone GA5), Red = C3).



Prostaglandin-endoperoxide synthase 1 (PTGS1) is strongly expressed in perikarya from hippocampal neurons (human tissue). Here shown using the Anti-COX1 (HPA002834) antibody.





The Anti-ITM2B antibody (HPA029292), targeting Integral membrane protein 2B, strongly labels the soma and processes of hippocampal neurons (human tissue). Note the labeling of the Golgi apparatus in A-431 cells.

Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-ADAR	AMAb90535[1]	IHC,WB	86 / 85%
Anti-ADAR	HPA003890[2-3]	IHC,WB,ICC-IF	86 / 85%
Anti-AIMP1	HPA018476	IHC,WB*,ICC-IF	96 / 97%
Anti-AKT1	AMAb90834	WB	97 / 97%
Anti-AOX1	HPA040199	IHC,ICC-IF	84 / 86%
Anti-APBA3	HPA045577	IHC,WB,ICC-IF	70 / 68%
Anti-APBB2	HPA023542	IHC,WB,ICC-IF	85 / 83%
Anti-APBB3	HPA005571	IHC,WB,ICC-IF	84 / 84%
Anti-APOA4	AMAb90769	IHC, WB	65 / 28%
Anti-APP	HPA001462[4]	IHC,ICC-IF	95 / 95%
Anti-AQP4	AMAb90537	IHC,WB	93 / 92%
Anti-ATF2	HPA022134	IHC,WB*,ICC-IF	99 / 99%
Anti-ATF3	AMAb90909	IHC	92 / 92%
Anti-ATF3	HPA001562	IHC,WB*,ICC-IF	92 / 92%
Anti-ATRX	AMAb90784	ICC-IF, IHC, WB	96 / 97%
Anti-ATXN1	HPA008335	IHC,ICC-IF	81 / 81%
Anti-ATXN2	HPA018295	IHC,WB*,ICC-IF	90 / 91%
Anti-C3	HPA020432	IHC	78 / 23%
Anti-CASP3	HPA002643[6]	IHC,WB*,ICC-IF	84 / 88%
Anti-CD4	AMAb90754	IHC, WB	55 / 57%
Anti-CD40	AMAb90905	IHC, WB	58 / 54%
Anti-CHGA	AMAb90525	IHC, WB	62 / 64%
Anti-COX1	HPA002834[7]	IHC,WB	93 / 90%
Anti-COX2/PTGS2	HPA001335[8,9]	IHC	88 / 88%
Anti-CTSB	HPA018156[10,11]	IHC,WB*,ICC-IF	79 / 79%

Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-CTSD	HPA003001[12]	IHC,WB	86 / 86%
Anti-CXorf27	HPA003356	IHC	47 / 46%
Anti-FBXO7 (PARK15)	HPA032114	IHC	78 / 81%
Anti-FUS	AMAb90549	ICC-IF, IHC, WB	91 / 91%
Anti-GSK3B	HPA028017	IHC,WB*,ICC-IF	100 / 100%
Anti-HIP1	HPA017964	IHC,WB	79 / 77%
Anti-HTRA2 (PARK13)	HPA027366	IHC,WB	57 / 63%
Anti-ITGAM (CD11b)	AMAb90911	IHC,WB	67 / 68%
Anti-ITGAM (CD11b)	HPA002274[13,14]	IHC,WB	67 / 68%
Anti-ITM2B	HPA029292	IHC,WB,ICC-IF	95 / 96%
Anti-LRP2	HPA005980[15]	IHC	78 / 36%
Anti-MSR1	HPA000272	IHC,WB	60 / 59%
Anti-NFKB1	HPA027305	IHC,WB,ICC-IF	60 / 62%
Anti-OPTN	HPA003360[16]	IHC,WB,ICC-IF	64 / 68%
Anti-PADI4	HPA017007	IHC,WB	66 / 69%
Anti-PARK7	HPA004190[17]	IHC,WB*	89 / 90%
Anti-PFN1	AMAb91181	IHC, WB	87 / 87%
Anti-PHGDH	AMAb90786	IHC, WB	99 / 99%
Anti-PHGDH	HPA021241[18-21]	IHC,WB*,ICC-IF	99 / 99%
Anti-PRNP	HPA042754	IHC	91 / 91%
Anti-PSEN1	HPA030760	IHC	82 / 81%
Anti-RHOT1	AMAb90852	IHC,WB	100 / 100%

Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-RHOT1	HPA010687[22-24]	IHC,WB	100 / 100%
Anti-S100A8	HPA024372[25]	IHC,WB	56 / 60%
Anti-SERPINA3	HPA002560[26,27]	IHC,WB	60 / 59%
Anti-SNCB	HPA035876	IHC,WB,ICC-IF	97 / 97%
Anti-SOD1	HPA001401[28,29]	IHC,WB*,ICC-IF	82 / 81%
Anti-SOD2	HPA001814[30,31]	IHC,WB	88 / 87%
Anti-THY1	AMAb90844	IHC,WB	64 / 68%
Anti-THY1	HPA003733	IHC	64 / 68%
Anti-TNFRSF21	HPA006746	IHC,WB	86 / 85%
Anti-TTR	AMAb90649	IHC, WB	81 / 83%

Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-UBE2K	HPA028869	IHC,ICC-IF	100 / 100%
Anti-UCHL1	HPA005993[32]	IHC,WB*,ICC-IF	97 / 97%
Anti-USP46	AMAb90722	WB	100 / 99%
Anti-VPS26A	AMAb90967	ICC-IF, IHC, WB	96 / 100%
Anti-WHSC1	AMAb90851	IHC,WB	91 / 91%
Anti-WHSC1	HPA015801[33]	IHC,WB*,ICC-IF	91 / 91%
Anti-VWF	AMAb90928	IHC,WB	80 / 80%
Anti-VWF	HPA002082[34,35]	IHC	82 / 78%

* WB both in human and rodent samples

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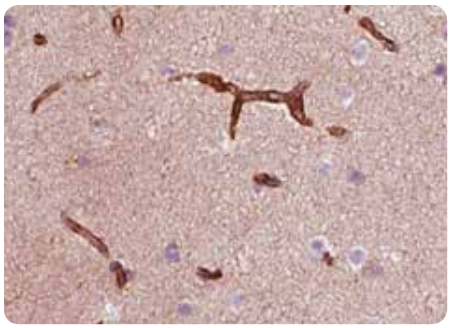
Development

DNA-binding protein SATB2 is required for initiation of the upper-layer neurons specific genetic program and for inactivation of deep-layer neurons specific genes. Here illustrated by Anti-SATB2 antibody AMAb90679 in rat brain. Note strong nuclear immunoreactivity in cerebral cortex and in the CA1 layer of the hippocampus and absence of positivity in the dentate gyrus.

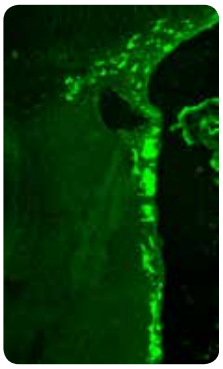
Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-CRBN	AMAb91227	WB	96 / 97 %
Anti-ENG	AMAb90925	IHC	66 / 22%
Anti-ENG	HPA011862[1]	IHC,WB,ICC-IF	66 / 22%
Anti-FABP7	AMAb90595	IHC,WB	89 / 90%
Anti-FABP7	HPA028825[2,3]	IHC,WB	89 / 90%
Anti-FLT1	AMAb90704	IHC,WB	80 / 82%
Anti-GAP43	HPA015600[4]	IHC,WB	71 / 70%
Anti-CRBN	AMAb91227	WB	96 / 97 %
Anti-ENG	AMAb90925	IHC	66 / 22%
Anti-ENG	HPA011862[1]	IHC,WB,ICC-IF	66 / 22%
Anti-FABP7	AMAb90595	IHC,WB	89 / 90%
Anti-FABP7	HPA028825[2,3]	IHC,WB	89 / 90%
Anti-FLT1	AMAb90704	IHC,WB	80 / 82%
Anti-GAP43	HPA015600[4]	IHC,WB	71 / 70%
Anti-GLI3	HPA005534	IHC,ICC-IF,WB	74 / 76%
Anti-MEF2C	AMAb90727	IHC,WB	97 / 47%
Anti-MEF2C	HPA005533[5-8]	IHC,WB,ICC-IF	97 / 47%
Anti-MKI67 (Ki67)	HPA000451[9,10]	IHC,ICC-IF	66 / 67%
Anti-NACC1	HPA021238	IHC,ICC-IF	91 / 89%
Anti-NES (Nestin)	AMAb90556	IHC,WB	47 / 42%
Anti-NES (Nestin)	HPA007007[11]	IHC,WB,ICC-IF	47 / 42%
Anti-NKX2-2	HPA003468[12,13]	IHC,WB	96 / 97%
Anti-PAX6	HPA030775	IHC,ICC-IF	100 / 100%
Anti-PBK	HPA005753	IHC,WB*,ICC-IF	91 / 94%
Anti-REST	AMAb90740	IGC	41 / 43%
Anti-RUNX1	HPA004176[14]	IHC,WB,ICC-IF	93 / 93%
Anti-RUNX2	AMAb90591	IHC,WB	100 / 81%
Anti-RUNX2	HPA022040[15,16]	IHC,WB,ICC-IF	100 / 81%

Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-SATB2	AMAb90679[17]	IHC,WB	100 / 100%
Anti-SATB2	HPA029543[18]	IHC,ICC-IF	100 / 100%
Anti-SOX4	HPA029901	IHC,ICC-IF	100 / 39%
Anti-SOX6	HPA001923[19,20]	IHC,WB,ICC-IF	96 / 96%
Anti-SOX7	HPA009065[21,22]	IHC,WB	91 / 91%
Anti-SOX9	AMAb90795	IHC, WB	97 / 96%
Anti-SOX11	AMAb90502[23]	IHC,WB	82 / 82%
Anti-SOX11	HPA000536[24-28]	IHC,WB	82 / 82%
Anti-SOX30	HPA006159	IHC,WB	68 / 70%
Anti-THY1	AMAb90844	IHC,WB	64 / 68%
Anti-THY1	HPA003733	IHC	64 / 68%
Anti-TM4SF2/ TSPAN7	HPA003140[29,30]	IHC,WB	96 / 96%
Anti-TM4SF2/ TSPAN7	AMAb90621	IHC,WB	96 / 96%
Anti-VANGL1	AMAb90600	WB	95 / 95%
Anti-VIM (vimentin)	AMAb90516	IHC,WB	99 / 99%
Anti-VIM	HPA001762[31]	IHC,WB*,ICC-IF	99 / 99%

* WB both in human and rodent samples



Immunohistochemical staining using the Anti-NES (Nestin) antibody AMAb90556 of human cerebral cortex shows strong immunoreactivity in the endothelial cells.



PDZ binding kinase (PBK) is expressed in neural progenitors in both the dentate gryrus and subventricular zone of the lateral ventricle in the adult rat. Here visualized using the Anti-PBK antibody (HPA005753).

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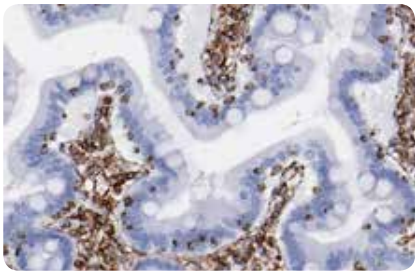
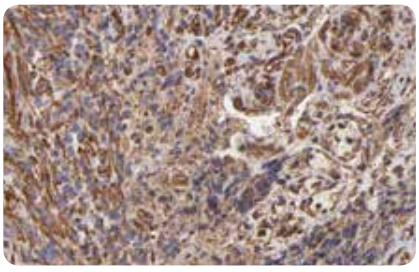
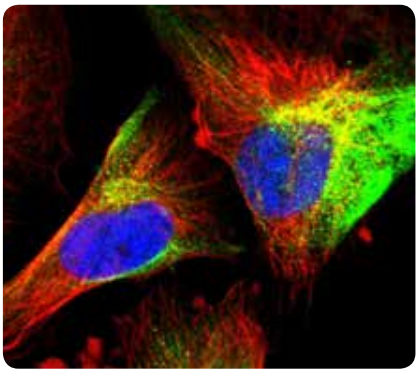




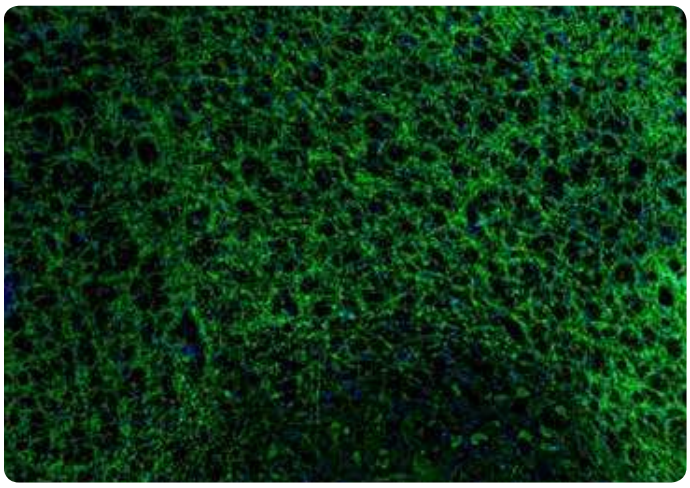


Immunohistochemical staining using the Anti-VIM (Vimentin) antibody HPA001762 of human duodenum shows distinct positivity in mesenchymal and lymphoid cells (upper left). In glioma tissue, immunoreactivity is strong in tumor cells (lower left). Immunofluorescent staining of human cell line U-251MG shows positivity in cytoskeleton (top).

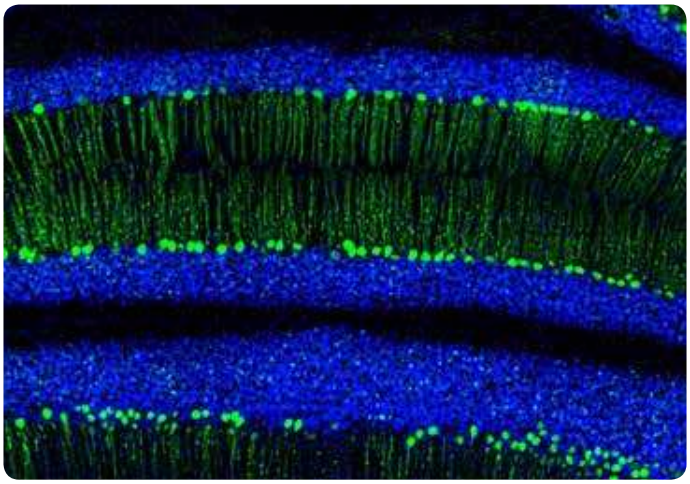
Antibodies on HPA Mouse Brain Atlas

Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-AMPD2	HPA045760	IHC,WB,ICC-IF	99% / 99%
Anti-AQP4	HPA014784	IHC,WB	93% / 92%
Anti-ARFGEF1	HPA023822	IHC,WB,ICC-IF	90% / 90%
Anti-ARHGAP1	HPA004689[1]	IHC,WB,ICC-IF	98% / 98%
Anti-BCAR1	HPA042282	IHC,WB,ICC-IF	75% / 93%
Anti-BCL11B	HPA049117	IHC	96% / 48%
Anti-BIRC3	HPA002317[2-4]	IHC,WB,ICC-IF	75% / 74%
Anti-C17orf75	HPA004061[5]	IHC,WB,ICC-IF	84% / 83%
Anti-C21orf59	HPA028849	IHC,WB	95% / 93%
Anti-CALB2	HPA007305[3]	IHC,WB,ICC-IF	98% / 98%
Anti-CAMK2B	HPA026307	IHC,WB	96% / 96%
Anti-DDX3X	HPA001648[3,6]	IHC,WB	97% / 97%
Anti-DPP6	HPA050509	IHC,WB	86% / 86%
Anti-DTX4	HPA059294	IHC,ICC-IF	86% / 33%
Anti-ECH1	HPA005835[3]	IHC,WB	78% / 81%
Anti-EIF1AY	HPA002561	IHC,WB	99% / 99%
Anti-FAM213B	HPA006403	IHC,WB	92% / 89%
Anti-FGF3	HPA012692	IHC,ICC-IF	80% / 81%
Anti-FH	HPA025770	IHC,WB,ICC-IF	99% / 100%
Anti-FOXO1	HPA001252[5,7]	IHC	91% / 90%
Anti-FRMD6	HPA001297[8]	IHC,WB,ICC-IF	94% / 94%
Anti-GABRA3	HPA000839[3]	IHC,WB	91% / 93%
Anti-GFAP	HPA056030	IHC,WB	98% / 100%
Anti-GKAP1	HPA035117	IHC,WB,ICC-IF	93% / 93%
Anti-GMFB	HPA002954[9]	IHC,WB	97% / 94%
Anti-GOLGA5	HPA000992[10]	IHC,WB,ICC-IF	70% / 76%
Anti-HSPA2	HPA000798[11-13]	IHC,WB	95% / 95%
Anti-IER5	HPA029894	IHC,WB,ICC-IF	86% / 33%
Anti-INA	HPA008057[3]	IHC,WB,ICC-IF	83% / 84%
Anti-ITPKA	HPA040454	IHC,WB,ICC-IF	91% / 89%
Anti-KIF5A	HPA004469	IHC,WB	91% / 88%
Anti-LIAS	HPA018842	IHC,WB,ICC-IF	89% / 92%
Anti-LRPAP1	HPA008001[3]	IHC,WB,ICC-IF	81% / 80%
Anti-MAP2	HPA012828[14,15]	IHC,ICC-IF	91% / 89%
Anti-MARS	HPA004125[16]	IHC,WB,ICC-IF	92% / 92%
Anti-MBP	HPA049222	IHC,WB	97% / 97%
Anti-NAGLU	HPA038815	IHC	88% / 89%
Anti-NDUFV2	HPA003404[17]	IHC,WB	95% / 95%
Anti-NECAB1	HPA023629[18]	IHC,WB	98% / 98%
Anti-NECAB2	HPA013998[18]	IHC,ICC-IF	98% / 97%
Anti-NPAS2	HPA019674	IHC,WB,ICC-IF	85% / 87%
Anti-OGFOD1	HPA003215[19,20]	IHC,WB,ICC-IF	80% / 81%

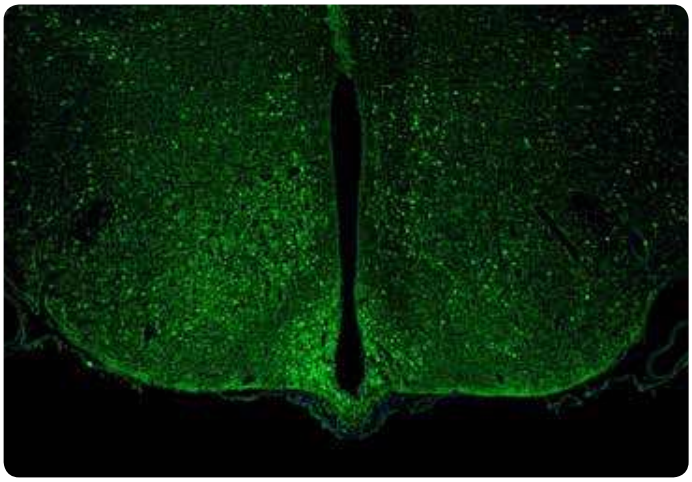
Product Name	Product Number	Applications (human tissues)	Antigen seq identity to mouse/rat
Anti-OTUB1	HPA039176	IHC,WB,ICC-IF	100% / 100%
Anti-PBK	HPA005753	IHC,WB,ICC-IF	91% / 94%
Anti-PCP4	HPA005792[21-24]	IHC,WB	96% / 96%
Anti-PPP1R1B	HPA048630	IHC,WB	87% / 91%
Anti-QK1	HPA019123	IHC,WB,ICC-IF	100% / 100%
Anti-RABGGTB	HPA026585	IHC,WB,ICC-IF	97% / 96%
Anti-RAP1GAP	HPA001922	IHC,WB	92% / 91%
Anti-RCN2	HPA030694	IHC,WB,ICC-IF	91% / 90%
Anti-RPL9	HPA003372[3,25]	IHC,WB,ICC-IF	99% / 98%
Anti-SCGN	HPA006641[26-29]	IHC	96% / 96%
Anti-SEMA3E	HPA029419	IHC	86% / 86%
Anti-SLC2A1	HPA031345	IHC	100% / 100%
Anti-SSR3	HPA014906	IHC,WB	100% / 43%
Anti-SST	HPA019472	IHC,WB	98% / 98%
Anti-SYNJ2BP	HPA000866	IHC,WB,ICC-IF	96% / 95%
Anti-TH	HPA061003	IHC	88% / 88%
Anti-TXNL1	HPA002828	IHC,WB,ICC-IF	98% / 98%
Anti-UBTF	HPA006385[30]	IHC,WB,ICC-IF	98% / 98%
Anti-USP11	HPA037536	IHC,ICC-IF	82% / 83%
Anti-USP48	HPA030046	IHC,WB,ICC-IF	95% / 94%
Anti-ZNF3	HPA003719	IHC,ICC-IF	77% / 78%



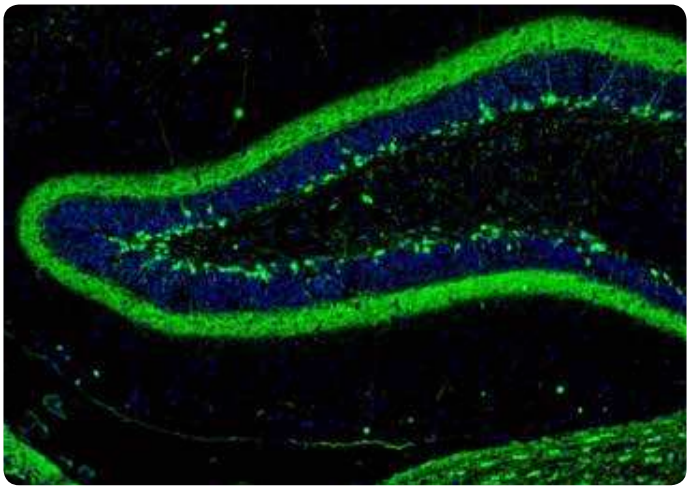
Immunofluorescence IHC staining of mouse medulla with Anti-GABRA3 antibody (HPA000839) shows strong immunoreactivity in neuronal processes and cell bodies.



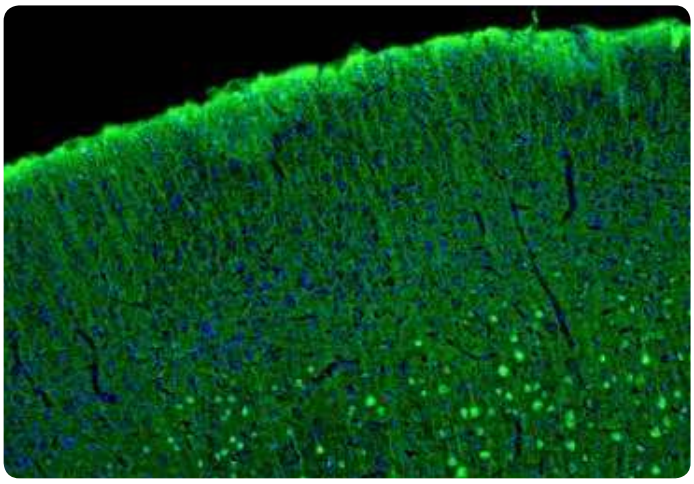
Immunohistochemical staining of mouse cerebellum with Anti-CAMK2B antibody (HPA026307) shows neuronal positivity in Purkinje cells.



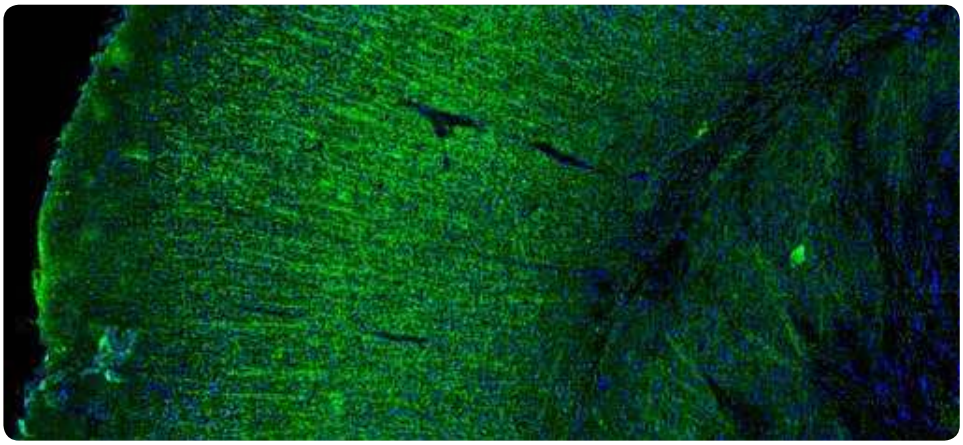
Immunohistochemical staining of mouse hypothalamus with Anti-CALB antibody (HPA007305) shows selective staining in a subset of neurons and fibers in the acrcuate nucleus.



Immunohistochemical staining of mouse hippocampus Anti-CALB antibody (HPA007305) shows selective staining in subsets of neurons and fibers in dentate gyrus.

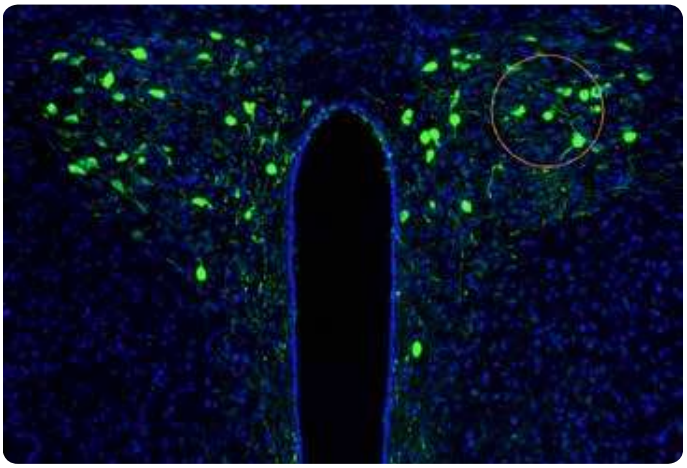


Immunohistochemical staining of mouse cerebral cortex with Anti-MBP antibody (HPA049222) shows strong staining in myelinated fibres.

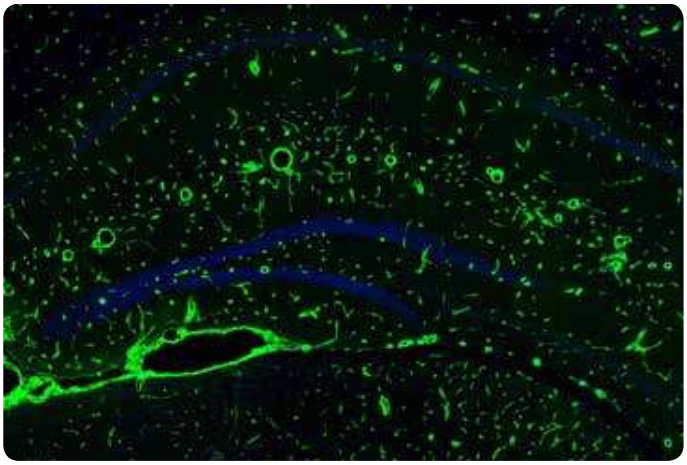


Immunofluorescence IHC staining of mouse cerebral cortex with Anti-PCP4 antibody (HPA005792) shows strong immunoreactivity in neuronal cell bodies in the deep cortical layers.

Antibodies on HPA Mouse Brain Atlas (continued)



Immunofluorescence IHC staining of mouse hypothalamus with Anti-SAYSD1 antibody (HPA007959) shows selective neuronal staining in the paraventricular nucleus.



Immunohistochemical staining of mouse hippocampus Anti-SLC2A1 antibody (HPA031345) shows strong staining in endothelial cells.

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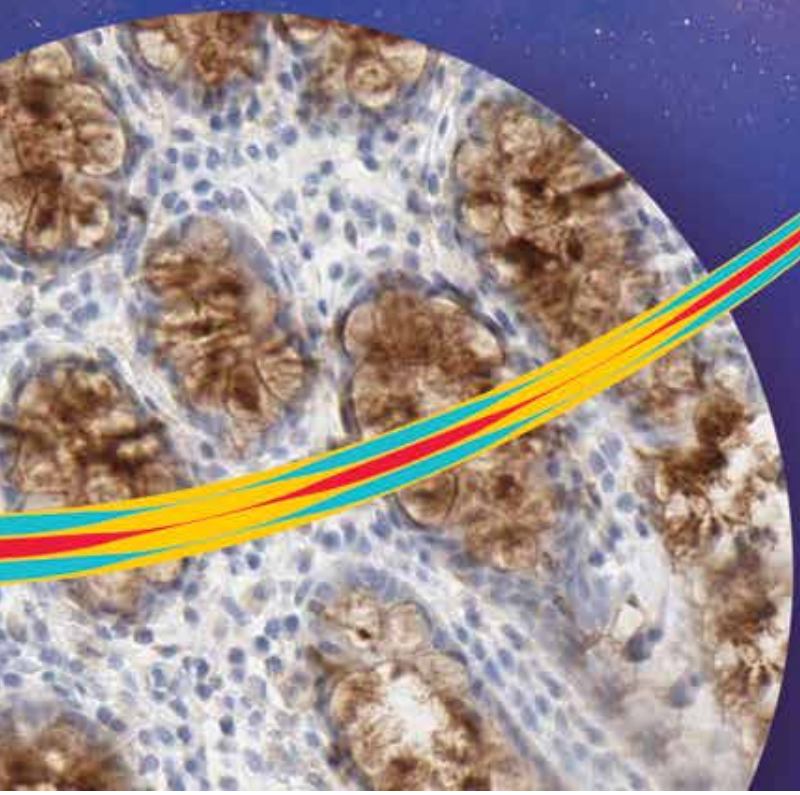
ATLAS ANTIBODIES



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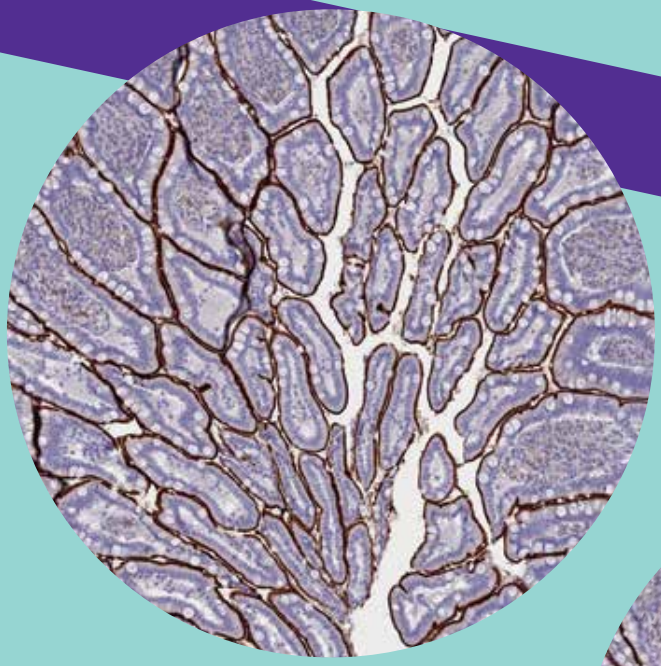
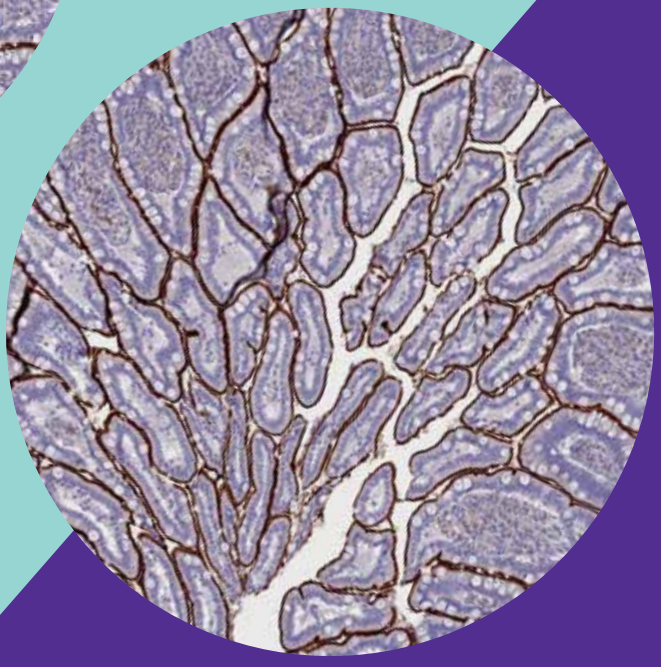
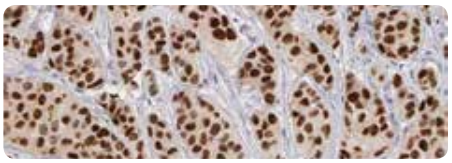
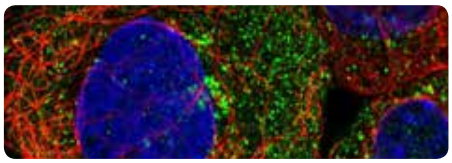




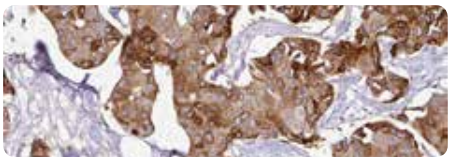
The Human Protein Atlas



Tissue Atlas



Cell Atlas



Cancer Atlas

The Human Protein Atlas is Characterizing the Human Proteome

The Human Protein Atlas project has created a complete map of protein expression in all major organs and tissues in the human body[1,2]. To accomplish this, highly specific antibodies have been developed to all protein coding human genes and protein profiling is established in a multitude of tissues and cells using tissue arrays.Applications applied are immunohistochemistry(IHC), Western blot(WB) analysis, protein array assay and immunofluorescent based confocal microscopy (ICC-IF).

The antibodies developed within the Human Protein Atlas project are carefully designed and manufactured to achieve the very highest level of specificity, reproducibility and versatility. You will find them in our catalog as Prestige Polyclonals.

The Human Protein Atlas (HPA) project was initiated in 2003 by Swedish researchers, headed by Professor Mathias Uhlén, and funded by the Knut and Alice Wallenberg foundation. It is a unique world leading effort performing systematic exploration ofthe human proteome using antibodies.

The Human Protein Atlas is divided into three major parts, the Tissue Atlas, Cell Atlas and Cancer Atlas. In different ways, the atlases show gene and protein expression data and make it easy to access, search and navigate.

The Tissue Atlas

For all proteins represented in the Tissue Atlas, the expression profiles are based on IHC analysis on a large number of human tissues. All IHC image scan be viewed in high resolution on the Tissue Atlas. The presentation of protein expression data in correlation to RNA sequencing data for each gene is included. Tissue microarrays containing samples from 44 different normal human tissues and from 20 different cancer types are utilized within the project. The 44 normal tissues are present in triplicate samples and annotated in 76 different cell types. All normal tissue images have undergone pathology-based annotation of expression levels and are displayed on the normal Tissue Atlas presenting information regarding the expression profiles of human genes both on mRNA and protein level. The mRNA expressiondata is derived from deep sequencing of RNA (RNASeq) from 37 major different normal tissue types.

The Cell Atlas

The Cell Atlas presents subcellular localization by confocal microscopy. The results are displayed as high resolution, multicolor images of immunofluorescently stained cells. Three human cell lines for each antibody are selected for the immunofluorescence analysis. Two cell lines from a cell line panel are chosen based on RNA sequencing data and the third cell line is always U-2 OS.

The Cancer Atlas

The Cancer Atlas contains gene expression data based on protein expression patterns in a multitude of human cancer specimens. Altogether 216 different cancer samples, corresponding to the 20 most common forms of human cancer, have been analyzed for all included genes. All cancer tissue images have been manually annotated by pathologists and just as for the normal Tissue Atlas, protein data includes protein expression levels corresponding to over 15,000 genes for which there are available antibodies.

Validation in Normal GI tract Tissue and Colorectal Cancer Tissue Samples

IHC images from normal gastrointestinal tract samples from three different individuals are available for each antibody in the normal Tissue Atlas. The gastrointestinal tract tissues include colon, small intestine, duodenum, rectum, stomach, esophagus, salivary gland and oral mucosa.

In addition, for each antibody, colorectal tumor samples from up to 12 patients in duplicates are presented in the Cancer Atlas.

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Prestige Polyclonals

The uniqueness and specificity of Prestige Polyclonals are due to a thorough selection of antigen regions, affinity purification on the recombinant antigen, validation using several methods and a stringent approval process.

Development

The Prestige Polyclonals are developed against recombinant human Protein Epitope Signature Tags (PrESTs) of approximately 50 to 150 amino acids. These protein fragments are designed, using a proprietary software, to contain unique epitopes present in the native protein suitable for triggering the generation of antibodies of high specificity. This is achieved by a complete human genome scanning to ensure that PrESTs with the lowest homology to other human proteins are used as antigens.

Approval

The approval of the Prestige Polyclonals relies on a combined validation of the experimental results using IHC, WB or ICC-IF, from RNA sequencing and from information obtained via bioinformatics prediction methods and literature. Since the literature is often inconclusive, an important objective of the HPA project has been to generate paired antibodies with non-overlapping epitopes towards the same protein target, allowing the results and validation of one antibody to be used to validate the other one.

Prestige Polyclonal catalog
Today, there are more than 21,000 Prestige Polyclonals.

The antibodies developed and characterized within the Human Protein Atlas project are supplied by Merck under the brand name Prestige Polyclonals. The product numbers of Prestige Polyclonals start with “HPA”.

Prestige Monoclonals

We also provide a selected number of mouse monoclonal antibodies, under the brand name Prestige Monoclonals. The Prestige Monoclonal catalog is regularly expanding with hundreds of new products every year.

Unique Features
Special care is taken in offering clones recognizing only unique non-overlapping epitopes and/or isotypes. Using the same stringent PrEST production process and characterization procedure as for the Prestige Polyclonals, the Prestige Monoclonals offer outstanding performance in approved applications, together with defined specificity, secured continuity and stable supply. In general they also permit high working dilutions and contribute to standardized assay procedures.

Clone Selection
Functional characterization is performed on a large number of ELISA positive cell supernatants to select the optimal clones for each application prior to subcloning and expansion of selected hybridomas.

Epitope Mapping
Clones are epitope-mapped using synthetic overlapping peptides in a bead-based array format for selection of clones with non-overlapping epitopes only.

Isotyping
All Prestige Monoclonals antibodies are isotyped to allow for multiplexing using isotype-specific secondary antibodies.

Hybridoma Cell Cultivation
Atlas Antibodies use *in-vitro* methods for the production scale-up phase” change to “In-vitro methods are used for the production scale up phase

Antibody Characterization
The characterization of Prestige Monoclonals starts with a thorough selection of the most relevant and clinically significant tissues to use for IHC characterization. In addition to positive stained tissues, a negative control tissue staining is also displayed and if relevant, clinical cancer tissue staining.

The Western blot (WB) characterization includes results from endogenous human cell or tissue protein lysates or optionally recombinant full-length human protein lysates.

Each Prestige Monoclonal is thus supplied with the most relevant characterization data for its specific target.

Prestige Monoclonals are developed based on the knowledge from the Human Protein Atlas with careful antigen design and extended validation of antibody performance. With precise epitope information following all monoclonals, these precise, accurate and targeted antibodies are denoted Prestige Monoclonals.The product numbers of Prestige Monoclonals start with ”AMAb”.

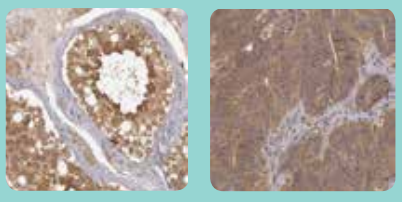
Antibodies Used In Colorectal Cancer Research

In this section, antibodies are selected either on a reference/article-basis or on colon cancer relevance for the corresponding target protein.

Target Protein	Product Name	Product Number	Validated Applications
ABCB1/CD243	**Anti-ABCB1**	HPA002199[1-2]	IHC,ICC-IF
ALCAM/CD166 antigen	**Anti-ALCAM**	HPA010926[3-5]	IHC
AOC3/HPAO	**ANTI-AOC3**	HPA000980[6-8]	IHC,WB
APC	**Anti-APC**	HPA013349	IHC
AXL	**Anti-AXL**	HPA037422[9-10]	IHC,WB
B-Raf	**Anti-BRAF**	HPA001328[11-13]	IHC
B-Raf	**Anti-BRAF**	HPA071048	ICC-IF,WB
B-Raf	**Anti-BRAF**	AMAb91257	IHC,WB
B-Raf	**Anti-BRAF**	AMAb91258	IHC,WB
BCL9	**Anti-BCL9**	HPA020274	IHC,ICC-IF
Bloom syndrome prot	**Anti-BLM**	HPA005689[14-15]	IHC,ICC-IF
Cadherin-17	**Anti-CDH17**	HPA023616[16]	IHC,WB,ICC-IF
Cadherin-17	**Anti-CDH17**	HPA026556	IHC,WB,ICC-IF
Caldesmon	**Anti-CALD1**	HPA008066[17-20]	IHC,WB,ICC-IF
Caspase-3	**Anti-CASP3**	HPA002643[21-22]	IHC,WB,ICC-IF
Catenin beta-1	**Anti-CTNNB1**	HPA029159	IHC,WB,ICC-IF
Catenin beta-1	**Anti-CTNNB1**	HPA029160	IHC,ICC-IF
Catenin beta-1	**Anti-CTNNB1**	AMAb91209	IHC,WB
Catenin beta-1	**Anti-CTNNB1**	AMAb91210	IHC,WB
CDX-2	**Anti-CDX2**	HPA045669	ICC-IF
CDX-2	**Anti-CDX2**	HPA049580	ICC-IF

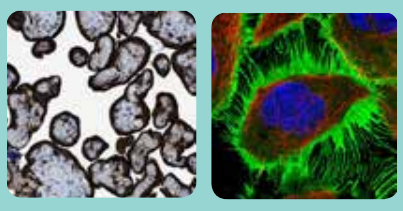
Target Protein	Product Name	Product Number	Validated Applications
CEACAM1/3/5/6	**Anti-CEACAM1**	HPA011041	IHC,WB
Chromogranin-A	**Anti-CHGA**	HPA017369[23-25]	IHC,WB,ICC-IF
Cytokeratin 18	**Anti-KRT18**	HPA001605	IHC,WB,ICC-IF
Cytokeratin 19	**Anti-KRT19**	HPA002465	IHC,WB,ICC-IF
Cytokeratin 20	**Anti-KRT20**	HPA024309	IHC,WB
Cytokeratin 20	**Anti-KRT20**	HPA024684	IHC,WB,ICC-IF
Cytokeratin 20	**Anti-KRT20**	HPA027236	IHC,WB
Cytokeratin 8	**Anti-KRT8**	HPA049866	IHC,WB,ICC-IF
DACH1	**Anti-DACH1**	HPA012672[26-28]	IHC,ICC-IF
DCC	**Anti-DCC**	HPA055376	ICC-IF
DCC	**Anti-DCC**	HPA069552	IHC
DTL	**Anti-DTL**	HPA028016[29]	IHC,WB
EGFR	**Anti-EGFR**	HPA001200[30]	IHC
EGFR	**Anti-EGFR**	HPA018530[31-32]	IHC,ICC-IF
EGFR	**Anti-EGFR**	AMAb90816	IHC,WB
FCGRT	**Anti-FCGRT**	HPA012122[33-35]	IHC,WB
Fibronectin	**Anti-FN1**	HPA027066[36]	IHC,WB
FOXRED1	**Anti-FOXRED1**	HPA046192[37]	IHC
GDF15	**Anti-GDF15**	HPA011191[38-42]	IHC,WB,ICC-IF
GPA33	**Anti-GPA33**	HPA018858[43-44]	IHC
GRHL2	**Anti-GRHL2**	HPA004820[45-49]	IHC,WB

Anti-BRAF (HPA001328)



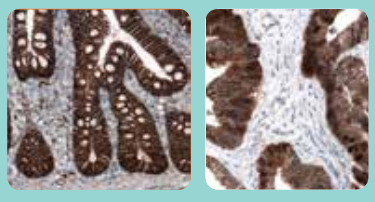
The Anti-BRAF antibody (HPA001328) shows cytoplasmic positivity in cells in seminiferous ducts in normal human testis as well as in tumor cells in colorectal cancer using immunohistochemistry. The HPA001328 antibody detects BRAF in human cell line MOLT-4 lysate using Western Blot analysis. Western blot analysis in human cell line MOLT-4.

Anti-EGFR (HPA018530)



The Anti-EGFR antibody (HPA018530) shows strong cytoplasmic positivity in trophoblastic cells in human placenta tissue using IHC. By ICC-IF, the antibody shows strong positivity in plasma membrane in human cell line A-431 and in Western blot analysis, EGFR is detected in human cell line A-549 lysate.

Anti-CTNNB1 (AMAb91210)



IHC staining using the Anti-CTNNB1 (AMAb91210) antibody shows strong membranous immunoreactivity in epithelial cells in normal small intestine and in tumor cells in colorectal cancer tissues. By WB analysis, Catenin beta-1 is detected in human cell line A-431.

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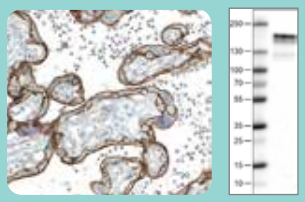
Anti-EGFR (AMAb90816)



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Antibodies Used In Colorectal Cancer Research (continued)

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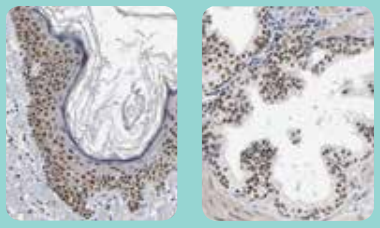
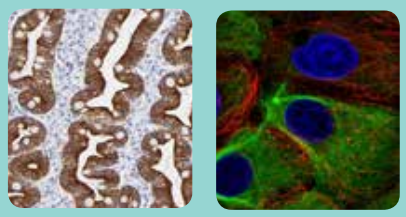
Anti-GRHL2 (HPA004820)



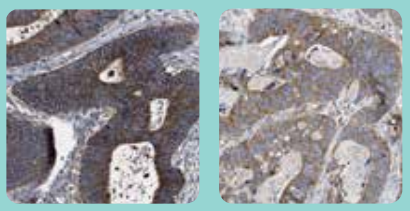
The Anti-GRHL2 antibody (HPA004820) shows strong nuclear positivity in glandular cells in human prostate tissue as well as in squamous epithelial cells in human skin tissue using IHC.

Anti-KRT19 (HPA002465)



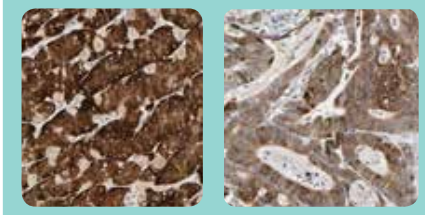
The Anti-KRT19 antibody (HPA002465) shows strong cytoplasmic and membranous positivity in glandular cells in human duodenum tissue using IHC. ICC-IF staining of human cell line MCF7 shows localization to intermediate filaments.

Anti-MACC1 (HPA020103)



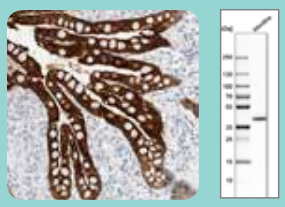
The Anti-KRT20 antibody (HPA024309) shows strong cytoplasmic and membranous positivity in glandular cells in colon tissue using IHC. Cytokeratin 20 ist detected using Western blot analysis in small intestine tissue lysate.

Anti-MUC1 (HPA004179)



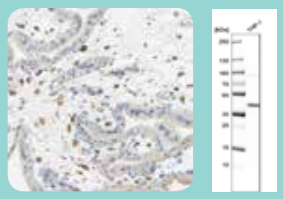
The Anti-MUC1 antibody (HPA004179) shows cytoplasmic and membranous positivity in glandular cells in normal stomach and in tumor cells in colorectal cancer.

Anti-KRT20 (HPA024309)



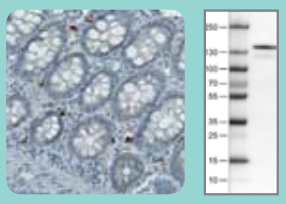
The Anti-KRT20 antibody (HPA024309) shows strong cytoplasmic and membranous positivity in glandular cells in colon tissue using IHC. Cytokeratin 20 ist detected using Western blot analysis in small intestine tissue lysate.

Anti-FCGRT (HPA012122)



By IHC, the Anti-FCGRT antibody (HPA012122) shows cytoplasmic positivity in Hofbauer cells in human placenta tissue. In Western blot analysis , FCGRT is detected in human cell line THP1 lysate.

Anti-KIT (AMAb90901)



The Anti-KIT antibody (AMAb90901) shows strong immunoreactivity in a subset of lymphoid cells (macrophages) in colon tissue. In Western blot analysis , KIT is detected in human cell line RT-4 lysate.

Target Protein	Product Name	Product Number	Validated Applications
Guanylin	**Anti-GUCA2A**	HPA018215[50-52]	IHC,WB
HMGCR	**Anti-HMGCR**	HPA008338[53-55]	IHC
HRH4	**Anti-HRH4**	HPA035009[56]	IHC
HTRB	**Anti-HTRB**	HPA012867[57-59]	IHC,ICC-IF
IDH1	**Anti-IDH1**	HPA035248[60]	IHC,WB
IGFBP7/IBP-7	**Anti-IGFBP7**	HPA002196[61-63]	IHC,WB
Integrin alpha-6	**Anti-ITGA6**	HPA012696[64-65]	IHC,WB
IRF2BP1	**Anti-IRF2BP1**	HPA042164[66]	IHC,WB
KIT	**Anti-KIT**	AMAb90901	IHC,WB
KIT	**Anti-KIT**	AMAb90904	IHC,WB
KIT	**Anti-KIT**	HPA004471	IHC
KIT	**Anti-KIT**	HPA073252	ICC-IF
KRAS/HRAS/ NRAS	**Anti-KRAS**	HPA049830	IHC
LAMB2/S-LAM beta	**Anti-LAMB2**	HPA001895[67]	IHC,WB
LCN2/NGAL/p25	**Anti-LCN2**	HPA002695[68-70]	IHC,WB
LGR5	**Anti-LGR5**	HPA012530[71-74]	IHC,WB

Target Protein	Product Name	Product Number	Validated Applications
LMAN1/ER-GIC-53	**Anti-LMAN1**	HPA002320[75]	IHC,WB
LPAR2	**Anti-LPAR2**	HPA019616[76-78]	IHC,WB
LPAR3	**Anti-LPAR3**	HPA013421[79]	IHC,WB,ICC-IF
MACC1	**Anti-MACC1**	HPA020103[80-81]	IHC,WB
MAP1B	**Anti-MAP1B**	HPA022275[82-83]	IHC,ICC-IF
MCAM/MUC18	**Anti-MCAM**	HPA008848[84]	IHC
MGAT5/GNT-V	**Anti-MGAT5**	HPA010919	IHC,WB
MLH1/COCA2	**Anti-MLH1**	HPA052707	IHC,WB,ICC-IF
MLH1/COCA2	**Anti-MLH1**	HPA060714	ICC-IF
MSH6/GTBP	**Anti-MSH6**	HPA028376	IHC,WB,ICC-IF
MSH6/GTBP	**Anti-MSH6**	HPA028446	IHC
MUC3/MUC3A	**Anti-MUC3A**	HPA010871	IHC
Mucin-1	**Anti-MUC1**	HPA004179	IHC,WB
Mucin-1	**Anti-MUC1**	HPA007235	IHC
Mucin-1	**Anti-MUC1**	HPA008855[85]	IHC,ICC-IF
NDRG1	**Anti-NDRG1**	HPA006881[86-89]	IHC,WB,ICC-IF

Antibodies Used In Colorectal Cancer Research (continued)

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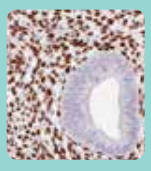
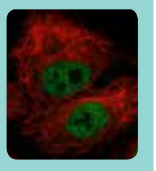
Target Protein	Product Name	Product Number	Validated Applications
Nucleophosmin	**Anti-NPM1**	HPA011384[90-91]	IHC,WB,ICC-IF
P53	**Anti-P53 Anti-body**	AMAb90956[92]	IHC,WB,ICC-IF
PARP6	**Anti-PARP6**	HPA026991[93-94]	IHC,ICC-IF
Periostin	**Anti-POSTN**	HPA012306[95-96]	IHC,WB
PIK3CA	**Anti-PIK3CA**	HPA009985[97-99]	IHC,ICC-IF
Plexin-B1	**Anti-PLXNB1**	HPA040586[100]	IHC
PMS2/PMSL2	**Anti-PMS2**	HPA070310	ICC-IF
PMS2/PMSL2	**Anti-PMS2**	HPA066490	ICC-IF
Podocalyxin	**Anti-PODXL**	HPA002110[101-105]	IHC,WB,ICC-IF
PTP4A1/2/3	**Anti-PTP4A1**	HPA003281	IHC,WB
RBM3	**Anti-RBM3**	AMAb90655[106-110]	IHC,WB,ICC-IF
RBM3	**Anti-RBM3**	HPA003624[111-113]	IHC,WB,ICC-IF
RECQL5	**Anti-RECQL5**	HPA029971[114-116]	IHC,WB,ICC-IF
RET	**Anti-RET**	HPA008356[117-118]	IHC,ICC-IF
RIBC2	**Anti-RIBC2**	HPA003210[119]	IHC
ROBO2	**Anti-ROBO2**	HPA013371[120]	IHC,WB,ICC-IF
SATB2	**Anti-SATB2**	HPA029543[121]	IHC,ICC-IF
SATB2	**Anti-SATB2**	AMAb90679	IHC,WB
Semaphorin-4D	**Anti-SEMA4D**	HPA015662	IHC,WB
Serpin A1	**Anti-SERPI-NA1**	HPA000927	IHC,WB,ICC-IF
SIX1	**Anti-SIX1**	HPA001893	IHC,WB,ICC-IF
SORD	**Anti-SORD**	HPA040260	IHC,WB,ICC-IF
SOX9	**Anti-SOX9**	HPA001758	IHC,WB,ICC-IF

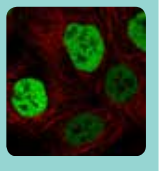
Target Protein	Product Name	Product Number	Validated Applications
SOX21	**Anti-SOX21**	AMAb91309	IHC,WB
SOX21	**Anti-SOX21**	AMAb91311	IHC,WB
SRC	**Anti-SRC**	HPA030875	IHC,WB,ICC-IF
SRSF5	**Anti-SRSF5**	HPA043484[122]	IHC,WB,ICC-IF
SRSF6	**Anti-SRSF6**	HPA029005[123]	IHC,WB
SRSF7	**Anti-SRSF7**	HPA043850[124]	IHC,WB,ICC-IF
STK4/MST-1	**Anti-STK4**	HPA015270[125]	IHC,WB,ICC-IF
SUSD2	**Anti-SUSD2**	HPA004117[126-127]	IHC,ICC-IF
TAK1/TR4/ NR2C2	**Anti-NR2C2**	HPA006313	IHC,WB,ICC-IF
TET1	**Anti-TET1**	HPA019032[128-129]	IHC,ICC-IF
TFAP4	**Anti-TFAP4**	HPA001912[130]	IHC,WB,ICC-IF
TGFB1	**Anti-TGFB1**	HPA008612[131-133]	IHC,WB
TIMP1/EPA	**Anti-TIMP1**	HPA053417	IHC
TJP1	**Anti-TJP1**	HPA001636[134-135]	IHC,WB,ICC-IF
TNIK	**Anti-TNIK**	HPA012128[136-137]	IHC,ICC-IF
TRAF6	**Anti-TRAF6**	HPA019805	IHC,WB,ICC-IF
TRAF6	**Anti-TRAF6**	HPA020599	IHC,WB
Transgelin	**Anti-TAGLN**	HPA019467[138]	IHC,WB,ICC-IF
Willin/FRMD6	**Anti-FRMD6**	HPA001297[139]	IHC,WB,ICC-IF
YWHAB/KCIP-1	**Anti-YWHAB**	HPA011212[140]	IHC,WB,ICC-IF
ZEB1/TCF-8	**Anti-ZEB1**	HPA027524[141-145]	IHC,WB,ICC-IF
ZEB1/TCF-8	**Anti-ZEB1**	AMAb90510	IHC,WB,ICC-IF
Zyxin	**Anti-ZYX**	HPA004835[146]	IHC,WB,ICC-IF

Anti-ZEB1 (AMAb90510)

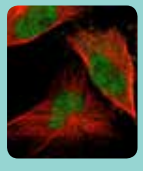

Shows strong nuclear positivity in the stromal, but not glandular cells in endometrium tissue using IHC. ICC-IF shows nuclear staining in the human A-549 cell line. The antibody signal is downregulated using ZEB1-specific siRNA probes in extracts from RH-30 cells, shown by WB analysis.

ANTI-P53 (AMAb90956)

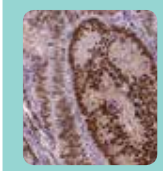
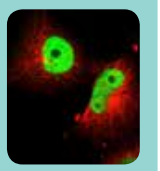

Shows strong nuclear immunoreactivity in tumor cells in human colorectal cancer using IHC. ICC-IF staining in A431 cell line shows cell cycle dependent nuclear (without nucleoli) staining. The antibody signal is downregulated using p53-specific siRNA probes in extracts from U-251 cells, shown by WB analysis.

ANTI-SIX1 (HPA001893)


Shows strong nuclear positivity in striated muscle fibers in human skeletal muscle using IHC. ICC-IF staining of human cell line U-251 MG shows positivity in nucleus but excluded from the nucleoli. Western blot analysis detects SIX1 in human cell line RH-30.

ANTI-SOX9 (HPA001758)


Shows moderate to strong nuclear positivity in tumor cells in human colorectal cancer using IHC. ICC-IF staining of human cell line U-251 MG shows positivity in nucleus but excluded from the nucleoli. Western blot analysis detects SOX9 in human cell line HepG2.

Antibodies against gene products in Oncotype and Coloprint tests

Oncotype DX (developed by Genomic Health) is the most frequently used gene expression profile in clinical practice in the United States analyzing a panel of 21 genes within a tumor to determine a Recurrence Score.

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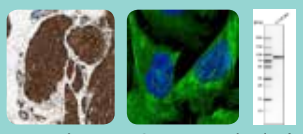
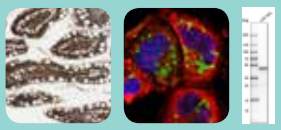
Anti-CALD1 (HPA008066)



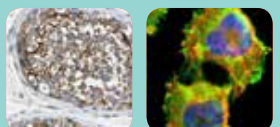
IHC staining of human smooth muscle tissue using the Anti-CALD1 antibody (HPA008066) shows cytoplasmic positivity in smooth muscle cells. Using ICC-IF in U2-OS cells, the antibody stains actin filament and plasma membrane. CALD1 is detected in cell line U-138 MG cell line.

Anti-PLIN3 (HPA006427)



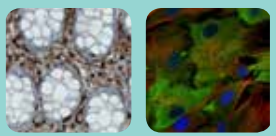
IHC staining of human small intestine tissue using the Anti-PLIN3 antibody (HPA006427) shows positivity in glandular cells. ICC-IF in A-431 cell line shows positivity in lipid droplets. PLIN3 is detedted in cell line U-87 MG lysate using WB analysis.

Anti-AKAP12 (HPA006344)



IHC staining of human testis tissue using the Anti-AKAP12 antibody (HPA006344) shows cytoplasmic and membranous positivity in seminiferous ducts. ICC-IF staining of human cell line U-251 MG shows localization to plasma membrane and cytosol.

Anti-S100A4 (AMAb90598)



IHC staining of human rectum tissue using the Anti-S100A4 antibody (AMAb90598) shows strong immunoreactivity in a subset of lymphoid cells. In ICC-IF, in BJ cells, plasma membrane is stained.

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J Cell Biochem 2012 May; 113(5):1569-1580.

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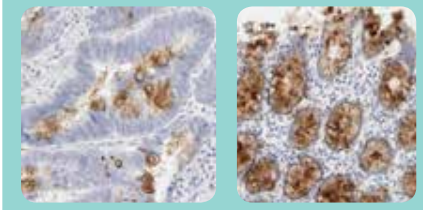
Target Protein	Product Name	Product Number	Validated Applications
AKAP12	**Anti-AKAP12**	HPA006344[1]	IHC,ICC-IF
AKAP12	**Anti-AKAP12**	HPA056230	IHC,ICC-IF
AKT3	**Anti-AKT3**	HPA026441[2-4]	IHC,WB
Caldesmon	**Anti-CALD1**	HPA008066[5-8]	IHC,WB,ICC-IF
Caldesmon	**Anti-CALD1**	HPA017330[9-11]	IHC,WB,ICC-IF
ANTXR1	**Anti-ANTXR1**	HPA052046	IHC
Biglycan	**Anti-BGN**	HPA003157[12-13]	IHC,WB,ICC-IF
Collagen alpha-1	**Anti-COL1A1**	HPA008405	IHC
Collagen alpha-1	**Anti-COL1A1**	HPA011795	IHC,ICC-IF
SPARC	**Anti-SPARC**	HPA002989[14]	IHC,WB
SPARC	**Anti-SPARC**	HPA003020[15]	IHC,WB
CTHRC1/NMTC1	**Anti-CTHRC1**	HPA059806	IHC,WB
FAP	**Anti-FAP**	HPA059739	IHC
Inhibin beta A chain	**Anti-INHBA**	HPA020031[16-18]	IHC
LOXL2	**Anti-LOXL2**	HPA036257	ICC-IF
LOXL2	**Anti-LOXL2**	HPA056542	ICC-IF
TGFB3	**Anti-TGFB3**	HPA063582	ICC-IF
PDGFC	**Anti-PDGFC**	HPA009134	IHC,ICC-IF
IGFBP7	**Anti-IGFBP7**	HPA002196[19-21]	IHC,WB
SFRP4	**Anti-SFRP4**	HPA009712	IHC,WB
SFRP4	**Anti-SFRP4**	HPA050585	IHC,WB
DLC1	**Anti-DLC1**	HPA017753[22]	IHC,WB,ICC-IF
EGR1	**Anti-EGR1**	HPA029938	ICC-IF
EGR1	**Anti-EGR1**	HPA029937	ICC-IF
GADD45B	**Anti-GADD45B**	HPA029816[23]	IHC,ICC-IF
SERPINE1/PAI1	**Anti-SERPINE1**	HPA050039[24]	IHC,ICC-IF
SPP1/OPN	**Anti-SPP1**	HPA027541[25]	IHC,WB
S100A4	**Anti-S100A4**	HPA007973[26-27]	IHC,WB
S100A4	**Anti-S100A4**	AMAb90596	IHC,WB,ICC-IF
S100A4	**Anti-S100A4**	AMAb90598	IHC,WB,ICC-IF
S100A4	**Anti-S100A4**	AMAb90599	IHC,WB,ICC-IF
HSPA1A	**Anti-HSPA1A**	HPA052504	IHC,WB
TGFBI	**Anti-TGFBI**	HPA008612[28-30]	IHC,WB
TGFBI	**Anti-TGFBI**	HPA017019	IHC,WB
GRB10	**Anti-GRB10**	HPA027502	IHC
LAMC2	**Anti-LAMC2**	HPA024638	IHC
LAMC2	**Anti-LAMC2**	AMAb91098	IHC,WB
CDKN2A/P14ARF	**Anti-CDKN2A**	HPA047838	ICC-IF
CDC20	**Anti-CDC20**	HPA055288	IHC,WB
CDC20	**Anti-CDC20**	HPA045842	ICC-IF
Ki-67/MKI67	**Anti-MKI67**	AMAb90870	IHC

Target Protein	Product Name	Product Number	Validated Applications
Ki-67/MKI67	**Anti-MKI67**	HPA000451[31-32]	IHC,ICC-IF
Ki-67/MKI67	**Anti-MKI67**	HPA001164[33]	IHC,ICC-IF
MCM2	**Anti-MCM2**	HPA031495	IHC,WB,ICC-IF
MCM2	**Anti-MCM2**	HPA031496	IHC,WB,ICC-IF
RRM1	**Anti-RRM1**	HPA057265	IHC,ICC-IF
RRM1	**Anti-RRM1**	HPA064297	IHC
RRM2	**Anti-RRM2**	HPA056994	IHC,WB,ICC-IF
SKP2	**Anti-SKP2**	HPA051196	WB,ICC-IF
SKP2	**Anti-SKP2**	HPA054633	IHC,WB
MYC/CMYC	**Anti-MYC**	HPA055893	IHC,ICC-IF
MYC/CMYC	**Anti-MYC**	HPA066556	ICC-IF
CSEL1/CSE1L	**Anti-CSE1L**	HPA038059	IHC,WB,ICC-IF
CSEL1/CSE1L	**Anti-CSE1L**	HPA038060	IHC,ICC-IF
MYBL2	**Anti-MYBL2**	HPA030530	IHC,WB
MYBL2	**Anti-MYBL2**	HPA055416	ICC-IF
NME1/GAAD	**Anti-NME1**	HPA008467[34]	IHC,WB,ICC-IF
NME1/GAAD	**Anti-NME1**	HPA041113	IHC,WB
UMPS/OPRT	**Anti-UMPS**	HPA036178	IHC,WB,ICC-IF
UMPS/OPRT	**Anti-UMPS**	HPA036179	IHC
HNRPD	**Anti-HNRNPD**	HPA004911	IHC,WB,ICC-IF
MCTP1	**Anti-MCTP1**	HPA019018	IHC,WB,ICC-IF
LAMA3	**Anti-LAMA3**	HPA009309	IHC
LAMA3	**Anti-LAMA3**	AMAb91123	IHC,WB
CTSC/Cathepsin C	**Anti-CTSC**	HPA066610	WB,ICC-IF
PYROXD1	**Anti-PYROXD1**	HPA038319	IHC,WB
PYROXD1	**Anti-PYROXD1**	HPA038320	IHC,WB,ICC-IF
EDEM1	**Anti-EDEM1**	HPA029565	IHC,ICC-IF
IL2RB/CD122	**Anti-IL2RB**	HPA062657	IHC,WB
ZNF697	**Anti-ZNF697**	HPA049933	IHC,ICC-IF
SLC6A11/GAT-3	**Anti-SLC6A11**	HPA037981	IHC,WB
IL2RA/CD25	**Anti-IL2RA**	HPA054622	IHC
CYFIP2	**Anti-CYFIP1**	HPA068106	IHC,WB
PIM3	**Anti-PIM3**	HPA068758	ICC-IF
LIF	**Anti-LIF**	HPA018844	IHC,ICC-IF
Perilipin-3/PLIN3	**Anti-PLIN3**	HPA006427[35]	IHC,WB,ICC-IF
Perilipin-3/PLIN3	**Anti-PLIN3**	HPA066538	IHC,WB,ICC-IF
HSD3B1	**Anti-HSD3B1**	HPA043261	IHC
HSD3B1	**Anti-HSD3B1**	HPA043264	IHC
HSD3B1	**Anti-HSD3B1**	HPA044028	IHC
ZBED4	**Anti-ZBED4**	HPA045341	IHC,ICC-IF
PPARA	**Anti-PPARA**	HPA067049	WB,ICC-IF
THNSL2	**Anti-THNSL2**	HPA035395	IHC

Antibodies against gene products elevated in colon identified in the Human Protein Atlas

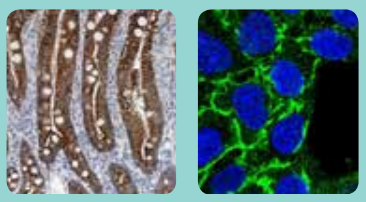
The genes included in this section show at least 5-fold higher mRNA levels in colon tissue compared to all other human tissues. Antibodies against these gene products are presented.

Anti-FCGBP (HPA003564)



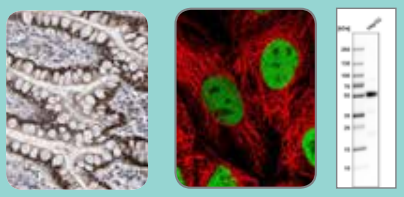
The Anti-FCGBP antibody (HPA003564) shows strong cytoplasmic positivity in glandular cells in human colorectal cancer and normal rectum tissue using IHC.

Anti-CDH17 (HPA023614)



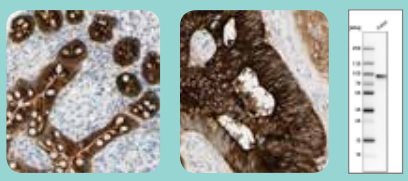
The Anti-CDH17 antibody (HPA023614) shows membranous positivity in glandular cells in human duodenum tissue using IHC. In ICC-IF, CDH17 is localized to cell junctions in human cell line CACO-2.

Anti-HNF4A (HPA004712)



The Anti-HNF4A antibody (HPA004712) shows strong nuclear positivity in glandular cells in human small intestine using IHC. Using ICC-IF, HNF4A was localized to nucleoplasm in cell line CACO-2. HNF4A was detected in human cell line HepG2 using WB analysis.

Anti-PIGR (HPA012012)



The Anti-PIGR antibody (HPA012012) shows strong cytoplasmic and membranous positivity in glandular cells in human colon and in tumor cells in colorectal cancer tissue using IHC. PIGR is detected in colon tissue lysate using Western blot analysis.

Anti-SLC9A3 (HPA036669)

The Anti-SLC9A3 antibody (HPA036669) shows strong apical membrane positivity in glandular cells in human small intestine and in colorectal cancer tissues using immunohistochemistry.

1. Hu X *et al.* Low CA II expression is associated with tumor aggressiveness and poor prognosis in gastric cancer patients *Int J Clin Exp Pathol* 2014; 7(10):6716-6724. Epub 2014 Sep 15.

2. Magnusson K *et al.* SATB2 in combination with cytokeratin 20 identifies over 95% of all colorectal carcinomas. *Am J Surg Pathol* 2011 Jul; 35(7):937-48.

3. Erickson NA *et al.* The Goblet Cell Protein Clca1 (Alias mClca3 or Gob-5) Is Not Required for Intestinal Mucus Synthesis, Structure and Barrier Function in Naive or DSS-Challenged Mice. *PLoS One* 2015; 10(7):e0131991. Epub 2015 Jul 10.

4. Okudela K *et al.* Down-regulation of FXYD3 expression in human lung cancers: its mechanism and potential role in carcinogenesis. *Am J Pathol* 2009 Dec; 175(6):2646-56. Epub 2009 Nov 5.

5. Brenna Ø *et al.* Cellular localization of guanylin and uroguanylin mRNAs in human and rat duodenal and colonic mucosa. *Cell Tissue Res* 2016 Apr 5; 365:331-341. Epub 2016 Apr 5.

6. Brenna Ø *et al.* The guanylate cyclase-C signaling pathway is down-regulated in inflammatory bowel disease. *Scand J Gastroenterol* 2015; 50(10):1241-1252. Epub 2015 May 15.

7. Wilson C *et al.* The paracrine hormone for the GUCY2C tumor suppressor, guanylin, is universally lost in colorectal cancer. *Cancer Epidemiol Biomarkers Prev* 2014 Nov; 23(11):2328-2337. Epub 2014 Oct 10.

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9. Mezentsev A *et al.* Global Gene Expression Responses to Low- or High-Dose Radiation in a Human Three-Dimensional Tissue Model. *Radiat Res* 2011 Jun; 175(6):677-688. Epub 2011 Apr 12.

10. Fristedt R *et al.* Expression and prognostic significance of the polymeric immunoglobulin receptor in esophageal and gastric adenocarcinoma. *J Transl Med* 2014 Apr 2; 12:83. Epub 2014 Apr 2.

11. Fristedt R *et al.* Reduced Expression of the Polymeric Immunoglobulin Receptor in Pancreatic and Periampullary Adenocarcinoma Signifies Tumour Progression and Poor Prognosis. *PLoS One* 2014; 9(11):e112728. Epub 2014 Nov 14.

12. Berntsson J *et al.* Expression and prognostic significance of the polymeric immunoglobulin receptor in epithelial ovarian cancer. *J Ovarian Res* 2014 Feb 26; 7:26. Epub 2014 Feb 26.

13. Trevisi P *et al.* Age-Related Expression of the Polymeric Immunoglobulin Receptor (pIgR) in the Gastric Mucosa of Young Pigs. *PLoS One* 2013; 8(11):e81473. Epub 2013 Nov 13.

14. Hjelm B *et al.* Generation of monospecific antibodies based on affinity capture of polyclonal antibodies. *Protein Sci* 2011 Nov; 20(11):1824-35. Epub 2011 Oct 12.

15. Magnusson K *et al.* SATB2 in combination with cytokeratin 20 identifies over 95% of all colorectal carcinomas. *Am J Surg Pathol* 2011 Jul; 35(7):937-48.

16. Wensman H *et al.* Extensive expression of craniofacial related homeobox genes in canine mammary sarcomas. *Breast Cancer Res Treat* 2009 Nov; 118(2):333-43. Epub 2008 Dec 2.

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18. Nodin B *et al.* Molecular correlates and prognostic significance of SATB1 expression in colorectal cancer. *Diagn Pathol* 2012 Aug 30; 7:115. Epub 2012 Aug 30.

19. Andersson S *et al.* Antibodies Biotinylated Using a Synthetic Z-domain from Protein A Provide Stringent In Situ Protein Detection. *J Histochem Cytochem* 2013 Nov; 61(11):773-784.

20. Kiflemariam S *et al.* Scalable in situ hybridization on tissue arrays for validation of novel cancer and tissue-specific biomarkers. *PLoS One* 2012; 7(3):e32927. Epub 2012 Mar 8.

Target Protein	Product Name	Product Number	Validated Applications
B3GNT6	**Anti-B3GNT6**	HPA039805	IHC
C10orf99	**Anti-C10orf99**	HPA050920	IHC
CA1	**Anti-CA1**	HPA006558	IHC
CA2	**Anti-CA2**	HPA001550[1]	IHC,WB
CD177	**Anti-CD177**	HPA041820	IHC
CD177	**Anti-CD177**	HPA046601	IHC
CDH17	**Anti-CDH17**	HPA023614	IHC,WB
CDH17	**Anti-CDH17**	HPA023616[2]	IHC,WB,ICC-IF
CDH17	**Anti-CDH17**	HPA026556	IHC,WB,ICC-IF
CDHR5	**Anti-CDHR5**	HPA009081	IHC
CDHR5	**Anti-CDHR5**	HPA009173	IHC,WB
CDX1	**Anti-CDX1**	HPA055196	IHC
CDX2	**Anti-CDX2**	HPA045669	ICC-IF
CDX2	**Anti-CDX2**	HPA049580	ICC-IF
CEACAM1/3/5/6	**Anti-CEACAM1**	HPA011041	IHC,WB
CEACAM5	**Anti-CEACAM5**	HPA019758	IHC,WB,ICC-IF
CEACAM7	**Anti-CEACAM7**	HPA069621	IHC
Claudin-3	**Anti-CLDN3**	HPA014361	IHC,ICC-IF
CLCA1	**Anti-CLCA1**	HPA052787	IHC
CLCA1	**Anti-CLCA1**	HPA059301	IHC
DHRS11	**Anti-DHRS11**	HPA041226	IHC,ICC-IF
DHRS11	**Anti-DHRS11**	HPA048236	IHC
DHRS11	**Anti-DHRS11**	HPA053623	IHC
ENTPD8	**Anti-ENTPD8**	HPA021509	IHC,ICC-IF
FABP1	**Anti-FABP1**	HPA028275	IHC,WB,ICC-IF
FCGBP	**Anti-FCGBP**	HPA003517[3]	IHC
FCGBP	**Anti-FCGBP**	HPA003564	IHC,ICC-IF
FUT3/5/6	**Anti-FUT3**	HPA046966	IHC
FXYD3	**Anti-FXYD3**	HPA010856[4]	IHC,ICC-IF
GAL3ST2	**Anti-GAL3ST2**	HPA071809	IHC
Galectin-4	**Anti-LGALS4**	HPA031184	IHC
Galectin-4	**Anti-LGALS4**	HPA031185	IHC
Galectin-4	**Anti-LGALS4**	HPA031186	IHC,WB
GPA33	**Anti-GPA33**	HPA018858	IHC
GUCA2A	**Anti-GUCA2A**	HPA018215[5-7]	IHC,WB
HNF4A	**Anti-HNF4A**	HPA004712[8-9]	IHC,WB,ICC-IF
HSD11B2	**Anti-HSD11B2**	HPA042186	IHC

Target Protein	Product Name	Product Number	Validated Applications
HSD11B2	**Anti-HSD11B2**	HPA056385	IHC,ICC-IF
INSL5	**Anti-INSL5**	HPA030100	IHC,WB
Keratin 20	**Anti-KRT20**	HPA024309	IHC,WB
Keratin 20	**Anti-KRT20**	HPA024684	IHC,WB,ICC-IF
Keratin 20	**Anti-KRT20**	HPA027236	IHC,WB
MEP1A	**Anti-MEP1A**	HPA029416	IHC
MISP	**Anti-MISP**	HPA049511	IHC,WB,ICC-IF
MISP	**Anti-MISP**	HPA062232	IHC,WB,ICC-IF
MS4A12	**Anti-MS4A12**	HPA057657	IHC
MUC13	**Anti-MUC13**	HPA045163	IHC,WB
NOXO1	**Anti-NOXO1**	HPA071540	IHC,WB
NXPE1	**Anti-NXPE1**	HPA049133	IHC,WB
NXPE2	**Anti-NXPE2**	HPA039744	IHC
NXPE2	**Anti-NXPE2**	HPA039876	IHC
PADI2	**Anti-PADI2**	HPA047735	IHC,WB
PHGR1	**Anti-PHGR1**	HPA068787	IHC,ICC-IF
PIGR	**Anti-PIGR**	HPA006154	IHC
PIGR	**Anti-PIGR**	HPA012012[10-13]	IHC,WB
PYY	**Anti-PYY**	HPA010973	IHC
REG4	**Anti-REG4**	HPA046555	IHC
SATB2	**Anti-SATB2**	HPA001042[14-17]	IHC
SATB2	**Anti-SATB2**	HPA029543[18]	IHC,ICC-IF
SATB2	**Anti-SATB2**	AMAb90679	IHC,ICC-IF
SLC22A18AS	**Anti-SLC22A18AS**	HPA068288	IHC,WB,ICC-IF
SLC26A2	**Anti-SLC26A2**	HPA058090	IHC,WB
SLC9A3	**Anti-SLC9A3**	HPA036493	IHC,ICC-IF
SLC9A3	**Anti-SLC9A3**	HPA036669	IHC,WB
SPINK4	**Anti-SPINK4**	HPA007286	IHC,ICC-IF
SULT1B1	**Anti-SULT1B1**	HPA002107	IHC,WB,ICC-IF
Tetraspanin 8	**Anti-TSPAN8**	HPA044337	IHC,ICC-IF
TFF3	**Anti-TFF3**	HPA035464	IHC,ICC-IF
TPH1	**Anti-TPH1**	HPA022483	IHC
UGT2B17	**Anti-UGT2B4**	HPA045108	IHC
VIL1	**Anti-VIL1**	HPA006884[19]	IHC,WB,ICC-IF
VIL1	**Anti-VIL1**	HPA006885[20]	IHC,WB
VIP	**Anti-VIP**	HPA017324	IHC
ZG16	**Anti-ZG16**	HPA052066	IHC,WB
ZG16	**Anti-ZG16**	HPA052512	IHC,WB

Antibodies identified in the Human Protein Atlas

In this section, antibodies are selected based on identified differential IHC staining patterns in colon and colorectal cancer samples.

1. Tsuneki M *et al.* A Hydrogel-Endothelial Cell implant Mimics Infantile Hemangioma: Modulation by Survivin and the Hippo pathway*. *Lab Invest* 2015 May 11; 95(7):765-780. Epub 2015 May 11.

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3. Powe DG *et al.* DACH1: Its Role as a Classifier of Long Term Good Prognosis in Luminal Breast Cancer. *PLoS One* 2014; 9(1):e84428. Epub 2014 Jan 2.

4. Vonlanthen J *et al.* A comprehensive look at transcription factor gene expression changes in colorectal adenomas. *BMC Cancer* 2014 Jan 29; 14:46. Epub 2014 Jan 29.

5. Stadler C *et al.* Immunofluorescence and fluorescent-protein tagging show high correlation for protein localization in mammalian cells. *Nat Methods* 2013 Apr; 10(4):315-23. Epub 2013 Feb 24.

6. Kim D *et al.* SHMT2 drives glioma cell survival in ischaemia but imposes a dependence on glycine clearance. *Nature* April 08, 2015.

7. Perisic L *et al.* Profiling of atherosclerotic lesions by gene and tissue microarrays reveals PCSK6 as a novel protease in unstable carotid atherosclerosis. *Arterioscler Thromb Vasc Biol* 2013 Oct; 33(10):2432-43. Epub 2013 Aug 1.

8. Ko YH *et al.* Glutamine fuels a vicious cycle of autophagy in the tumor stroma and oxidative mitochondrial metabolism in epithelial cancer cells: Implications for preventing chemotherapy resistance. *Cancer Biol Ther* 2011 Dec 15; 12(12):1085-1097. Epub 2011 Dec 15.

9. Stadler C *et al.* Immunofluorescence and fluorescent-protein tagging show high correlation for protein localization in mammalian cells. *Nat Methods* 2013 Apr; 10(4):315-23. Epub 2013 Feb 24.

10. Brown LJ *et al.* Chronic Reduction of the Cytosolic or Mitochondrial NAD(P)-malic Enzyme Does Not Affect Insulin Secretion in a Rat Insulinoma Cell Line. *J Biol Chem* 2009 Dec 18; 284(51):35359-35367. Epub 2009 Oct 26.

11. Zoccarato F *et al.* Succinate is the controller of O2-/H2O2 release at mitochondrial complex I : negative modulation by malate, positive by cyanide. *J Bioenerg Biomembr* 2009 Aug; 41(4):387-93. Epub 2009 Oct 10.

Product Name	Product Number	Validated Applications
Anti-ACADSB	HPA041458	IHC,WB,ICC-IF
Anti-ACBD7	HPA043326	IHC,ICC-IF
Anti-ACSL5	HPA007162	IHC,WB,ICC-IF
Anti-ADIRF	HPA026810	IHC,ICC-IF
Anti-AGR3	HPA053942	IHC,ICC-IF
Anti-AJUBA	HPA006171[1]	IHC,WB,ICC-IF
Anti-ALG14	HPA031829	IHC,ICC-IF
Anti-AN-KRD34C	HPA045329	IHC,ICC-IF
Anti-AOAH	HPA021666	IHC,WB
Anti-AQP3	HPA014924	IHC,WB,ICC-IF
Anti-ATF6	HPA005935	IHC
Anti-AT-P6V1B2	HPA008147	IHC,WB,ICC-IF
Anti-AVPR2	HPA046678	IHC
Anti-B3GNT8	HPA043669	IHC
Anti-BCL9	HPA020274	IHC,ICC-IF
Anti-CAND2	HPA005777	IHC,ICC-IF
Anti-CCDC-144NL	HPA023457	IHC,WB,ICC-IF
Anti-CDH12	HPA029325	IHC
Anti-CDK6	HPA002637	IHC,WB,ICC-IF
Anti-CLDN18	HPA018446	IHC
Anti-COG7	HPA040758	IHC,WB,ICC-IF
Anti-CPE	HPA003545	IHC
Anti-CPE	HPA003819	IHC,WB
Anti-CXorf67	HPA006128	IHC,ICC-IF
Anti-DACH1	HPA012672[2-4]	IHC,ICC-IF
Anti-DEFB115	HPA053160	IHC
Anti-FAM3D	HPA013844	IHC
Anti-FBXW12	HPA037491	IHC
Anti-FKBP7	HPA008707[5]	IHC,WB,ICC-IF
Anti-GAA	HPA026970	IHC,WB
Anti-GAK	HPA027463	IHC,ICC-IF
Anti-GALNT6	HPA011762	IHC,WB
Anti-GLB1L3	HPA039916	IHC
Anti-GLDC	HPA002318[6]	IHC,WB
Anti-GLUL	HPA007316[7-8]	IHC,WB
Anti-HEPH	HPA005824	IHC,WB
Anti-HLA-E	HPA031454	IHC,ICC-IF
Anti-HMGCS2	HPA027423	IHC,WB
Anti-HMGCS2	HPA027442	IHC,WB,ICC-IF
Anti-HNF4G	HPA005438	IHC
Anti-HPS6	HPA040687	IHC,WB

Product Name	Product Number	Validated Applications
Anti-IFITM3	HPA004337[9]	IHC,WB
Anti-ITGBL1	HPA005676	IHC,WB
Anti-KLHL8	HPA017762	IHC,ICC-IF
Anti-MAGEB1	HPA002820	IHC
Anti-ME2	HPA008247	IHC,WB,ICC-IF
Anti-ME2	HPA008880[10-14]	IHC,WB
Anti-METTL7B	HPA038644	IHC,WB,ICC-IF
Anti-MRS2	HPA017642	IHC,WB
Anti-MYBB-P1A	HPA005466	IHC,WB,ICC-IF
Anti-NAA-LADL2	HPA012413	IHC
Anti-NCBP3	HPA008959[15]	IHC,ICC-IF
Anti-OR9K2	HPA015808	IHC
Anti-OSBPL3	HPA000691[16]	IHC,WB,ICC-IF
Anti-P2RX6	HPA028776	IHC,ICC-IF
Anti-PFKFB2	HPA049975	IHC,ICC-IF
Anti-PHTF2	HPA012312	IHC,ICC-IF
Anti-PITX1	HPA008743	IHC,ICC-IF
Anti-PKN3	HPA045390	IHC
Anti-POMK	HPA013321	IHC,WB,ICC-IF
Anti-PPP1R35	HPA051607	IHC
Anti-PYGB	HPA031067	IHC,WB,ICC-IF
Anti-RAD18	HPA008752	IHC,WB,ICC-IF
Anti-REEP4	HPA042683	IHC,WB
Anti-REG1A	HPA045549	IHC,WB
Anti-RIPPLY2	HPA047454	IHC
Anti-RPS13	HPA005985	IHC,ICC-IF
Anti-S100A4	HPA007973[17-18]	IHC,WB
Anti-SATB2	HPA001042[19-22]	IHC
Anti-SOCS7	HPA004475[23]	IHC,ICC-IF
Anti-SQLE	HPA018038[24]	IHC,WB
Anti-STAG3	HPA049106	IHC
Anti-SYNC	HPA028311	IHC,ICC-IF
Anti-TACC3	HPA005781[25]	IHC,WB
Anti-TBXAS1	HPA031257	IHC
Anti-TBXAS1	HPA031258	IHC
Anti-TBXAS1	HPA031259	IHC,WB
Anti-TGFBI	HPA017019	IHC,WB
Anti-TMEM154	HPA019184	IHC
Anti-TMEM222	HPA016579	IHC,ICC-IF
Anti-TMEM47	HPA046658	IHC,ICC-IF
Anti-TPX2	HPA005487[26]	IHC,WB,ICC-IF

12. MacDonald MJ *et al.* Mitochondrial malic enzyme (ME2) in pancreatic islets of the human, rat and mouse and clonal insulinoma cells. *Arch Biochem Biophys* 2009 Aug 15; 488(2):100-4.

13. MacDonald MJ *et al.* Mitochondrial malic enzyme (ME2) in pancreatic islets of the human, rat and mouse and clonal insulinoma cells. *Arch Biochem Biophys* 2009 Aug 15; 488(2):100-4.

14. MacDonald MJ *et al.* Mitochondrial Malic Enzyme (ME2) In Pancreatic Islets of the Human, Rat and Mouse and Clonal Insulinoma Cells: Simple Enzyme Assay For Mitochondrial Malic Enzyme 2. *Arch Biochem Biophys* 2009 Aug 15; 488(2):100-104.

15. Gebhardt A *et al.* mRNA export through an additional cap-binding complex consisting of NCBP1 and NCBP3. *Nat Commun* 2015 Sep 18; 6:8192. Epub 2015 Sep 18.

16. Ek S *et al*. From gene expression analysis to tissue microarrays: a rational approach to identify therapeutic and diagnostic targets in lymphoid malignancies. *Mol Cell Proteomics* 2006 Jun; 5(6):1072-81. Epub 2006 Mar

17. den Boon JA *et al.* Molecular transitions from papillomavirus infection to cervical precancer and cancer: Role of stromal estrogen receptor signaling. *Proc Natl Acad Sci U S A* 2015 Jun 23; 112(25):E3255-E3264. Epub 2015 Jun 8.

18. Laguë MN *et al.* Decidual PTEN expression is required for trophoblast invasion in the mouse. *Am J Physiol Endocrinol Metab* 2010 Dec; 299(6):E936-E946. Epub 2010 Sep 21.

19. Hjelm B *et al.* Generation of monospecific antibodies based on affinity capture of polyclonal antibodies. *Protein Sci* 2011 Nov; 20(11):1824-35. Epub 2011 Oct 12.

20. Magnusson K *et al.* SATB2 in combination with cytokeratin 20 identifies over 95% of all colorectal carcinomas. *Am J Surg Pathol* 2011 Jul; 35(7):937-48.

21. Wensman H *et al.* Extensive expression of craniofacial related homeobox genes in canine mammary sarcomas. *Breast Cancer Res Treat* 2009 Nov; 118(2):333-43. Epub 2008 Dec 2.

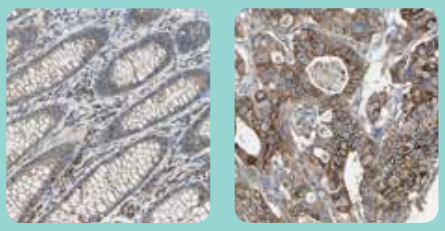
22. Ek S *et al.* From gene expression analysis to tissue microarrays: a rational approach to identify therapeutic and diagnostic targets in lymphoid malignancies. *Mol Cell Proteomics* 2006 Jun; 5(6):1072-81. Epub 2006 Mar 8.

23. Fagerberg L *et al.* Analysis of the Human Tissue-specific Expression by Genome-wide Integration of Transcriptomics and Antibody-based Proteomics. *Mol Cell Proteomics* 2014 Feb; 13(2):397-406. Epub 2013 Dec 5.

24. Nguyen VT *et al.* Differential epigenetic reprogramming in response to specific endocrine therapies promotes cholesterol biosynthesis and cellular invasion. *Nat Commun* 2015 Nov 27; 6:10044. Epub 2015 Nov 27.

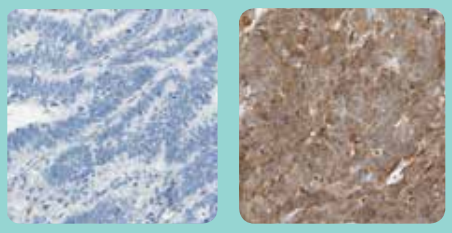
25. Guo Y *et al.* Regulating the ARNT/TACC3 axis: Multiple approaches to manipulating protein/protein interactions with small molecules. *ACS Chem Biol* 2013 Mar 15; 8(3):626-635. Epub 2012 Dec 26.

Anti-HEPH (HPA005824)



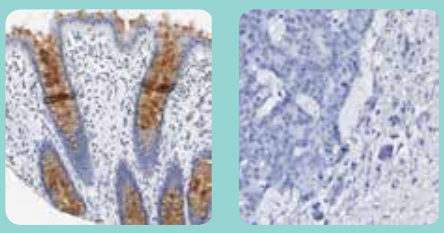
Using IHC, the Anti-HEPH antibody (HPA005824) shows cytoplasmic and membranous positivity in glandular cells in normal human colon tissue. In some colorectal cancer samples, prominent membranous positivity could be seen.

Anti-GLUL (HPA007316)



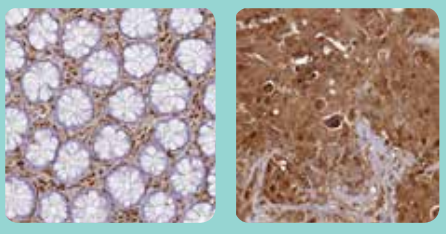
Using IHC, the Anti-GLUL antibody (HPA007316) shows either positive, or negative staining in different colorectal cancer samples.

Anti-SOCS7 (HPA004475)



The Anti-SOCS7 antibody (HPA004475) shows positivity in glandular cells in normal human colon tissue, while colorectal cancer samples are negative.

Anti-S100A4 (HPA007973)



The Anti-S100A4 antibody (HPA007973) shows no positivity in glandular cells in normal human colon tissue (left image), while colorectal cancer samples are either positive (right image), or negative.

Epithelial to Mesenchymal Transition Marker Panel

The EMT Panel

Epithelial and mesenchymal cells are fundamentally different and represent the two main cell types in the body. Epithelial cells are polarised along the apical/basal axis and are tightly connected to each other as well as to underlying basement membrane by a number of cell junction proteins. In contrast, mesenchymal cells are adhered to the extracellular matrix and have enhanced migratory capacities.

Epithelial cells can transition into mesenchymal cells – a process known as epithelial-mesenchymal transition (EMT), which leads to loss of epithelial barrier functions and changes in cell adhesion and motility[1]. Normally, EMT occurs during development (embryogenesis), but it is also present in wound healing and cancer progression of epithelial tumors. In metastasis, tumor cells dissociate from the epithelial layer, penetrate through basement membrane into connective tissue and can then enter the vascular system for further dissemination and subsequent growth of distant metastases[2].

A number of factors drive and regulate the EMT process, including zinc finger proteins such as SNAI1, SNAI2, ZEB1 and ZNF703. These transcription factors down-regulate the expression of epithelial cell adhesion proteins such as E-cadherin, occludin, beta-catenin and claudin. In addition, they up-regulate expression of mesenchymal proteins, including N-cadherin, fibronectin, vimentin, S100A4 and others. Taken together, EMT leads to increase motility and invasiveness of cancer cells[1].

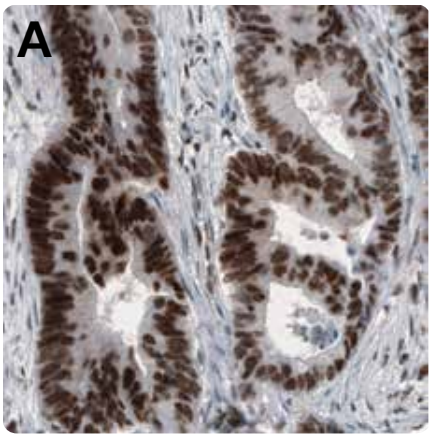
This panel of Prestige Monoclonals has been developed against the key EMT markers for cell junctions, cytoskeletal changes, transcription regulation and migration/motility. The antibodies targeting selected EMT marker proteins are:

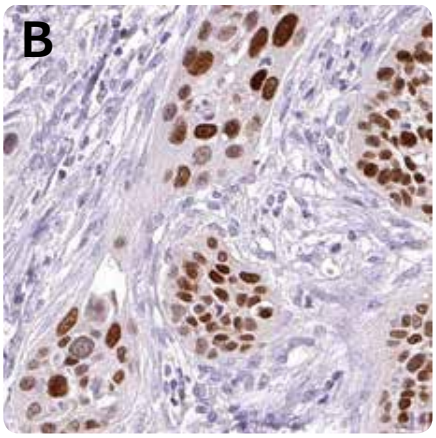
- IHC-validated in relevant normal and cancer human tissues
- WB-validated in positive and negative cell lines (when available)
- Available with different isotypes, allowing for multiplexing experiments
- Supplemented with information on antigens used for immunization and precise epitope sequence (when available)

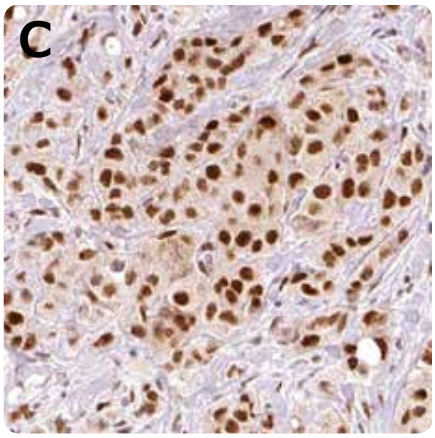
The monoclonal antibodies within the panel have been developed using the same stringent conditions as for all Prestige Monoclonals, ensuring a secured continuity and stable supply.

Using Monoclonals of Defined Isotypes for Multiplexed Immunofluorescence

The EMT panel includes monoclonal antibodies with different isotypes, which allows for co-localization studies using immunofluorescence with isotype-specific secondary antibodies. The images on the right side show multiplexed staining of colorectal cancer tissue derived from two different patients using the Anti-CDH1 (A, E: AMAb90863, IgG1), Anti-CTNNB1 (B, F: AMAb91209, IgG2a) and LAMC1 (C, G: AMAb91138, IgG2b) monoclonal antibodies, respectively. The tumor with higher degree of differentiation (indicated by preserved basement membrane, C) shows higher expression of E-cadherin (A) as compared to the tumor with lower differentiation grade (E). Also note the absence of LAMC1 immunoreactivity in the second tumor (G). Beta-catenin (CTNNB1) expression is preserved in both tumors (B, F). Panels D and H show overlay images for the two tumors.







Transcription factors involved in regulation of EMT. IHC images show nuclear immunoreactivity in tumor cells in (A) colorectal cancer (Anti-SNAI1 antibody AMAb91215), (B) cervical cancer (Anti-SIX1 antibody AMAb90544) and (C) breast cancer (Anti-ZNF703 AMAb90789).

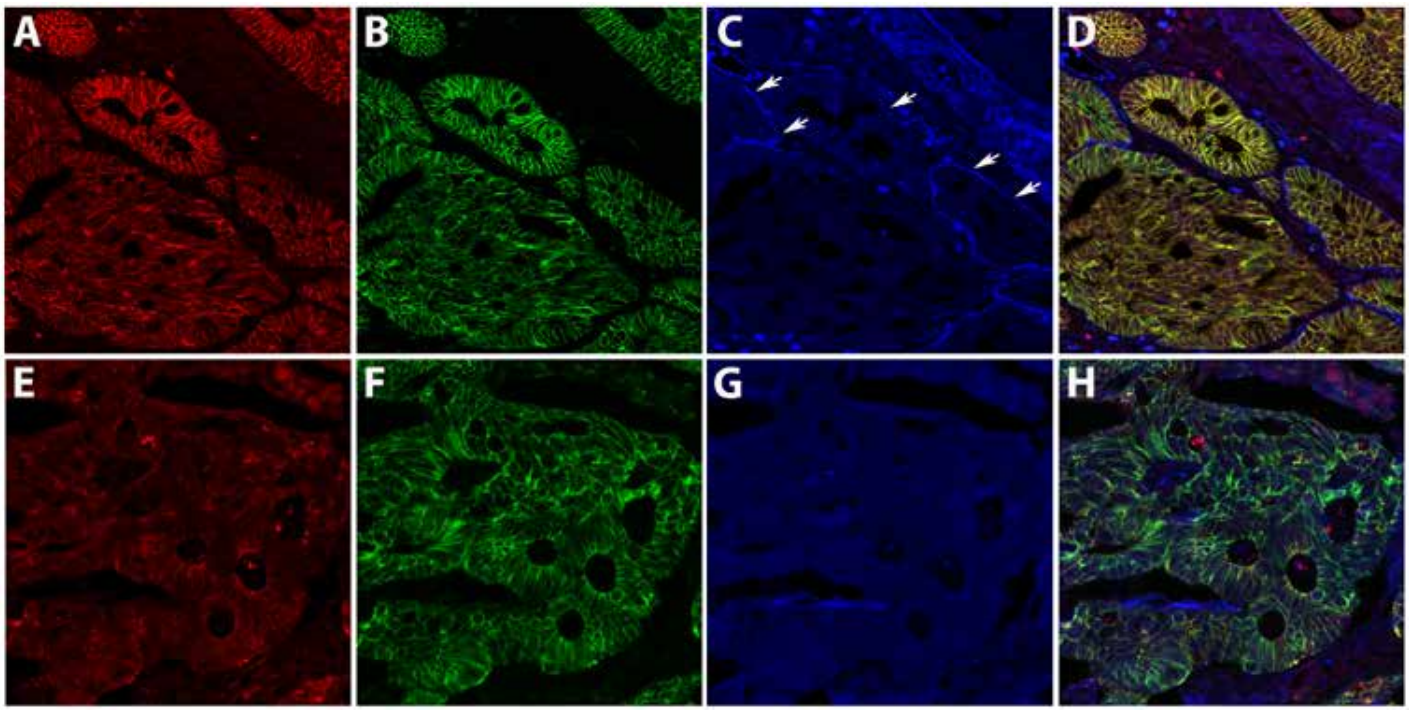
Table 1.
Summary of the Prestige Monoclonals EMT Markers.

Marker for	Product Name	Product Number	Validated Applications	Epitope	Isotype
Cell junctions	**Anti-CDH1**	AMAb90862	IHC, WB	NWTIQYNDPTQESII	IgG2b
Cell junctions	**Anti-CDH1**	AMAb90863	IHC, WB	APIPEPRTIF	IgG1
Cell junctions	**Anti-CDH1**	AMAb90865	IHC, WB	LKPKMALEVG	IgG2a
Cell junctions	**Anti-OCLN**	AMAb90889	IHC, WB	TSPVDDFRQPRYSSG	IgG2a
Cell junctions	**Anti-OCLN**	AMAb90890	IHC, WB	NDKRFYPESSYKSTP	IgG2a
Cell junctions	**Anti-OCLN**	AMAb90893	IHC, WB	RYSSGGNFETPSKRA	IgG1
Cell junctions	**Anti-CTNNB1**	AMAb91209	IHC, WB	TSQVLYEWEQGFSQS	IgG2a
Cell junctions	**Anti-CTNNB1**	AMAb91210	IHC, WB	TSQVLYEWEQGFSQS	IgG1
Cell junctions	**Anti-CLDN1**	AMAb91213	IHC, WB	KTTSYPTPRPYPKPA	IgG1
Cytoskeletal changes	**Anti-VIM**	AMAb90516	IHC, WB	N.D.	IgG1
Cytoskeletal changes	**Anti-S100A4**	AMAb90596	IHC, WB	KFKLNKSELKELLTR	IgG1
Cytoskeletal changes	**Anti-S100A4**	AMAb90598	IHC, WB	CNEFFEGFPDKQPRKK	IgG2b
Cytoskeletal changes	**Anti-S100A4**	AMAb90599	IHC, WB	CNEFFEGFPD	IgG1
Transcription regulation	**Anti-SNAI1**	AMAb91215	IHC	N.D.	IgG1
Transcription regulation	**Anti-ZEB1**	AMAb90510	IHC, WB, ICC	N.D.	IgG1
Transcription regulation	**Anti-SIX1**	AMAb90544	IHC, WB, ICC	N.D.	IgG1
Transcription regulation	**Anti-ZNF703**	AMAb90789	IHC, WB	PGDKAGFRVP	IgG1
Transcription regulation	**Anti-TP63**	AMAb91224	IHC, WB	MQYLPQHTIETYRQQ	IgG1
Migration/Motility	**Anti-CDH2**	AMAb91220	IHC, WB	ENPYFAPNPK	IgG1
Migration/Motility	**Anti-FN1**	AMAb91223	IHC, WB	GRWKCDPVDQ	IgG1
Migration/Motility	**Anti-MMP9**	AMAb90804	IHC, WB	VPDLGRFQTF	IgG1
Migration/Motility	Anti-MMP9	AMAb90805	IHC, WB	RGESKSLGPALLLLQ	IgG1
Migration/Motility	Anti-MMP9	AMAb90806	IHC	RGESKSLGPALLLLQ	IgG2b

Related Publications

1. Lamouille S *et al*. Molecular mechanisms of epithelial-mesenchymal transition. 2014 *Nat Rev Mol Cell Biol.* 15(3):178-196

2. Chambers AF *et al*. 2002. Dissemination and growth of cancer cells in metastatic sites. *Nat Rev Cancer* 2(8):563-572.



Multiplexed IHC-IF staining of two colorectal tumors (A-D and E-H) showing E-cadherin (A, E), beta-catenin (B, F) and laminin-gamma 1 (C, G) immunoreactivity using primary antibodies of different isotypes: Anti-CDH1 AMAb90863, IgG1 (red), Anti-CTNNB1 AMAb91209, IgG2a (green) and Anti-LAMC1 (AMAb91138), IgG2b (blue). Arrowheads in C indicate basement membrane. Alexa Fluor® 647-, 594- and 488-labelled isotype-specific secondary antibodies (Life Technologies) were used for visualisation.

Finding biomarkers for colorectal cancer research

Colorectal Cancer

Colorectal cancer is one of the most common types of cancer. Each year, approximately one million new cases are detected, and approximately 600,000 deaths can be contributed to this disease worldwide. Today, surgery is the only curative treatment for colorectal cancer, but adjuvant treatment may significantly improve patient survival. For adjuvant treatment to be successful, however, it is important to correctly identify patients that will benefit from treatment. For colon cancer, which accounts for approximately 70% of colorectal cancer cases, adjuvant treatment is currently recommended for patients with stage III and high-risk stage II disease. For patients with stage II colon cancer, it is thus of utmost importance to find biomarkers that can separate high-risk disease from low-risk disease.

Colorectal Cancer Biomarkers

Within the Human Protein Atlas (HPA) project, several potential prognostic and diagnostic biomarkers have been discovered. By staining of both normal- and tumor tissue samples, proteins with a tissue specific expression have been identified. Also, proteins with a differential expression in colorectal tissue samples from different patients have been identified. These potential biomarkers have subsequently been analyzed in larger patient cohorts, and their prognostic potential evaluated. Below, some of the most promising markers are described briefly.

RBM3

The RNA-binding motif protein 3 (RBM3) is an RNA- and DNA-binding protein, whose function has not been fully elucidated. It has been shown that the protein is expressed as an early event in mild hypothermia, and also in other conditions relating to cellular stress, such as glucose deprivation and hypoxia. During stress, RBM3 is thought to protect the cells by aiding in maintenance of protein synthesis needed for survival. Recently, it has also been shown that RBM3 attenuates stem cell-like properties in prostate cancer cells.

The RNA-binding protein RBM3 was identified via the Human Protein Atlas as an oncology biomarker through the differential expression pattern observed within several investigated cancers.

The levels of RBM3 expression were found to have a significant correlation to patient survival in breast, colon, ovarian, testicular, prostate and urothelial cancer as well as in malignant melanoma.

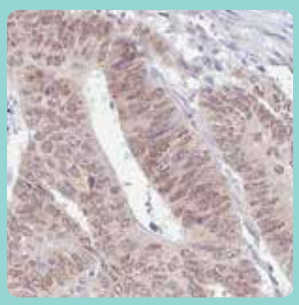
RBM3 as a prognostic biomarker in colon cancer

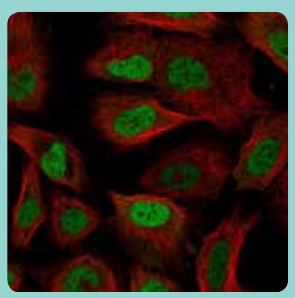
RBM3 was shown to be a prognostic marker in colorectal cancer in two independent patient cohorts, with a significantly improved survival for patients with high levels of RBM3 expression in their tumors. When analyzing stage II patients separately, similar results were obtained.

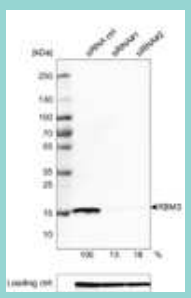
This indicates that RBM3 may be used as a biomarker for aid in deciding which stage II patients would benefit from adjuvant treatment.

RBM3 as a treatment predictive biomarker

The RBM3 protein has also been shown to be a treatment predictive marker for platinum based treatment. Chemotherapy with oxaliplatin is commonly used in colorectal cancer treatment.







The Anti-RBM3 (AMAb90655) antibody shows nuclear positivty by IHC in cancer cells in human colorectal tumor samples and nuclear staining by ICC-IF in U2-OS cells. By WB, the AMAb90655 antibody signal is down regulated using target specific siRNA probes in U-251 cells.

Related Publications

Zeng Y *et al*. (2013) Stress response protein RBM3 attenuates the stem-like properties of prostate cancer cells by interfering with CD44 variant splicing. *Cancer Res.* Jul 1;73(13):4123-33.

Ehlén A *et al*. Expression of the RNA-binding protein RBM3 is associated with a favourable prognosis and cisplatin sensitivity in epithelial ovarian cancer. *J Transl Med.* 2010 Aug 20;8:78.

Hjelm B *et al*. High nuclear RBM3 expression is associated with an improved prognosis in colorectal cancer. *Proteomics Clin Appl.* 2011 Dec;5(11-12):624-35.

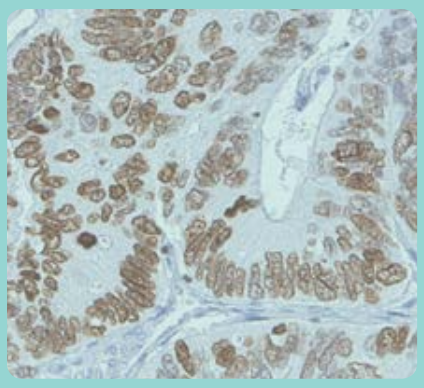
Boman K *et al*. Decreased expression of RNA-binding motif protein 3 correlates with tumour progression and poor prognosis in urothelial bladder cancer. *BMC Urol.* 2013, 13:17.

SATB2 – A diagnostic biomarker for tumors of colorectal origin

Cell- and cancer-type specific proteins are rare. The special AT-rich sequence-binding protein SATB2 has been identified as having a very selective expression pattern. In cells of epithelial lineages, SATB2 is expressed in glandular cells lining the lower gastrointestinal tract and expression is retained in a large majority of primary and metastatic colorectal cancers. Thus, SATB2 is a promising diagnostic biomarker for tumors of colorectal origin.

In a previously published study by Magnusson et al it was shown, by analyzing more than 1,800 tumor samples, that SATB2 expression is largely preserved in cells of colorectlal cancer origin. More than 85% of all colorectal cancers showed distinct SATB2 immunostaining and when used in combination with Cytokeratin 20 analysis, SATB2 identified more than 95% of all tumors with colorectal origin.

These promising data suggested that the combination of SATB2 and CK20 should be tested in an unbiased clinical study to further validate the initial findings. In a recent publication by Dragomir et al, the expression of SATB2 was analyzed in over 800 consecutive clinical cases for which CK20 immunostaining was considered necessary to obtain a final diagnosis. In this study, SATB2 showed 93% sensitivity and 77% specificity to determine a cancer of colorectal origin and in combination with CK7 and CK20, the specificity increased to 100%. SATB2 thus provides a new and advantageous supplement to current standards for clinical differential diagnosis.



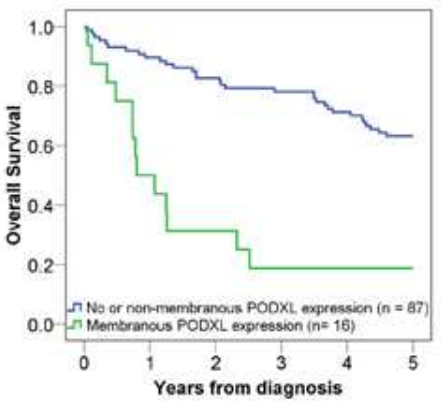
Immunohistochemical staining of human colorectal tumor with Anti-SATB2 antibody (AMAb90635) shows strong nuclear staining in tumor cells.

Related Publications

Magnusson K *et al*. SATB2 in combination with cytokeratin 20 identifies over 95% of all colorectal carcinomas. *Am J Surg Pathol.* 2011 Jul;35(7):937-48.

Dragomir A *et al*. The role of SATB2 as a diagnostic marker for tumors of colorectal origin: results from a pathology-based clinical prospective study. *Am J Clin Pathol.* 2013 In press.

PODXL - An independent factor for poor prognosis and treatment stratification

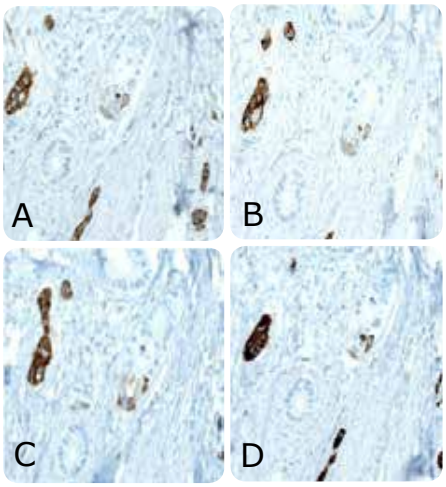


Kaplan–Meier estimates of 5-year Overall Survival (OS) according to PODXL expression in a urothelial cancer patient cohort of 110 individuals.

Podocalyxin-like 1 (PODXL) is a cell-adhesion glycoprotein and stem cell marker that has been associated with aggressive tumor phenotype and adverse outcome in several cancer types.

In a number of recently published papers, Larsson *et al* have demonstrated that membraneous expression of PODXL is associated with unfavourable clinicopathological characteristics and independently predicts a poor prognosis in colorectal cancer (CRC). This has been demonstrated in three independent patient cohorts in total comprising more than 1,000 patients. The results clearly demonstrate the potential utility of PODXL as a biomarker for more precise prognostication and treatment stratification in CRC.

Boman *et al* have investigated the prognostic impact of membraneous PODXL expression in almost 500 cases of urothelial cancer. They concluded that PODXL is indeed an independent risk factor for progressive disease and death in patients with urothelial cancer and that this warrant further studies to fully evaluate the use of PODXL as a biomarker for improved treatment stratification of bladder cancer patients.



Immunohistochemical staining of PODXL protein in colorectal tumor tissue using A) HPA002110, B) AMAb90643, C) AMAb90644 and D) AMAb90667 antibodies.

Related Publications

Larsson A *et al*. Overexpression of podocalyxin-like protein is an independent factor of poor prognosis in colorectal cancer. *Br J Cancer* 2011 Aug 23;105(5):666-72.

Larsson A *et al*. Validation of podocalyxin-like protein as a biomarker of poor prognosis in colorectal cancer. *BMC Cancer.* 2012 Jul 8;12:282.

Boman K *et al*. Membraneous expression of podocalyxin-like protein is an independent factor of poor prognosis in urothelial bladder cancer. *Br J Cancer.* 2013 Jun 11;108(11), 2321-2328.

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