abcam

ab81289

Anti-CD34 antibody [EP373Y]

Anti-CD34 antibody [EP373Y] (ab81289) is a rabbit monoclonal antibody detecting CD34 in **Western Blot, Flow Cytometry (Intra), IP, IHC-P, IHC-Fr, ICC/IF**. Suitable for **Human, Mouse, Rat**.

- Biophysical QC for unrivalled batch-batch consistency
- Over 570 publications
- Trusted since 2009

Recombinant | RabMAb | 20ul selling size

Key facts

Isotype	IgG
Host species	Rabbit
Storage buffer	pH: 7.2 - 7.4 Preservative: 0.01% Sodium azide Constituents: PBS, 40% Glycerol (glycerin, glycerine), 0.05% BSA
Form	Liquid
Clonality	Monoclonal
Immunogen	The exact immunogen used to generate this antibody is proprietary information.
Clone number	EP373Y
Purification technique	Affinity purification Protein A
Dissociation constant	1.15 x 10^{-10} M
Concentration	0.535 mg/mL The concentration of this product may be batch-dependent Batch concentration finder →

Reactivity data

IHC-P

Tested

Species	Mouse
Dilution info	1/2500 - 1/5000
Notes	Perform heat-mediated antigen retrieval with citrate buffer pH 6 before commencing with IHC staining protocol.

Species	Rat
Dilution info	1/2500 - 1/5000
Notes	Perform heat-mediated antigen retrieval with citrate buffer pH 6 before commencing with IHC staining protocol.

Species	Human
Dilution info	1/2500 - 1/5000
Notes	Perform heat-mediated antigen retrieval with citrate buffer pH 6 before commencing with IHC staining protocol.

Predicted

Species	Sheep, Dog, African bush elephant
Dilution info	-
Notes	-

IP

Tested

Species	Human
Dilution info	1/30
Notes	-

Expected

Species	Mouse, Rat
Dilution info	Use at an assay dependent concentration.
Notes	-

Predicted

Species	Sheep, Dog, African bush elephant
Dilution info	-
Notes	-

WB

Tested

Species	Human
Dilution info	1/1000
Notes	-

Species	Mouse
Dilution info	1/1000
Notes	-

Species	Rat
Dilution info	1/1000
Notes	-

Predicted

Species	Sheep, Dog, African bush elephant
Dilution info	-
Notes	-

ICC/IF

Tested

Species	Human
Dilution info	1/100 - 1/250
Notes	-

Expected

Species	Mouse, Rat
Dilution info	Use at an assay dependent concentration.
Notes	-

Predicted

Species	Sheep, Dog, African bush elephant
Dilution info	-
Notes	-

IHC-Fr

Tested

Species	Rat
Dilution info	1/50 - 1/200
Notes	-

Species	Mouse
Dilution info	1/50
Notes	-

Expected

Species	Human
Dilution info	Use at an assay dependent concentration.
Notes	-

Predicted

Species	Sheep, Dog, African bush elephant
Dilution info	-
Notes	-

Flow Cyt (Intra)

Tested

Species	Human
Dilution info	0.2-1 µg/mL
Notes	-

Expected

Species	Mouse, Rat
Dilution info	Use at an assay dependent concentration.
Notes	-

Predicted

Species	Sheep, Dog, African bush elephant
Dilution info	-
Notes	-

Target data

See full target information CD34

Function	Possible adhesion molecule with a role in early hematopoiesis by mediating the attachment of stem cells to the bone marrow extracellular matrix or directly to stromal cells. Could act as a scaffold for the attachment of lineage specific glycans, allowing stem cells to bind to lectins expressed by stromal cells or other marrow components. Presents carbohydrate ligands to selectins.

Storage

Shipped at conditions	Conditional Ambient
Appropriate short-term storage duration	1-2 weeks
Appropriate short-term storage conditions	+4°C
Appropriate long-term storage conditions	-20°C

Aliquoting information	Upon delivery aliquot
Storage information	Avoid freeze / thaw cycle

Notes

Anti-CD34 antibody [EP373Y] (ab81289) was developed by Abcam using patented rabbit monoclonal antibody technology and is validated for use in Flow Cyt (Intra), ICC/IF, IHC-Fr, IHC-P and IP.

Anti-CD34 antibody [EP373Y] (ab81289) was first used in a scientific publication in 2010 and has been cited over 570 times in peer reviewed journals. It's performance in IHC and Flow Cytometry in human, mouse and rat samples is trusted by the scientific community.

Abcam's high quality manufacturing and validation processes ensure Anti-CD34 antibody [EP373Y] (ab81289) has high sensitivity and specificity alongside high lot-to-lot consistency and reproducibility.

Anti-CD34 antibody [EP373Y] (ab81289) has 54 independent reviews from customers.

Anti-CD34 antibody [EP373Y] (ab81289) specifically detects CD34 (UniProt ID: P28906; Molecular weight: 38kDa) and is sold in 100 µL and 1 mL selling sizes.

Conjugation-ready, carrier free format available for antibody clone EP373Y - ab188169.

Antibody clone EP373Y is also available pre-conjugated to a variety of labels for your convenience - Alexa Fluor® 488, HRP, PE, APC, Alexa Fluor® 594, Alexa Fluor® 568, Alexa Fluor® 555, Alexa Fluor® 750 (ab195013, ab195017, ab223930, ab310881, ab311670, ab312945, ab313155, ab321739).

CD34 is a marker for hematopoietic stem cells and plays a role in immunology diseases by facilitating cell migration and adhesion, impacting conditions like leukaemia and other hematologic disorders. EP373Y is top cited on the market with over 763 citations and validated in human, mouse, rat samples with the broadest range of applications.

Patented technology
Our RabMAb® technology is a patented hybridoma-based technology for making rabbit monoclonal antibodies. For details on our patents, please refer to RabMAb® patents.

What are the advantages of a recombinant monoclonal antibody?
This product is a recombinant monoclonal antibody, which offers several advantages including:

- High batch-to-batch consistency and reproducibility
- Improved sensitivity and specificity
- Long-term security of supply
- Animal-free batch production

For more information, read more on recombinant antibodies.

Product promise

Tested

We have tested this species and application combination and it works. It is covered by our product promise.

Expected

We have not tested this specific species and application combination in-house, but expect it will work. It is covered by our product promise.

Predicted

This species and application combination has not been tested, but we predict it will work based on strong homology. However, this combination is not covered by our product promise.

Not recommended

We do not recommend this combination. It is not covered by our product promise.

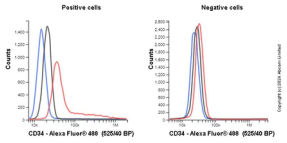
We are dedicated to supporting your work with high quality reagents and we are here for you every step of the way should you need us.

In the unlikely event of one of our products not working as expected, you are covered by our product promise.

Full details and terms and conditions can be found here:
Terms & Conditions.

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20 product images



Flow Cytometry (Intracellular) - Anti-CD34 antibody [EP373Y] (ab81289)

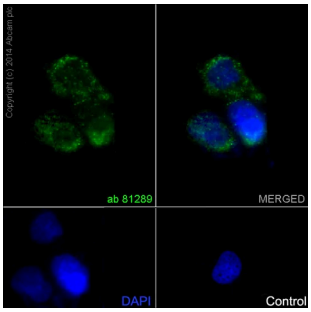
CD34 Flow Cytometry (Intracellular) staining using rabbit Anti-CD34 antibody

Flow cytometry overlay histogram showing left HUVEC positive cells and right negative HL60 stained with ab81289 (red line). The cells were fixed with 4% formaldehyde (10 min) and then permeabilised with 0.1% PBS-Triton X-100 for 15 mins. The cells were then incubated in 1x PBS containing 10% normal goat serum to block non-specific protein-protein interaction followed by the antibody (ab81289) (1x 10^6 in 100µl at 0.2µg/ml (1/11550 dilution)) for 30 mins at 22°C.

The secondary antibody Goat Anti-Rabbit IgG H&L (Alexa Fluor® 488) preadsorbed was incubated at 1/4000 dilution for 30 mins at 22°C

Isotype control antibody (black line) was Recombinant Rabbit IgG, monoclonal [EPR25A] - Isotype Control (ab172730) used at the same concentration and conditions as the primary antibody. Unlabelled sample (blue line) was also used as a control.

Acquisition of >5000 events were collected using a 50 mW Blue laser (488nm) and 525/40 bandpass filter.



Immunocytochemistry/ Immunofluorescence - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunocytochemistry/ Immunofluorescence staining using rabbit Anti-CD34 antibody

Immunocytochemistry/Immunofluorescence analysis of HUVEC (Human umbilical vein endothelial cell line) cells labelling CD34 with purified ab81289 at 1/100. Cells were fixed with 4% paraformaldehyde and permeabilized with 0.1% Triton X-100. An Alexa Fluor® 488-conjugated goat anti-rabbit IgG (ab150077) (1/500) was used as the secondary antibody. DAPI (blue) was used as the nuclear counter stain.
Control: Secondary antibody only, ab150120, an Alexa Fluor® 488-conjugated goat anti-mouse IgG (1/500).

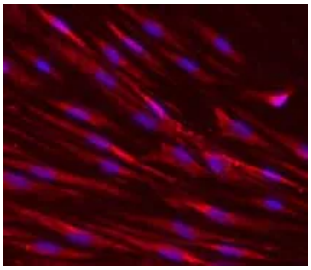
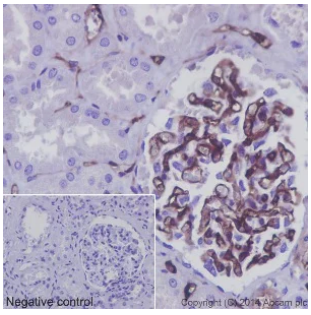


Image from Földes G et al. PLoS One. 2010 May 5;5(5):e10501 Fig 3.

Immunocytochemistry/ Immunofluorescence - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunocytochemistry/ Immunofluorescence staining using rabbit Anti-CD34 antibody

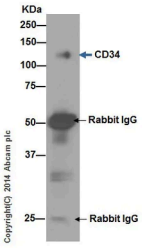
Immunocytochemistry/Immunofluorescence analysis of human embryonic stem cell-derived endothelial cells labeling CD34 with unpurified ab81289 at 1/200. Cells were fixed with 4% paraformaldehyde and permeabilized with 0.2% aTriton X-100. An Alexa Fluor® 647-conjugated secondary antibody was used at a 1/400 dilution. DAPI (blue) was used as the nuclear counter stain.



Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) staining using rabbit Anti-CD34 antibody

Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) analysis of human kidney tissue labelling CD34 with purified ab81289 at 1/2500. Heat mediated antigen retrieval was performed using Tris/EDTA buffer pH 9. Goat Anti-Rabbit IgG H&L (HRP) (ab97051) was used as the secondary antibody at 1/500. Negative control using PBS instead of primary antibody. Counter stained with Hematoxylin.

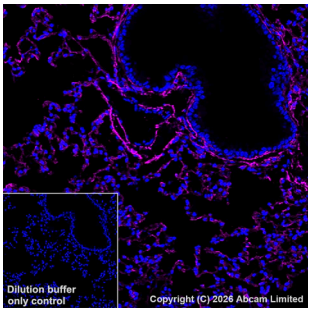


Immunoprecipitation - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 was immunoprecipitated from TF-1 (Human bone marrow erythroleukemia cells) cells using purified ab81289 at 1/30 dilution. Western blot was performed from the immunoprecipitate using ab81289. Goat Anti-Rabbit IgG, (H+L), Peroxidase conjugated was used as secondary antibody at 1/1000 dilution. Blocking and dilution buffer and concentration: 5% NFDM/TBST
All lanes:
Immunoprecipitation - Anti-CD34 antibody [EP373Y] (ab81289)

Predicted band size: 40 kDa

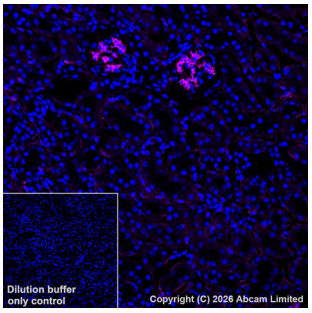
Observed band size: 120 kDa



Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining of Mouse Lung using rabbit Anti-CD34 antibody

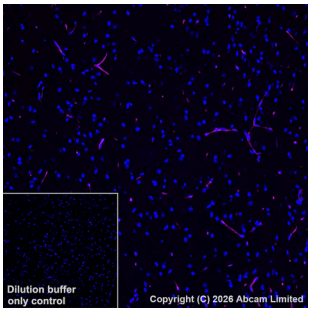
Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Mouse Lung tissue labeling CD34 with ab81289 at 1/50 (9.58 µg/ml) dilution followed by ab150079 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 647) preadsorbed at 1/1000 (4 µg/mL). Confocal image showing positive staining on mouse lung tissue. The nuclear counterstain was DAPI (Blue). The section was incubated with ab81289 for 60 mins at room temperature. The section was then mounted using Fluoromount®.The immunostaining was performed on a Leica Biosystems BOND® RX instrument. Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8). Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).



Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining of Mouse Kidney using rabbit Anti-CD34 antibody

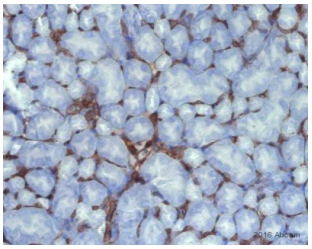
Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Mouse Kidney tissue labeling CD34 with ab81289 at 1/50 (9.58 µg/ml) dilution followed by ab150079 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 647) preadsorbed at 1/1000 (4 µg/mL). Confocal image showing positive staining on mouse kidney tissue. The nuclear counterstain was DAPI (Blue). The section was incubated with ab81289 for 60 mins at room temperature. The section was then mounted using Fluoromount®.The immunostaining was performed on a Leica Biosystems BOND® RX instrument. Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8). Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).



Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining of Mouse Brain using rabbit Anti-CD34 antibody

Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Mouse Brain tissue labeling CD34 with ab81289 at 1/50 (9.58 µg/ml) dilution followed by ab150079 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 647) preadsorbed at 1/1000 (4 µg/mL). Confocal image showing positive staining on mouse brain tissue. The nuclear counterstain was DAPI (Blue). The section was incubated with ab81289 for 60 mins at room temperature. The section was then mounted using Fluoromount®.The immunostaining was performed on a Leica Biosystems BOND® RX instrument. Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8). Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).

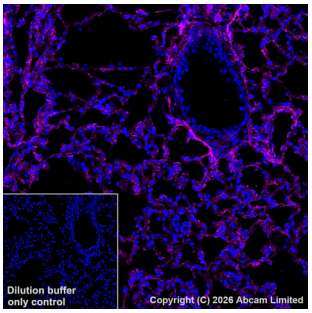


Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) staining using rabbit Anti-CD34 antibody

Paraformaldehyde-fixed, paraffin-embedded mouse kidney tissue stained for CD34 using ab81289 at 1/200 dilution in immunohistochemical analysis.

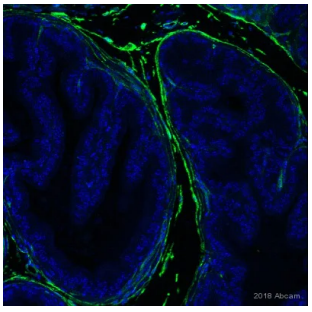
This image is courtesy of a customer review submitted by Rudolf Jung.



Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining of Rat Lung using rabbit Anti-CD34 antibody

Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Rat Lung tissue labeling CD34 with ab81289 at 1/200 (2.4 µg/ml) dilution followed by ab150079 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 647) preadsorbed at 1/1000 (4 µg/mL). Confocal image showing positive staining on rat lung tissue. The nuclear counterstain was DAPI (Blue). The section was incubated with ab81289 for 60 mins at room temperature. The section was then mounted using Fluoromount®.The immunostaining was performed on a Leica Biosystems BOND® RX instrument. Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8). Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).

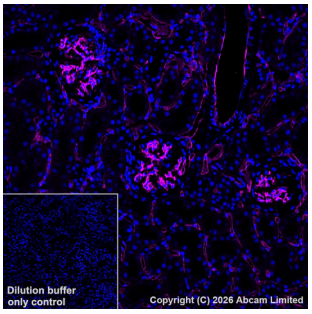


This image is courtesy of an anonymous customer review.

Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) staining using rabbit Anti-CD34 antibody

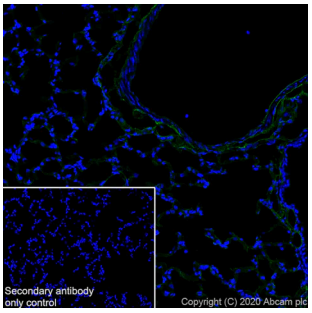
Paraformaldehyde-fixed, paraffin-embedded mouse prostate tissue stained for CD34 using ab81289 at 1/150 dilution in immunohistochemical analysis.



Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining of Rat Kidney using rabbit Anti-CD34 antibody

Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Rat Kidney tissue labeling CD34 with ab81289 at 1/200 (2.4 µg/ml) dilution followed by ab150079 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 647) preadsorbed at 1/1000 (4 µg/mL). Confocal image showing positive staining on rat kidney tissue. The nuclear counterstain was DAPI (Blue). The section was incubated with ab81289 for 60 mins at room temperature. The section was then mounted using Fluoromount®.The immunostaining was performed on a Leica Biosystems BOND® RX instrument. Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8). Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).

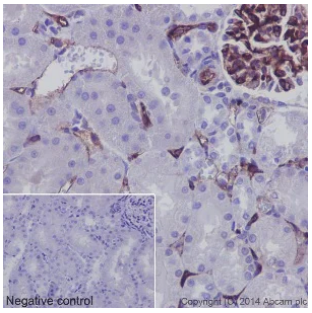


Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining using rabbit Anti-CD34 antibody

Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Rat lung tissue labeling CD34 with ab81289 at 1/50 (11.04 µg/ml) dilution followed by ab150077 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 488) at 1/1000 dilution (Green). Positive staining on rat lung. is observed. The nuclear counterstain was DAPI (Blue).
Secondary antibody control: Secondary antibody is ab150077 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 488) at 1000 dilution.

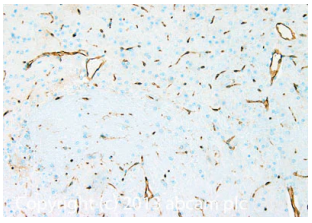
Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).



Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) staining using rabbit Anti-CD34 antibody

Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) analysis of rat kidney tissue labelling CD34 with purified ab81289 at 1/2500. Heat mediated antigen retrieval was performed using Tris/EDTA buffer pH 9. Goat Anti-Rabbit IgG H&L (HRP) (ab97051) was used as the secondary antibody at 1/500. Negative control using PBS instead of primary antibody. Counter stained with Hematoxylin.

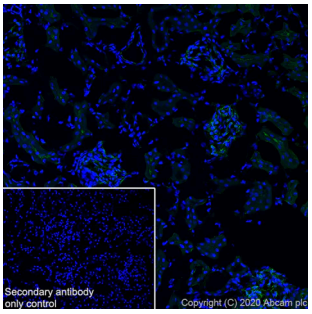


Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) staining using rabbit Anti-CD34 antibody

IHC image of CD34 staining in Mouse normal brain formalin fixed paraffin embedded tissue section, performed on a Leica Bond™ system using the standard protocol B. The section was pre-treated using heat mediated antigen retrieval with sodium citrate buffer (pH6, epitope retrieval solution 1) for 20 mins. The section was then incubated with unpurified ab81289, 1/250 dilution, for 15 mins at room temperature. A Goat anti-Rabbit biotinylated secondary antibody was used to detect the primary, and visualized using an HRP conjugated ABC system. DAB was used as the chromogen. The section was then counterstained with haematoxylin and mounted with DPX.

For other IHC staining systems (automated and non-automated) customers should optimize variable parameters such as antigen retrieval conditions, primary antibody concentration and antibody incubation times.



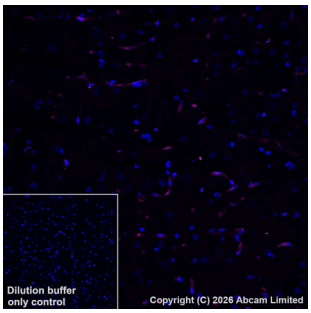
Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining using rabbit Anti-CD34 antibody

Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Rat kidney tissue labeling CD34 with ab81289 at 1/50 (11.04 µg/ml) dilution followed by ab150077 Goat Anti-

Rabbit IgG H&L (Alexa Fluor® 488) at 1/1000 dilution (Green). Positive staining on rat kidney. is observed. The nuclear counterstain was DAPI (Blue).
Secondary antibody control: Secondary antibody is ab150077 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 488) at 1000 dilution.

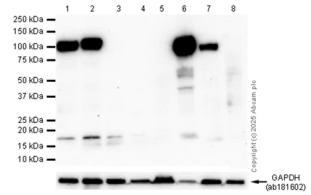
Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).



Immunohistochemistry (Frozen sections) - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Immunohistochemistry (Frozen sections) staining of Rat Brain using rabbit Anti-CD34 antibody

Immunohistochemical analysis of 4% PFA-fixed 0.2% Triton X-100 permeabilized frozen Rat Brain tissue labeling CD34 with ab81289 at 1/200 (2.4 µg/ml) dilution followed by ab150079 Goat Anti-Rabbit IgG H&L (Alexa Fluor® 647) preadsorbed at 1/1000 (4 µg/mL). Confocal image showing positive staining on rat brain tissue. The nuclear counterstain was DAPI (Blue). The section was incubated with ab81289 for 60 mins at room temperature. The section was then mounted using Fluoromount®.The immunostaining was performed on a Leica Biosystems BOND® RX instrument. Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8). Heat mediated antigen retrieval using sodium citrate buffer (10mM citrate pH 6.0 + 0.05% Tween-20).



Western blot - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Western blot staining using rabbit Anti-CD34 antibody

Blocking and diluting buffer and concentration: 5% NFDM/TBST.

Negative control: Daudi, HL-60.

Low expression: HUVEC, Neuro-2a.

All lanes:
Western blot - Anti-CD34 antibody [EP373Y] (ab81289) at 1/1000 dilution

Lane 1:
KG-1a (human bone marrow myeloblast) whole cell lysate at 20 µg

Lane 2:
TF-1 (human erythroleukemia erythroblast) whole cell lysate at 20 µg

Lane 3:
Daudi (human Burkitts lymphoma lymphoblast) whole cell lysate at 20 µg

Lane 4:
HL-60 (Human acute promyelocytic leukemia promyeloblast) whole cell lysate at 20 µg

Lane 5:
HUVEC (Human umbilical vein endothelial cell) whole cell lysate at 20 µg

Lane 6:
bEnd.3 (mouse brain endothelioma) whole cell lysate at 20 µg

Lane 7:
NIH/3T3 (mouse embryonic fibroblast) whole cell lysate at 20 µg

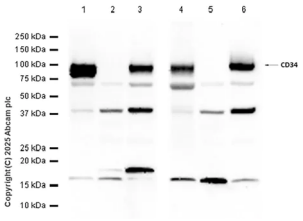
Lane 8:
Neuro-2a (mouse neuroblastoma neuroblast) whole cell lysate at 20 µg

Secondary

All lanes:
Western blot - Goat Anti-Rabbit IgG H&L (HRP) (ab97051) at 1/100000 dilution

Observed band size: 80-120 kDa

Exposure time: 60s



Western blot - Anti-CD34 antibody [EP373Y] (ab81289)

CD34 Western blot staining using rabbit Anti-CD34 antibody

Blocking and diluting buffer and concentration: 5% NFDM/TBST.
This product failed to detect any signal in the kidney lysate.

All lanes:
Western blot - Anti-CD34 antibody [EP373Y] (ab81289) at 1/1000 dilution

Lane 1:
Mouse lung tissue lysate at 20 µg

Lane 2:
Mouse kidney tissue lysate at 20 µg

Lane 3:
Mouse heart tissue lysate at 20 µg

Lane 4:
Rat lung tissue lysate at 20 µg

Lane 5:
Rat kidney tissue lysate at 20 µg

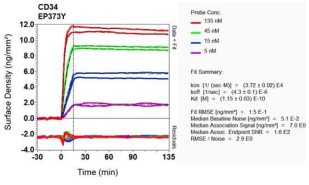
Lane 6:
Rat heart tissue lysate at 20 µg

Secondary

All lanes:
Western blot - Goat Anti-Rabbit IgG H&L (HRP) (ab97051) at 1/20000 dilution

Observed band size: 80-120 kDa

Exposure time: 40s



OI-RD Scanning - Anti-CD34 antibody [EP373Y] (ab81289)

We have systematically measured KD (the equilibrium dissociation constant between the antibody and its antigen), of more than 840 recombinant antibodies to assess not only their individual KD values but also to see the average affinity of antibody. Based on the comparison with published literature values for mouse monoclonal antibodies, Recombinant antibodies appear to be on average 1-2 order of magnitude higher affinity.

Please note: All products are 'FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC OR THERAPEUTIC PROCEDURES'.