Claudin 5 Monoclonal Antibody (4C3C2)

Catalog Number 35-2500

**Details**
- **Size**: 100 µg
- **Host/Isotope**: Mouse / IgG1
- **Class**: Monoclonal
- **Type**: Antibody
- **Clone**: 4C3C2
- **Immunogen**: Synthetic peptide derived from the mouse Claudin-5 protein
- **Conjugate**: Unconjugated
- **Form**: Liquid
- **Concentration**: 0.5 mg/mL
- **Purification**: Protein A
- **Storage buffer**: PBS, pH 7.4
- **Contains**: 0.1% sodium azide
- **Storage Conditions**: -20°C

**Species Reactivity**
- **Species reactivity**: Human, Mouse, Rat, Murine, Pig, Amphibian, Bovine, Sheep, Zebrafish, Human, Mouse, Chicken, Xenopus, Not Applicable, Dog, Cynomolgus monkey

**Tested Applications**
- **ELISA (ELISA)**: Assay-dependent
- **Immunohistochemistry (Paraffin) (IHC (P))**: 1:20
- **Western Blot (WB)**: 1:1,000

**Published Applications**
- **Western Blot (WB)**: See 77 publications below
- **Immunohistochemistry (Frozen) (IHC (F))**: See 10 publications below
- **Immunocytochemistry (ICC/IF)**: See 38 publications below
- **Miscellaneous PubMed (Misc)**: See 13 publications below
- **Immunohistochemistry (IHC)**: See 51 publications below
- **Immunohistochemistry (Paraffin) (IHC (P))**: See 7 publications below

**Suggested working dilutions are given as a guide only. It is recommended that the user titrate the product for use in their own experiment using appropriate negative and positive controls.**

**Background/Target Information**

This gene encodes a member of the claudin family. Claudins are integral membrane proteins and components of tight junction strands. Tight junction strands serve as a physical barrier to prevent solutes and water from passing freely through the paracellular space between epithelial or endothelial cell sheets, and also play critical roles in maintaining cell polarity and signal transductions. Differential expression of this gene has been observed in different types of malignancies, including breast cancer, ovarian cancer, hepatocellular carcinomas, urinary tumors, prostate cancer, lung cancer, head and neck cancers, thyroid carcinomas, etc. Alternatively spliced transcript variants encoding different isoforms have been found.

Claudin 5 Antibody (35-2500) in IHC (P)
Immunohistochemistry analysis of Claudin 5 showing staining in the Membrane and Cytoplasm of paraffin-embedded human kidney tissue (right) compared to a negative control without primary antibody (left). To expose target proteins, antigen retrieval was performed using 10mM sodium citrate (pH 6.0), microwaved for 8-15 min. Following antigen retrieval, tissues were blocked in 3% H2O2-methanol for 15 min at room temperature, washed with ddH2O and PBS, and then probed with a Claudin 5 Mouse Monoclonal Antibody (Product # 35-2500) diluted in 3% BSA-PBS at a dilution of 1:20 overnight at 4°C in a humidified chamber. Tissues were washed extensively in PBST and detection was performed using an HRP-conjugated secondary antibody followed by colorimetric detection using a DAB kit. Tissues were counterstained with hematoxylin and dehydrated with ethanol and xylene to prep for mounting.

Claudin 5 Antibody (35-2500)
Antibody specificity was demonstrated by detection of differential basal expression of the target across cell lysates tested owing to their inherent genetic constitution. Relative expression of Claudin 5 was observed in HUVEC as compared to THP-1 and MOLT-4 using Anti-Claudin 5 Monoclonal Antibody (Product # 35-2500) in Western Blot. (RE)

Claudin 5 Antibody (35-2500) in WB
Western blot was performed using Anti-Claudin 5 Monoclonal Antibody (Product # 35-2500) and an 18kDa band corresponding to Claudin 5 was observed to be downregulated upon treatment with VEGF and TGF beta. In addition, altered expression of proteins upon cell treatment demonstrates antibody specificity. Western blot using Claudin 5 Monoclonal Antibody (Product # 35-2500) shows reduced expression of protein upon treatment with VEGF and TGF beta. (TM)
Claudin 5 Antibody (35-2500) in WB

Western blot analysis of Claudin-5 was performed by loading 20 µg of Mouse Placenta (lane1) and Mouse Small Intestine (lane2) lysates using Novex® NuPAGE® 4-12 % Bis-Tris gel (Product # NP0321BOX), XCell SureLock Electrophoresis System (Product # EI0002), Novex® Sharp Pre-Stained Protein Standard (LC5800), and iBlot® Dry Blotting System (IB21001). Proteins were transferred to a nitrocellulose membrane and blocked with 5 % skim milk for 1 hour at room temperature. Claudin-5 was detected at ~23 kDa using Claudin-5 Mouse Monoclonal Antibody (Product # 35-2500) at 0.5-1 µg/mL in 2.5 % skim milk at 4°C overnight on a rocking platform. Goat Anti-Mouse IgG - HRP Secondary Antibody (Product # 62-6520) at 1:4000 dilution was used and chemiluminescent detection was performed using Pierce™ ECL Western Blotting Substrate (Product # 32106).
### PubMed References For Claudin 5 Monoclonal Antibody (4C3C2)

#### 77 Western Blot References

<table>
<thead>
<tr>
<th>Species / Dilution</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rat / 1:500</strong></td>
<td>35-2500 was used in Western Blotting to examine whether inflammatory response to Lipopolysaccharide and the associated blood-brain barrier disruption differed in male and female adult rats.</td>
</tr>
<tr>
<td><strong>Mouse / 1:800</strong></td>
<td>35-2500 was used in Western Blotting to link modulation of nuclear receptors in the physiology and pathophysiology of the brain and central nervous system.</td>
</tr>
<tr>
<td><strong>Mouse / Not Cited</strong></td>
<td>35-2500 was used in Western Blotting to study the role of mammalian/mechanistic target of rapamycin as a critical mediator of blood-brain barrier breakdown in models of Alzheimer's disease and vascular cognitive impairment.</td>
</tr>
<tr>
<td><strong>Mouse / 1:1,000</strong></td>
<td>35-2500 was used in Western Blotting to investigate the therapeutic potential of C-1 inhibitors in traumatic brain injury.</td>
</tr>
<tr>
<td><strong>Mouse / 1:1,000</strong></td>
<td>35-2500 was used in Western Blotting to investigate the effects of miRNA-9-5p on brain function in traumatic brain injury using rat models.</td>
</tr>
<tr>
<td><strong>Human / 1:300</strong></td>
<td>35-2500 was used in Western Blot, Immunocytochemistry to investigate the effects of microRNA-9-5p on brain function in traumatic brain injury using rat models.</td>
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</tr>
</tbody>
</table>

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35-2500 was used in Western Blotting to provide new insight on how dsRNA-activated signaling pathways may disrupt vascular endothelial function and contribute to vascular leakage pathologies.

Human / Not Cited

PloS one (Aug 2017; 11: )
"Poly(I:C) Induces Human Lung Endothelial Barrier Dysfunction by Disrupting Tight Junction Expression of Claudin-5."
Author(s): Huang LY, Stuart C, Takeda K, D'Agnillo F, Golding B
PubMed Article URL: http://dx.doi.org/10.1371/journal.pone.0160875

35-2500 was used in Western Blotting to examine the effect of blocking LCN2 genetically on neuroinflammation and oxidative stress in KA-induced neuronal death.

Mouse / 1:1000

Antioxidants (Basel, Switzerland) (Jan 2021; 10: )
"Lipocalin-2 Deficiency Reduces Oxidative Stress and Neuroinflammation and Results in Attenuation of Kainic Acid-Induced Hippocampal Cell Death."
PubMed Article URL: http://dx.doi.org/10.3390/antiox10010100

35-2500 was used in Western Blotting to generate brain endothelial cell (EC) specific Hgs knockout mice to uncover the function of Hgs in EC polarity and cerebrovascular stability.

Mouse / 1:200

Cardiovascular research (Jan 2021; 117: 533)
"Hepatocyte growth factor-regulated tyrosine kinase substrate is essential for endothelial cell polarity and cerebrovascular stability."
PubMed Article URL: http://dx.doi.org/10.1093/cvr/cvra016

35-2500 was used in Western Blot to define effects of Wnt activation in naïve ECs and establish an improved hPSC-based model for interrogation of CNS barriergenesis.

Human / 1:500
eLife (Nov 2021; 10: )
"Wnt signaling mediates acquisition of blood-brain barrier properties in naïve endothelium derived from human pluripotent stem cells."
Author(s): Gastfriend BD, Nishihara H, Canfield SG, Foreman KL, Engelhardt B, Palecek SP, Shusta EV
PubMed Article URL: http://dx.doi.org/10.7554/eLife.70992

35-2500 was used in Western Blot, Immunocytochemistry to demonstrate that the circular RNA of FoxO3 promotes autophagy via mTORC1 inhibition to attenuate BBB collapse under ischemia/reperfusion injury.

Mouse / Not Cited

Molecular therapy : the journal of the American Society of Gene Therapy (Mar 2022; 30: 1275)
"Circular RNA circ-FoxO3 attenuates blood-brain barrier damage by inducing autophagy during ischemia/reperfusion."
PubMed Article URL: http://dx.doi.org/10.1016/j.yether.2021.11.004

352500 was used in western blot to describe a role for sphingosine 1-phosphate receptor-1 in regulating blood brain barrier permeability

Mouse / 1:5000

Proceedings of the National Academy of Sciences of the United States of America (Apr 2017; 114: 4531)
"Size-selective opening of the blood-brain barrier by targeting endothelial sphingosine 1-phosphate receptor 1."
PubMed Article URL: http://dx.doi.org/10.1073/pnas.1618659114

35-2500 was used in western blot to study tight-junction proteins in human proximal small intestinal mucosa before and after Roux-en-Y gastric bypass surgery

Human / Not Cited

Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery (Jan 2016; 11: 45)
"Expression of tight-junction proteins in human proximal small intestinal mucosa before and after Roux-en-Y gastric bypass surgery."
Author(s): Casselbrant A, Elias E, Fändriks L, Wallenius V
PubMed Article URL: http://dx.doi.org/10.1016/j.soard.2014.05.009

35-2500 was used in Western Blotting to demonstrate that BACE1-mediated endothelial cell damage and senescence may be linked to CVD after COVID-19 infection.

Human / 1:1000

Biochemical and biophysical research communications (Oct 2022; 626: 66)
"SARS-CoV-2 spike S1 subunit protein-mediated increase of beta-secretase 1 (BACE1) impairs human brain vessel cells."
Author(s): Choi JY, Park JH, Jo C, Kim KC, Koh YH
PubMed Article URL: http://dx.doi.org/10.1016/j.bbrc.2022.07.113
35-2500 was used in Western Blotting to study the activation of matrix metalloproteinases in the brain following stroke, and the effects that they have on the blood-brain barrier. 

Rat / Not Cited

Methods in molecular biology (Clifton, N.J.) (Nov 2011; 762: 333)
"MMP-mediated disruption of claudin-5 in the blood-brain barrier of rat brain after cerebral ischemia."
Author(s):Yang Y,Rosenberg GA
PubMed Article URL:http://dx.doi.org/10.1007/978-1-61779-185-7_24

35-2500 was used in Western Blotting to study the mechanisms by which IL-10 protects the blood-brain barrier in severe acute pancreatitis.

Rat / 1:500

"Interleukin-10 attenuates impairment of the blood-brain barrier in a severe acute pancreatitis rat model."
Author(s):Lin R,Chen F,Wen S,Teng T,Pan Y,Huang H
PubMed Article URL:http://dx.doi.org/10.1186/s12950-018-0180-0

35-2500 was used in Western Blotting to describe the impact of early, non-thrombolytic reperfusion on the vascular brain component and its potential contribution to tissue remodelling and long-term functional recovery beyond the acute phase after stroke in 3-month-old male C57Bl/6 mice.

Mouse / 1:1000

Frontiers in neuroscience (Oct 2020; 13: )
"Delayed Effects of Acute Reperfusion on Vascular Remodeling and Late-Phase Functional Recovery After Stroke."
PubMed Article URL:http://dx.doi.org/10.3389/fnins.2019.00767

35-2500 was used in western blot to test if pre-treatment with nitric oxide before ischemia and reperfusion injury affects cell junction proteins and vascular endothelial growth factor

Not Applicable / 1:1000

The Journal of surgical research (Nov 2009; 157: 30)
"Cell-cell junctions and vascular endothelial growth factor in rat lung as affected by ischemia/reperfusion and preconditioning with inhaled nitric oxide."
Author(s):Waldow T,Witt W,Janke A,Ulmer A,Buzin A,Matschke K
PubMed Article URL:http://dx.doi.org/10.1016/j.jss.2008.07.042

35-2500 was used in Western Blotting to investigate the therapeutic mechanism of hypertonic saline (HS) in brain edema in terms of aquaporins and inflammatory factors.

Human / Not Cited

American journal of physiology. Gastrointestinal and liver physiology (Feb 2006; 290: G222)
"Roles of ZO-1, occludin, and actin in oxidant-induced barrier disruption."
Author(s):Musch MW,Walsh-Reitz MM,Chang EB
PubMed Article URL:http://dx.doi.org/10.1152/ajpgi.00301.2005

35-2500 was used in Western Blotting to show that urokinase-type plasminogen activator receptor (uPAR) expression is essential for maintaining the epithelial phenotype in Neuro2a cells and that uPAR silencing promotes epithelial-mesenchymal transition (EMT) and increased cell migration.

Mouse / Not Cited

Journal of cellular physiology (Sep 2020; 235: 6268)
"Downregulation of uPAR promotes urokinase translocation into the nucleus and epithelial to mesenchymal transition in neuroblastoma."
Author(s):Semina EV,Rubina KA,Shmakova AA,Rysenkova KD,Klimovich PS,Aleksanrushkina NA,Sysoeva VY,Karagyaur MN,Tkachuk VA
PubMed Article URL:http://dx.doi.org/10.1002/jcp.29555

35-2500 was used in Western Blotting to describe the impact of early, non-thrombolytic reperfusion on the vascular brain component and its potential contribution to tissue remodelling and long-term functional recovery beyond the acute phase after stroke in 3-month-old male C57Bl/6 mice.

Rat / 1:1000

Journal of inflammation research (Apr 2022; 14: )
"Urinary Trypsin Inhibitor Protects Tight Junctions of Septic Pulmonary Capillary Endothelial Cells by Regulating the Functions of Macrophages."
PubMed Article URL:http://dx.doi.org/10.2147/JIR.S303577


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35-2500 was used in Western Blotting to demonstrate the ability of cortical spreading depression (CSD) events to produce transient, time-dependent changes in blood-brain barrier (BBB) permeability when allodynia is present and to mediate access of clinically relevant therapeutics (i.e., sumatriptan) to the CNS.

**Not Applicable / 1:500**

eNeuro (Feb 2019; 5: )

"Loss of Blood-Brain Barrier Integrity in a KCl-Induced Model of Episodic Headache Enhances CNS Drug Delivery."

Author(s): Covino KE, Galloway EA, Calabrese EC, Tome ME, Liktar-Busa E, Kim J, Davis TP, Vanderah TW, Largent-Milnes TM

PubMed Article URL: http://dx.doi.org/10.1523/EINEURO.0116-18.2018

**Human / 1:1000**

Journal of translational medicine (Mar 2012; 10: )

"Prostaglandin-induced cervical remodeling in humans in the first trimester is associated with increased expression of specific tight junction, but not gap junction proteins."

Author(s): Ghuilé VV, Gray C, Galimberti A, Anumba DO

PubMed Article URL: http://dx.doi.org/10.1186/1479-5876-10-40

35-2500 was used in Western Blotting to demonstrate that the proteins forming the blood brain barrier (BBB) and the cell count are clearly influenced by catecholamine (CAT) and INF applied under oxygen glucose deprivation (OGD) conditions.

**Mouse / 1:500**

Frontiers in cardiovascular medicine (Sep 2020; 7: )

"Increased Cathecolamine Levels and Inflammatory Mediators Alter Barrier Properties of Brain Microvascular Endothelial Cells in vitro."

Author(s): Ilter C, Burek M, Störk S, Nagai M, Förster CY

PubMed Article URL: http://dx.doi.org/10.3389/fcmv.2020.00073

35-2500 was used in Western Blot to assess the role of tight junctions and gap proteins in cervical remodeling.

**Human / Not Cited**

Reproduction, fertility, and development (Apr 2016; 28: 690)

"Inhibition of angiopeptin-1 (ANGPT1) affects vascular integrity in ovarian hyperstimulation syndrome (OHSS),"

Author(s): Scotti L, Abramovich D, Pascuali N, Durand LH, Iresta G, de Zúñiga I, Tesone M, Parborell F

PubMed Article URL: http://dx.doi.org/10.1016/j.rdon.2013.06.008

35-2500 was used in Western Blot to explore whether inhibition of TLR-4 signaling prevents endothelial cell death and mRNAs of unfertilized Xenopus laevis oocytes expressing human claudin 1 (CLDN1) to claudin 5 (CLDN5).

**Mouse / 1:500**

Neuron (Oct 2018; 100: 167)

"Vascular and Neurogenic Rejuvenation in Aging Mice by Modulation of ASM."


PubMed Article URL: http://dx.doi.org/10.1016/j.neuron.2018.09.010

35-2500 was used in Western Blot to investigate the effect of angiopeptins 1 inhibition on ovarian angiogenesis in follicular fluid (FF) from women at risk of Ovarian hyperstimulation syndrome, using the chorioallantoic membrane (CAM) of quail embryos as an experimental model.

**Human / Not Cited**

35-2500 was used in Western Blot to test if 2,3,5,6-tetramethylpyrazine protects the blood brain barriers integrity in ischemia /reperfusion injury.

Rat / 1:500

Experimental and therapeutic medicine (May 2015; 9: 1757)

"Ligustrazine reduces blood-brain barrier permeability in a rat model of focal cerebral ischemia and reperfusion."

Author(s): Tan F, Fu W, Cheng N, Meng DL, Gu Y

PubMed Article URL: http://dx.doi.org/10.3892/etm.2015.2365

35-2500 was used in Western Blot to reveal endogenous gap1 expression in protein and mRNA analyses of unfertilized Xenopus laevis oocytes expressing human claudin 1 (CLDN1) to claudin 5 (CLDN5).

**Amphibian / Not Cited**

The Journal of membrane biology (Feb 2023; 256: 51)

"Cellular Distribution Pattern of gap1 (ZO-1) in Xenopus laevis Oocytes Heterologously Expressing Claudins."

Author(s): Brunner N, Stein L, Amasheh S

PubMed Article URL: http://dx.doi.org/10.1007/s00232-022-00251-z

35-2500 was used in Western Blotting to demonstrate the ability of cortical spreading depression (CSD) events to produce transient, time-dependent changes in blood-brain barrier (BBB) permeability when allodynia is present and to mediate access of clinically relevant therapeutics (i.e., sumatriptan) to the CNS.

**Rat / Not Cited**

Molecular neurobiology (Mar 2019; 56: 1607)

"Inhibition of Toll-Like Receptor-4 (TLR-4) Improves Neurobehavioral Outcomes After Acute Ischemic Stroke in Diabetic Rats: Possible Role of Vascular Endothelial TLR-4."

Author(s): Abdul Y, Abdelsaid M, Li W, Webb RC, Sullivan JC, Dong G, Ergul A

PubMed Article URL: http://dx.doi.org/10.1007/s12035-018-1184-8
352500 was used in western blot to elucidate the mechanisms by which hypertonic saline attenuates cerebral oedema

**Rat / 1:500**

"Hypertonic saline alleviates experimentally induced cerebral oedema through suppression of vascular endothelial growth factor and its receptor VEGFR2 expression in astrocytes."

Author(s): Huang L, Cao W, Deng Y, Zhu G, Han Y, Zeng H


**Mouse / 1:500**

Translational research: the journal of laboratory and clinical medicine (Apr 2017; 182: 27)

"Effect of PPAR- agonist GW0742 treatment in the acute phase response and blood-brain barrier permeability following brain injury."

Author(s): Chehabili K, le Maire L, Bradoni S, Escola JC, Blanco-Vaca F, Slimane MN

PubMed Article URL: http://dx.doi.org/10.1016/j.jrlc.2016.10.004

35-2500 was used in Western Blot to test the hypothesis that endothelial-specific thioredoxin-interacting protein knock-out mice will be more resistant to the neurovascular damage associated with hyperglycemia in embolic stroke.

**Mouse / 1:1000**

Pharmaceuticals (Basel, Switzerland) (Sep 2021; 14:)

"Endothelial Thioredoxin-Interacting Protein Depletion Reduces Hemorrhagic Transformation in Hyperglycemic Mice after Embolic Stroke and Thrombolytic Therapy."


PubMed Article URL: http://dx.doi.org/10.1007/s14109-021-00184-3

352500 was used in immunohistochemistry - paraffin section and western blot to measure tight junction protein expression in canine duodenum, lung, liver, and kidney

**Dog / 1:1000**

Molecular medicine reports (Oct 2016; 14:3697)

"Expression of claudins, occludin, junction adhesion molecule A and zona occludens 1 in canine organs."

Author(s): Ahn C, Shin DH, Lee D, Kang SM, Seok JH, Kang HY, Jeung EB

PubMed Article URL: http://dx.doi.org/10.3892/mmr.2016.5725

35-2500 was used in western blot to study the role of vascular endothelial growth factor A in ovarian hyperstimulation syndrome

**Human / 2:000**

The Journal of steroid biochemistry and molecular biology (Oct 2014; 144 Pt B: 392)

"Local VEGF inhibition prevents ovarian alterations associated with ovarian hyperstimulation syndrome."

Author(s): Scotti L, Abramovich D, Pascuail N, Irusta G, Meresan M, Tesone M, Parborell F

PubMed Article URL: http://dx.doi.org/10.1016/j.jsbmb.2014.08.013

35-2500 was used in western blot to analyze lumbar spinal cord proteins present in naive and experimental autoimmune encephalomyelitis rats

**Not Applicable / 1:1000**

Neuroscience (Jul 2007; 147: 664)

"Inflammation and dephosphorylation of the tight junction protein occludin in an experimental model of multiple sclerosis."


PubMed Article URL: http://dx.doi.org/10.1016/neuroscience.2007.04.051

35-2500 was used in Immunocytochemistry-immunofluorescence to show that the LN221F-iBMELCs had more robust barrier function for a longer period than Matrigel-iBMELCs with characteristics of BMECs.

**Human / 1:500**

Fluids and barriers of the CNS (Mar 2020; 17:)

"Laminin 221 fragment is suitable for the differentiation of human induced pluripotent stem cells into brain microvascular endothelial-like cells with robust barrier integrity."

Author(s): Aoki H, Yamashita M, Hashita T, Iwao T, Matsunaga T

PubMed Article URL: http://dx.doi.org/10.1186/s12868-020-00186-4

35-2500 was used in Western Blotting and ICC/IF to investigate the influence of microRNA-155 on the barrier characteristics of human primary brain microvascular endothelial cells.

**Human / Not Cited**

Journal of the American Heart Association (Jun 2018; 7:)

"Inhibition of MicroRNA-155 Supports Endothelial Tight Junction Integrity Following Oxygen-Glucose Deprivation."

Author(s): Pena-Philippides J, Gardiner AS, Caballero-Garrido E, Pan R, Zhu Y, Roitbak T

PubMed Article URL: http://dx.doi.org/10.1161/JAHA.118.009244
"Impact of chronic smoking on traumatic brain microvascular injury: An in vitro study."
Author(s): Alqahtani F, Cucullo L
PubMed Article URL: http://dx.doi.org/10.1111/jcmm.16741

"Brain Endothelial Cells Maintain Lactate Homeostasis and Control Adult Hippocampal Neurogenesis."
PubMed Article URL: http://dx.doi.org/10.1016/j.stem.2019.09.009

"Activated Microglia Disrupt the Blood-Brain Barrier and Induce Chemokines and Cytokines in a Rat <i>in vitro</i> Model."
Author(s): Shigemoto-Mogami Y, Hoshikawa K, Sato K
PubMed Article URL: http://dx.doi.org/10.3389/nc.neur.2018.00494

"TNF disrupts blood brain barrier integrity to maintain prolonged depressive-like behavior in mice."
Author(s): Cheng Y, Desse S, Martinez A, Worthen RJ, Jope RS, Beurel E
PubMed Article URL: http://dx.doi.org/10.1016/j.bbi.2018.02.003

"Blood-Brain Barrier Protein Claudin-5 Expressed in Paired <i>Xenopus laevis</i> Oocytes Mediates Cell-Cell Interaction."
Author(s): Brunner N, Stein L, Cornelius V, Knittel R, Fallier-Becker P, Arasheh S
PubMed Article URL: http://dx.doi.org/10.3389/fphys.2020.00857

"HIF-1 is involved in blood-brain dysfunction and paracellular migration of bacteria in pneumococcal meningitis."
PubMed Article URL: http://dx.doi.org/10.1007/s00401-020-02174-2

"Prolonged culturing of iPSC-derived brain endothelial-like cells is associated with quiescence, downregulation of glycolysis, and resistance to disruption by an Alzheimer’s brain milieu."
Author(s): Williams LM, Fujimoto T, Weaver RR, Logsdon AF, Evitts KM, Young JE, Banks WA, Erickson MA
PubMed Article URL: http://dx.doi.org/10.1186/s12987-022-00307-1

American journal of physiology. Cell physiology (Nov 2008; 295: C1215)
"Molecular profile of endothelial invasion of three-dimensional collagen matrices: insights into angiogenic sprout induction in wound healing."
Author(s):Su SC,Mendoza EA,Kwak HI,Bayless KJ
PubMed Article URL:http://dx.doi.org/10.1152/ajpcell.00336.2008

Rat / Not Cited
Diabetes (Oct 2010; 59: 2637)
"Calcium dobesilate inhibits the alterations in tight junction proteins and leukocyte adhesion to retinal endothelial cells induced by diabetes."
Author(s):Leal EC,Martins J,Voabil P,Liberal J,Chiavaroli C,Bauer J,Cunha-Vaz J,Ambrósio AF
PubMed Article URL:http://dx.doi.org/10.1237/db09-1421

Rat / 1:1000
Journal of neurochemistry (Apr 2014; 129: 130)
"Neurovascular protection by post-ischemic intravenous injections of the lipoxin A4 receptor agonist, BML-111, in a rat model of ischemic stroke."
PubMed Article URL:http://dx.doi.org/10.1111/jnc.12607

Mouse / Not Cited
Journal of virology (Sep 2009; 83: 9398)
"Mouse adenovirus type 1-induced breakdown of the blood-brain barrier."
Author(s):Gralinski LE,Ashley SL,Dixon SD,Spindler KR
PubMed Article URL:http://dx.doi.org/10.1128/JVI.00954-09

Mouse / 1:500
Translational stroke research (Oct 2019; 10: 534)
"The Contractile Apparatus Is Essential for the Integrity of the Blood-Brain Barrier After Experimental Subarachnoid Hemorrhage."
Author(s):Luh C,Feiler S,Frauenknecht K,Meyer S,Lubomirov LT,Neulen A,Thal SC
PubMed Article URL:http://dx.doi.org/10.1007/s12975-018-0677-0

Human / Not Cited
Annals of the New York Academy of Sciences (Jun 2017; 1397: 119)
"Two common human CLDN5 alleles encode different open reading frames but produce one protein isoform."
Author(s):Cornely RM,Schlingmann B,Shepherd WS,Chandler JD,Neujahr DC,Koval M
PubMed Article URL:http://dx.doi.org/10.1111/nyas.13342

Human / Not Cited
Fluids and barriers of the CNS (Jul 2019; 16: )
"The role of mutations associated with familial neurodegenerative disorders on blood-brain barrier function in an iPSC model."
Author(s):Katt ME,Mayo LN,Ellis SE,Mahairaki V,Rothstein JD,Cheng L,Searson PC
PubMed Article URL:http://dx.doi.org/10.1111/jnc.12607

Human / Not Cited
Journal of virology (Aug 2020; 94: )
"Alanyl-Glutamine Restores Tight Junction Organization after Disruption by a Conventional Peritoneal Dialysis Fluid."
PubMed Article URL:http://dx.doi.org/10.3390/biom10081178
35-2500 was used in Western Blotting to explore the neuroprotective role of TIMP1 in mice with experimental brain injury.

**Mouse / Not Cited**


"TIMP1 preserves the blood-brain barrier through interacting with CD63/integrin <b></b> 1 complex and regulating downstream FAK/RhoA signaling."

Author(s):Tang J,Kang Y,Huang L,Wu L,Peng Y

PubMed Article URL: http://dx.doi.org/10.1016/j.apsb.2020.02.015

35-2500 was used in western blot to compare the tight junction proteins in the choroid plexus of ewes exposed to short or long days.

Sheep / 1:5000

Brain research (Jun 2011; 1393: 44)

"Tight junction proteins vary in the choroid plexus of ewes according to photoperiod."

Author(s):Lagaraine C,Skipor J,Szczepkowska A,Dufourny L,Thiery JC

PubMed Article URL: http://dx.doi.org/10.1016/j.brainres.2011.04.009

35-2500 was used in Western Blotting to determine the role of glutamate release in matrix metalloproteinase mediated blood brain barrier dysfunction in epilepsy.

**Rat / Not Cited**

The Journal of neuroscience : the official journal of the Society for Neuroscience (May 2018; 38: 4301)

"Matrix Metalloproteinase-Mediated Blood-Brain Barrier Dysfunction in Epilepsy."

Author(s):Rempe RG,Hartz AMS,Soldner ELB,Sokola BS,Allun SR,Abner EL,Kryscio RJ,Pekcec A,Schlichtiger J,Bauer B

PubMed Article URL: http://dx.doi.org/10.1523/JNEUROSCI.2751-17.2018

35-2500 was used in Western Blotting to report that pharmacologic restoration of the blood-brain barrier (BBB), 12 mo after murine TBI, is associated with arrested axonal neurodegeneration and cognitive recovery, benefits that persisted for months after treatment cessation.

**Mouse / 1:1000**

Proceedings of the National Academy of Sciences of the United States of America (Nov 2020; 117: 27667)

"AMPK3-A20 treatment one year after TBI in mice repairs the blood-brain barrier, arrests chronic neurodegeneration, and restores cognition."


PubMed Article URL: http://dx.doi.org/10.1073/pnas.2010430117

35-2500 was used in Western Blotting to evaluate whether induced pluripotent stem cell-derived brain microvascular endothelial cells are appropriate for modelling bacterial interaction with the blood-brain barrier.

**Human / Not Cited**

mSphere (Nov 2019; 2: )

"Modeling Group B <i>&lt;i&gt;Streptococcus&lt;/i&gt;&lt;/i&gt; and Blood-Brain Barrier Interaction by Using Induced Pluripotent Stem Cell-Derived Brain Endothelial Cells."

Author(s):Kim BJ,Bee OB,McDonagh MA,Stebbins MJ,Palecek SP,Doran KS,Shusta EV

PubMed Article URL: http://dx.doi.org/10.1128/mSphere.00398-17

35-2500 was used in Western Blotting to demonstrate that the noncanonical inflammasome pathway can be induced in cerebral endothelial cells as well, leading to a further increase in the secretion of active interleukin-1 over that observed in response to activation of the canonical pathway.

**Pig / Not Cited**


"Cerebral Pericytes and Endothelial Cells Communicate through Inflammasome-Dependent Signals."

Author(s):Kozma M,Mészáros Á,Nyúl-Tóth Á,Molnár K,Costea L,Hernádi Z,Fazakas C,Farkas AE,Wilhelm I,Krizbai IA

PubMed Article URL: http://dx.doi.org/10.3390/ijms22116122

35-2500 was used in Western Blotting to investigate biological roles of pioglitazone in relieving colitis-associated pain hypersensitivity by a PPAR tight junction protein-dependent mechanism during the course of dextran sodium sulfate (DSS)-induced intestinal inflammation.

**Mouse / 1:1000**

Inflammation (Apr 2020; 43: 568)

"Pioglitazone Attenuates Experimental Colitis-Associated Hyperalgesia through Improving the Intestinal Barrier Dysfunction."

Author(s):Kozma M,Mészáros Á,Nyúl-Tóth Á,Molnár K,Costea L,Hernádi Z,Fazakas C,Farkas AE,Wilhelm I,Krizbai IA

PubMed Article URL: http://dx.doi.org/10.1007/s10753-019-01138-3

35-2500 was used in Western Blotting to determine the effects of tryptase on mouse brain microvascular endothelial cell line bEnd3 and its potential mechanisms of action.

**Mouse / 1:500**


"Effect of tryptase on mouse brain microvascular endothelial cells via protease-activated receptor 2."

Author(s):Zhou Q,Wang YW,Ni PF,Chen YN,Dong HQ,Qian YN

PubMed Article URL: http://dx.doi.org/10.1186/s12974-018-1287-1

PubMed Article URL: http://dx.doi.org/10.3390/ijms22116122

35-2500 was used in Western Blotting to investigate the effects of tryptase on mouse brain microvascular endothelial cell line bEnd3 and its potential mechanisms of action.
35-2500 was used in Western Blotting to investigate the effect of targeting TLRs with proteoglycan 4 on post-traumatic neuroinflammation and blood-brain barrier function.

**Journal of neurotrauma** (Feb 2021; 38: 385)  
"Proteoglycan 4 Reduces Neuroinflammation and Protects the Blood-Brain Barrier after Traumatic Brain Injury."  
Author(s): Bennett M, Chin A, Lee HJ, Morales Cestero E, Straussl N, Gherman Egea JF, Threlkeld SW, Schmidt TA, Richendrfer HA, Szmydenger-Chodobska J, Jay GD, Chodobski A  
PubMed Article URL: http://dx.doi.org/10.1089/neu.2020.7229

35-2500 was used in western blot to investigate the effect of prostacyclin on pericyte loss and demyelination induced by lysophosphatidylcholine in the central nervous system

**The Journal of biological chemistry** (May 2015; 290: 11515)  
"Prostacyclin prevents pericyte loss and demyelination induced by lysophosphatidylcholine in the central nervous system."  
PubMed Article URL: http://dx.doi.org/10.1074/jbc.M114.587253

35-2500 was used in Western Blotting to investigate the role of miR-623 in Matrix metalloproteinase-1 regulation and its impact on the extravasation of triple-negative breast cancer cells through the brain metastasis in vitro.

**Breast cancer** (Dove Medical Press) (Aug 2022; 14: 187)  
"miR-623 Targets Metalloproteinase-1 and Attenuates Extravasation of Breast Metastatic Triple-Negative Breast Cancer Cells."  
Author(s): Hammash D, Mahfood M, Khoder G, Ahmed M, Tilli A, Hamoudi R, Harati R  
PubMed Article URL: http://dx.doi.org/10.2147/BCTT.S372083

35-2500 was used in Western Blot to investigate whether an altered blood-brain barrier and gut permeability is part of the pathophysiology of autism spectrum disorders.

**Science signaling** (Apr 2020; 13:)  
"Endothelium-targeted deletion of the miR-15a/16-1 cluster ameliorates blood-brain barrier dysfunction in ischemic stroke."  
Author(s): Ma F, Sun P, Zhang X, Hamblin MH, Yin KJ  
PubMed Article URL: http://dx.doi.org/10.1126/scisignal.aay5686

35-2500 was used in Western Blotting to investigate whether the impact of constitutive androstane nuclear receptors on neurophysiology and behaviour is underlined by cerebrovascular-neuronal modifications.

**Molecular autism** (Oct 2017; 7:)  
"Blood-brain barrier and intestinal epithelial barrier alterations in autism spectrum disorders."  
Author(s): Fiorentino M, Sapone A, Senger S, Camhi SS, Kadzielski SM, Buie TM, Kelly DL, Cascella N, Fasano A  

35-2500 was used in Western Blotting to investigate the effect of miR-15a/16-1 cluster deletion in blood brain barrier dysregulation following ischemic stroke.

35-2500 was used in Immunohistochemistry (Frozen) to investigate the expression of junctional protein and P-gp efflux pump function in the blood-brain barrier.

**Proteoglycan 4** Reduces neuroinflammation and Protects the Blood-Brain Barrier after Traumatic Brain Injury.  
Author(s): Bennett M, Chin A, Lee HJ, Morales Cestero E, Straussl N, Gherman Egea JF, Threlkeld SW, Schmidt TA, Richendrfer HA, Szmydenger-Chodobska J, Jay GD, Chodobski A  
PubMed Article URL: http://dx.doi.org/10.1089/neu.2020.7229

35-2500 was used in Western Blot to identify Netrin-1-Unc5B signaling as a ligand-receptor pathway that regulates BBB integrity.

**Experimental neurology** (Sep 2016; 283: 39)  
"Lack of CAR Impacts neuronal function and cerebrovascular integrity in vivo."  
Author(s): Boussadia B, Gangarossa G, Mseli-Lakhal L, Rouset MC, de Bock F, Lasserre F, Ghosh C, Pascussi JM, Janigro D, Marchi N  
PubMed Article URL: http://dx.doi.org/10.1016/j.expneurol.2016.05.018

35-2500 was used in Western Blotting to investigate the effect of miR-15a/16-1 cluster deletion in blood brain barrier dysregulation following ischemic stroke.

35-2500 was used in Western Blotting to investigate the role of miR-623 in Matrix metalloproteinase-1 regulation and its impact on the extravasation of triple-negative breast cancer cells through the brain metastasis in vitro.

35-2500 was used in Western Blotting to investigate the effect of miR-15a/16-1 cluster deletion in blood brain barrier dysregulation following ischemic stroke.


35-2500 was used in Western Blotting to show that cumulative effects of repeated low-level BOP may increase the vulnerability to injury of the brain by disrupting neurovascular architecture, which may lead to downstream deleterious effects on behavior and cognition.

Frontiers in cellular neuroscience (Mar 2021; 15: )
"Repeated Low-Level Blast Acutely Alters Brain Cytokines, Neurovascular Proteins, Mechanotransduction, and Neurodegenerative Markers in a Rat Model."
PubMed Article URL:http://dx.doi.org/10.3389/fncel.2021.636707

35-2500 was used in western blot to study claudins in the lung.

Human / Not Cited
American journal of respiratory cell and molecular biology (Jul 2003; 29: 62)
"Heterogeneity of claudin expression by alveolar epithelial cells."
Author(s):Wang F,Daugherty B,Keise LL,Wei Z,Foley JP,Savani RC,Koval M
PubMed Article URL:http://dx.doi.org/10.1165/rcmb.2002-0180OC

35-2500 was used in Western Blot, Immunohistochemistry to propose that specific frequency EA can transiently open the BBB and may be related to the change of tight junctions (TJ).

Frontiers in neuroscience (Oct 2020; 14: )
"Specific Frequency Electroacupuncture Stimulation Transiently Enhances the Permeability of the Blood-Brain Barrier and Induces Tight Junction Changes."
PubMed Article URL:http://dx.doi.org/10.3389/fnins.2020.582324

35-2500 was used in Western Blot to study the effect of endurance training and testosterone supplementation on the expression of blood spinal cord barrier proteins in rats.

PloS one (Nov 2019; 14: )
"The effect of endurance training and testosterone supplementation on the expression of blood spinal cord barrier proteins in rats."
Author(s):Nierwiska K,Nowacka-Chmielewska M,Bernacki J,Jaqsz S,Chalimoniuk M,Langfort J,Maeck A
PubMed Article URL:http://dx.doi.org/10.3389/fnsal.2019.00118

35-2500 was used in immunohistochemistry and western blot to identify and characterize claudin-5 expression in podocytes.

Cell and tissue research (Mar 2011; 343: 637)
"Novel expression of claudin-5 in glomerular podocytes."
PubMed Article URL:http://dx.doi.org/10.1007/s00444-010-1117-y

35-2500 was used in Western Blot to establish a brain capillary isolation method from a single mouse brain for protein expression analysis.

"Efficient isolation of brain capillary from a single frozen mouse brain for protein expression analysis."
Author(s):Ogata S,Ito S,Masuda T,Ohtsuki S
PubMed Article URL:http://dx.doi.org/10.1177/0271678X21941449

10 Immunohistochemistry (Frozen) References

Species / Dilution
Summary
Not Applicable / Not Cited
"Localization of claudin-5 and ZO-1 in rat spleen sinus endothelial cells."
Author(s):Uehara K,Uehara A
PubMed Article URL:http://dx.doi.org/10.1371/journal.pone.0211818

35-2500 was used in immunohistochemistry - frozen section to study the spatial and functional relationships between tight and adherens junctions in the sinuses endothelial cells of rat spleen

Histochemistry and cell biology (Jan 2008; 129: 95)
"Novel expression of claudin-5 and ZO-1 in rat spleen sinus endothelial cells."
Author(s):Uehara K,Uehara A
PubMed Article URL:http://dx.doi.org/10.1007/s00441-010-1117-y

35-2500 was used in Western Blotting to study claudin-5 expression in podocytes.

35-2500 was used in Western Blot to establish a brain capillary isolation method from a single mouse brain for protein expression analysis.

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35-2500 was used in Western Blot to study the effect of endurance training and testosterone supplementation on the expression of blood spinal cord barrier proteins in rats.
35-2500 was used in immunohistochemistry - frozen section to determine the distribution and role of perineurial cells in neurofibromas.

**Not Applicable / Not Cited**


"Tight junction proteins and perineurial cells in neurofibromas."

Author(s): Pummi KP, Aho HJ, Laato MK, Peltonen JT, Peltonen SA

PubMed Article URL: http://dx.doi.org/10.1369/jhc.5A6671.2005

35-2500 was used in Immunohistochemistry-immunofluorescence to reveal that nafamostat functions through inhibiting the thrombin-mediated BSCB breakdown and subsequent peripheral immune cells infiltration.

**Rat / Not Cited**

*Journal of neuroinflammation* (Jul 2022; 19:)

"Delayed administration of nafamostat mesylate inhibits thrombin-mediated blood-spinal cord barrier breakdown during acute spinal cord injury in rats."


PubMed Article URL: http://dx.doi.org/10.1186/s12974-022-02531-w

35-2500 was used in immunohistochemistry - frozen section to characterize the blood brain barrier in the median eminence-arcuate nucleus complex.

**Not Applicable / 1:50**

*Journal of chemical neuroanatomy* (Oct 2008; 36: 107)

"Protein components of the blood-brain barrier (BBB) in the mediobasal hypothalamus."

Author(s): Norsted E, Gömüç B, Meister B

PubMed Article URL: http://dx.doi.org/10.1016/j.jchemneu.2008.06.002

35-2500 was used in Western Blot, Immunohistochemistry (Frozen) to investigate the effect of miR-15a/16-1 cluster deletion in blood brain barrier dysregulation following ischemic stroke.

**Mouse / Not Cited**

*Science signaling* (Apr 2020; 13:)

"Endothelium-targeted deletion of the miR-15a/16-1 cluster ameliorates blood-brain barrier dysfunction in ischemic stroke."

Author(s): Ma F, Sun P, Zhang X, Hamblin MH, Yin KJ

PubMed Article URL: http://dx.doi.org/10.1126/scisignal.aay5686

35-2500 was used in Immunohistochemistry-immunofluorescence to investigate the mechanism of action of VCE-004.8 in the hypoxia inducible factor pathway and explored its efficacy in a preclinical model of Traumatic brain injury.

**Mouse / 1:50**

*Journal of neuroinflammation* (Jul 2022; 19:)

"A cannabidiol aminoquinone derivative activates the PP2A/B55/HIF pathway and shows protective effects in a murine model of traumatic brain injury."


PubMed Article URL: http://dx.doi.org/10.1186/s12974-022-02540-9

35-2500 was used in Immunohistochemistry (Frozen) to report that an obesity-associated increase in serum leptin triggers the select expansion of the micro-angioarchitecture in pre-autonomic brain centers that regulate hemodynamic homeostasis.

**Mouse / 1:300**

*Cell metabolism* (Jun 2021; 33: 1155)

"Obesity-associated hyperleptinemia alters the gliovascular interface of the hypothalamus to promote hypertension."


PubMed Article URL: http://dx.doi.org/10.1101/j.cmet.2021.03.007

35-2500 was used in Immunohistochemistry-immunofluorescence to conclude that astrocytes undergo a phenotypic shift over time after ischemic stroke.

**Mouse / 1:100**

*Aging and disease* (Jun 2022; 13: 943)

"Blocking C3<sup>+</sup>/GFAP<sup>+</sup> A1 Astrocyte Conversion with Semaglutide Attenuates Blood-Brain Barrier Disruption in Mice after Ischemic Stroke."


PubMed Article URL: http://dx.doi.org/10.14336/AD.2021.1029
**Species / Dilution**

<table>
<thead>
<tr>
<th>Species</th>
<th>Dilution</th>
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</table>
| Mouse / 1:100| PLoS pathogens (Dec 2016; 12: )
|              | "CD8+ T Cells Induce Fatal Brainstem Pathology during Cerebral Malaria via Luminal Antigen-Specific Engagement of Brain Vasculature." Author(s): Swanson PA, Hart GT, Russo MV, Nayak D, Yazew T, Peña M, Khan SM, Janse CJ, Pierce SK, McGavern DB PubMed Article URL: http://dx.doi.org/10.1371/journal.ppat.1006022 |
| Mouse / 1:50 | Pharmaceutics (Jul 2022; 14: )
| Human / 1:100| eLife (Nov 2021; 10: )
|              | "Wnt signaling mediates acquisition of blood-brain barrier properties in naive endothelium derived from human pluripotent stem cells." Author(s): Gastfriend BD, Nishihara H, Canfield SG, Foreman KL, Engelhardt B, Palecek SP, Shusta EV PubMed Article URL: http://dx.doi.org/10.7554/eLife.70992 |
| Human / 1:200| The Journal of cell biology (Oct 2002; 159: 361)
|              | "Distinct claudins and associated PDZ proteins form different autotypic tight junctions in myelinating Schwann cells." Author(s): Poliak S, Matlins S, Ullmer C, Scherer SS, Peles E PubMed Article URL: http://dx.doi.org/10.1083/jcb.200207050 |
| Human / 1:200| Cells (Nov 2020; 9: )


Products are warranted to operate or perform substantially in conformance with published Product specifications in effect on the date of sale, as set forth in the Production documentation, specifications and in accompanying package inserts ("Documentation"). Unless otherwise stated on the Documentation, the warranty is limited to one year from date of shipment when the Product is subjected to normal, proper and intended usage. This warranty does not extend to anyone other than the Buyer. Any model or sample furnished to Buyer is merely illustrative of the general type and quality of goods and does not represent that any Product will conform to such model or sample.

**38 Immunocytochemistry References**

<table>
<thead>
<tr>
<th>Species</th>
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<tbody>
<tr>
<td>Mouse / 1:100</td>
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</tr>
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<td>Dog / 1:1,000</td>
<td>35-2500 was used in Immunocytochemistry-Immunofluorescence to show the LSMCs of the peritubular wall monolayers are SMCs sensu strico which are laterally connected by a novel architectonic system of arrays of vertical AJs located in overlapping cell protrusions.</td>
</tr>
<tr>
<td>Bovine / Not Cited</td>
<td>Cell and tissue research (Feb 2019; 375: 451) &quot;The cell-cell junctions of mammalian testes: II. The lamellar smooth muscle monolayer cells of the peritubular wall are laterally connected by vertical adherens junctions-a novel architectonic cell-cell junction system.&quot; Author(s): Domke LM, Franke WW PubMed Article URL: <a href="http://dx.doi.org/10.1007/s00441-018-2968-x">http://dx.doi.org/10.1007/s00441-018-2968-x</a></td>
</tr>
<tr>
<td>Rat / 1:500</td>
<td>35-2500 was used in Western Blot, Immunocytochemistry to investigate the effects of miRNA-9-5p on brain function in traumatic brain injury using rat models.</td>
</tr>
<tr>
<td>Dog / 1:1,000</td>
<td>35-2500 was used in Immunocytochemistry-Immunofluorescence to demonstrate relocalization and functional alteration to proteins associated with the actin cytoskeleton and endothelial tight junctions.</td>
</tr>
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<td>Mouse / 1:50</td>
<td>35-2500 was used in Immunocytochemistry-immunofluorescence to define effects of Wnt activation in naïve ECs and establish an improved hPSC-based model for interrogation of CNS barrier genesis.</td>
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<td>35-2500 was used in Immunocytochemistry to identify and investigate major cellular targets of APP down-regulation in endothelial cells.</td>
</tr>
</tbody>
</table>
35-2500 was used in Immunocytochemistry-immunofluorescence to investigate proteins specifically expressed by restrictive endoneurial microvascular endothelium in four adult sural nerves.

**Human / Not Cited**

Krizbai I, da Cruz-Höfling MA

*PEGylation of Reduced Graphene Oxide Induces Toxicity in Cells of the Blood-Brain Barrier: An in Vitro and in Vivo Study.*


PubMed Article URL:http://dx.doi.org/10.1021/acs.molpharmaceut.6b00696

35-2500 was used in Immunocytochemistry-immunofluorescence to investigate the expression of triglyceride in pulmonary microvascular endothelial cells during sepsis.

**Mouse / Not Cited**

"A three-dimensional model of the human brain-blood barrier to analyse the transport of nanoparticles and astrocyte /endothelial interactions and transport of nanoparticles"

Author(s): Sreekanthreddy P, Gromnicova R, Davies H, Phillips J, Romero IA, Male D

PubMed Article URL:http://dx.doi.org/10.12688/f1000research.7142.2

35-2500 was used in Immunocytochemistry-immunofluorescence to study a model of the human blood-brain barrier in 3D to analyze astrocyte /endothelial interactions and transport of nanoparticles.

**Not Applicable / Not Cited**

"A three-dimensional model of the human brain-blood barrier to analyse the transport of nanoparticles and astrocyte /endothelial interactions."

Author(s): Sreekanthreddy P, Gromnicova R, Davies H, Phillips J, Romero IA, Male D

PubMed Article URL:http://dx.doi.org/10.12688/f1000research.7142.2

35-2500 was used in Immunocytochemistry to study a model of the human blood-brain barrier in 3D to analyze astrocyte /endothelial interactions and transport of nanoparticles.

**Chicken / Not Cited**

"The apical and basal environments of the retinal pigment epithelium regulate the maturation of tight junctions during development."

Author(s): Rahner C, Fukushima M, Peng S, Kojima S, Rizzolo LJ

PubMed Article URL:http://dx.doi.org/10.1242/jcs.01181

352500 was used in immunocytochemistry to ask if nucleoside diphosphate kinase B interacting with caveolin-1 in endothelial cells is required for the regulation of angiogenesis and adherens junction integrity.

**Mouse / Not Cited**

"Nucleoside diphosphate kinase B regulates angiogenic responses in the endothelium via caveolae formation and c-Src-mediated caveolin-1 phosphorylation."

Author(s): Gross S, Devraj K, Feng Y, Macias J, Liebner S, Wieland T

PubMed Article URL:http://dx.doi.org/10.1177/0271678X16669365

35-2500 was used in immunofluorescence to identify a inducible barrier to CNS entry at the glia limitans, which may be attributed to the conjugation of histones.

**Not Applicable / Not Cited**

"Site-specific opening of the blood-brain barrier by extracellular histones."

Author(s): Sreekanthreddy P, Gromnicova R, Davies H, Phillips J, Romero IA, Male D

PubMed Article URL:http://dx.doi.org/10.12688/f1000research.7142.2

35-2500 was used in Immunocytochemistry-immunofluorescence to investigate the effect of urinary trypsin inhibitor on expression of junctional proteins in pulmonary microvascular endothelial cells during sepsis.

**Rat / 1:100**

"Ulinastatin Ameliorates Pulmonary Capillary Endothelial Permeability Induced by Sepsis Through Protection of Tight Junctions via Inhibition of TNF- and Related Pathways."


PubMed Article URL:http://dx.doi.org/10.1186/s12974-020-01950-x

35-2500 was used in Immunocytochemistry-immunofluorescence to suggest that circulating histones may contribute to cerebrovascular injury or brain dysfunction by altering BBB structure and function.

**Mouse / 1:50**

"Nucleoside diphosphate kinase B regulates angiogenic responses in the endothelium via caveolae formation and c-Src-mediated caveolin-1 phosphorylation."

Author(s): Gross S, Devraj K, Feng Y, Macias J, Liebner S, Wieland T

PubMed Article URL:http://dx.doi.org/10.1177/0271678X16669365

35-2500 was used in Immunocytochemistry-immunofluorescence to investigate proteins specifically expressed by restrictive endoneurial microvascular endothelium in four adult sural nerves.

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"Ulinastatin Ameliorates Pulmonary Capillary Endothelial Permeability Induced by Sepsis Through Protection of Tight Junctions via Inhibition of TNF- and Related Pathways."


PubMed Article URL:http://dx.doi.org/10.1186/s12974-020-01950-x

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35-2500 was used in Immunocytochemistry-immunofluorescence to investigate the effect of urinary trypsin inhibitor on expression of junctional proteins in pulmonary microvascular endothelial cells during sepsis.

**Rat / 1:100**

"Ulinastatin Ameliorates Pulmonary Capillary Endothelial Permeability Induced by Sepsis Through Protection of Tight Junctions via Inhibition of TNF- and Related Pathways."


PubMed Article URL:http://dx.doi.org/10.1186/s12974-020-01950-x

35-2500 was used in Immunocytochemistry-immunofluorescence to investigate the effect of urinary trypsin inhibitor on expression of junctional proteins in pulmonary microvascular endothelial cells during sepsis.
35-250 was used in immunocytochemistry to analyze why the blood-brain barrier breakdown occurs via oxidative stress-dependent tight junction protein disruption following moderate hypoxia and reoxygenation

**Not Applicable / 1:50**

PloS one (Jul 2014; 8: )

"Moderate hypoxia followed by reoxygenation results in blood-brain barrier breakdown via oxidative stress-dependent tight-junction protein disruption."

Author(s): Zehendner CM, Librizzi L, Hedrich J, Bauer NM, Angamo EA, de Curtis M, Luhmann HJ

PubMed Article URL:http://dx.doi.org/10.1371/journal.pone.0082823

35-250 was used in immunocytochemistry to determine the contribution of neutrophils to central nervous system vascular permeability.

**Mouse / Not Cited**


"CD8 T cell-initiated blood-brain barrier disruption is independent of neutrophil support."

Author(s): Johnson HL, Chen Y, Jin F, Hanson LM, Gamez JD, Pirko I, Johnson AJ

PubMed Article URL:http://dx.doi.org/10.4049/jimmunol.1200658

Infection and immunity (Jan 2012; 80: 175)

"Two strikingly different signaling pathways are induced by meningococcal type IV pili on endothelial and epithelial cells."

Author(s): Lécuyer H, Nassif X, Courreuil M

PubMed Article URL:http://dx.doi.org/10.1128/IAI.05837-11

35-250 was used in Immunocytochemistry-immunofluorescence to investigate whether murine cell-derived laminin-5 is involved in vascular integrity regulation.

**Human / Not Cited**

American journal of physiology. Gastrointestinal and liver physiology (Feb 2006; 290: G222)

"Roles of ZO-1, occludin, and actin in oxidant-induced barrier disruption."

Author(s): Musch MW, Walsh-Reitz MM, Chang EB

PubMed Article URL:http://dx.doi.org/10.1152/ajpgi.00301.2005

35-250 was used in Western Blot to detect zonula occludens-1 (ZO-1), occludin and claudin-5 expression in PMVECs, as well as TNF-, TGF-, iNOS, CD86 and CD206 expression in lungs.

**Mouse / 1:200**

Acta neuropathologica communications (Feb 2019; 7: )

"Mural cell-derived laminin-5 plays a detrimental role in ischemic stroke."

Author(s): Ninwane A, Johnson J, Nguyen B, Miner JH, Yao Y

PubMed Article URL:http://dx.doi.org/10.1186/s40478-019-0676-8

35-250 was used in Immunocytochemistry to compare the blood-brain barrier features of NHP transcriptome of isolated brain microcapillaries and in vitro-tailored brain endothelial cells.

**Human / 1:50**

Molecular pharmaceutics (Sep 2016; 13: 3341)

"Analysis of Cancer-Targeting Alkylphosphocholine Analogue Permeability Characteristics Using a Human Induced Pluripotent Stem Cell Blood-Brain Barrier Model."

Author(s): Clark PA, Al-Ahmad AJ, Qian T, Zhang RR, Wilson HK, Weichert JP, Palecek SP, Kuo JS, Shusta EV

PubMed Article URL:http://dx.doi.org/10.1021/acs.molpharmaceut.6b00441

35-250 was used in Immunocytochemistry to examine trafficking of cancer-targeting alkylphosphocholine analogues across the blood brain barrier

**Cynomolgus monkey / 1:200**

Pharmaceutics (Oct 2020; 12: )

"Non-Human Primate Blood-Brain Barrier and In Vitro Brain Endothelium: From Transcriptome to the Establishment of a New Model."

Author(s): Chaves C, Do TM, Cegarra C, Roudières V, Tolou S, Rocher C, Lesuisse D

PubMed Article URL:http://dx.doi.org/10.2147/JIR.S303577

35-250 was used in Immunocytochemistry to demonstrate that ectopically administered N-terminal Sonic Hedgehog (Shh) and endogenous endothelial-derived Desert Hedgehog (Dhh) induce opposite effects in endothelial cells (ECs).

**Mouse / Not Cited**

Cardiovascular research (Nov 2021; 117: 2489)

"Full-length Dhh and N-terminal Shh act as competitive antagonists to regulate angiogenesis and vascular permeability."

Author(s): Hollier PL, Chapouly C, Diop A, Guimbal S, Cornuault L, Gadeau AP, Renault MA

PubMed Article URL:http://dx.doi.org/10.1093/cvr/cvaa285


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35-250 was used in Immunocytochemistry to evaluate the effects of adult PS1-KI and 3xTg-AD astrocyte conditioned media (CM) and EVs on NVU components (neuroglia and endothelium) in vitro.

**Mouse / 1:500**

Frontiers in aging neuroscience (Mar 2021; 13:)

"Extracellular Vesicles From 3xTg-AD Mouse and Alzheimer's Disease Patient Astrocytes Impair Neuroglial and Vascular Components."


PubMed Article URL: http://dx.doi.org/10.3839/fragi.2021.593927

35-250 was used in Immunocytochemistry to demonstrate that exposure of brain microvessels to hyperglycemic conditions or advanced glycation end products (AGEs) ex vivo results in significant abnormalities in membranous distribution of TJ proteins.

**Mouse / 1:25**

Scientific reports (Apr 2020; 10:)

"Hyperglycemia and advanced glycation end products disrupt BBB and promote occludin and claudin-5 protein secretion on extracellular microvesicles."

Author(s): Rom S, Heldt NA, Gaghatre S, Seliga A, Reichenbach NL, Persidsky Y

PubMed Article URL: http://dx.doi.org/10.1038/s41598-020-64349-x

35-250 was used in immunocytochemistry to study tight junction proteins in ECV304 cells

**Not Applicable / Not Cited**

Neuroscience letters (Dec 2008; 446: 59)

"Expression of Claudin-1, Claudin-3 and Claudin-5 in human blood-brain barrier mimicking cell line ECV304 is inducible by glioma-conditioned media."

Author(s): Neuhaus W, Wirth M, Plattner VE, Germann B, Gabor F, Noe CR

PubMed Article URL: http://dx.doi.org/10.1016/j.neulet.2008.09.025

35-250 was used in Immunocytochemistry-immunofluorescence to conclude that iPSC-BBB models make it possible to predict BBB permeability, and employing coculturing can improve iPSC-BBB function.

**Human / 1:50**

BioResearch open access (Oct 2020; 8: 200)


Author(s): Ohshima M, Kamei S, Fushimi H, Mima S, Yamada T, Yamamoto T

PubMed Article URL: http://dx.doi.org/10.1089/biores.2019.0026

35-250 was used in Immunocytochemistry-immunofluorescence to help unravel the mechanism by which S1P regulates BBB and also provide previously unidentified insights into the delivery of neurological drugs in the CNS.

**Human / 1:200**

Science advances (May 2020; 6:)

"Mfsd2a and Smps2 are essential for sphingosine-1-phosphate transport in the formation and maintenance of the blood-brain barrier."


PubMed Article URL: http://dx.doi.org/10.1126/sciadv.aay6827

35-250 was used in Immunocytochemistry-immunofluorescence to analyze the effects of 10% patient sera on the "function, structure, and gene expression" of cultured human dermal and pulmonary microvascular endothelial cells.

**Human / Not Cited**


"Sera From Children After Cardiopulmonary Bypass Reduces Permeability of Capillary Endothelial Cell Barriers."

Author(s): Pierce RW, Zahr RA, Kandil S, Faustino EVS, Pober JS

PubMed Article URL: http://dx.doi.org/10.1097/PCC.0000000000001553

35-250 was used in immunocytochemistry to describe a murine blood-brain barrier coculture model that includes neurons, astrocytes, and brain endothelial cells.

**Mouse / 1:50**

Methods in molecular biology (Clifton, N.J.) (Sep 2014; 1135: 403)

"A neurovascular blood-brain barrier in vitro model."

Author(s): Zehenhnder CM, White R, Hedrich J, Luhmann HJ

PubMed Article URL: http://dx.doi.org/10.1007/978-1-4939-0320-7_33

35-250 was used in Immunocytochemistry-immunofluorescence to help show that the LN221F-iBMELCs had more robust barrier function for a longer period than Matrigel-iBMELCs with characteristics of BMECs.

**Human / 1:50**

Fluids and barriers of the CNS (Mar 2020; 17:)

"Laminin 221 fragment is suitable for the differentiation of human induced pluripotent stem cells into brain microvascular endothelial-like cells with robust barrier integrity."

Author(s): Aoki H, Yamashita M, Hashita T, Iwao T, Matsunaga T

PubMed Article URL: http://dx.doi.org/10.1186/s12987-020-00186-4

35-250 was used in Immunocytochemistry to help show that the LN221F-iBMELCs had more robust barrier function for a longer period than Matrigel-iBMELCs with characteristics of BMECs.


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35-2500 was used in Immunofluorescence to show that the perineurial diffusion barrier matures relatively late during human peripheral nerve development.

Human / 1:100
"Tight junction proteins ZO-1, occludin, and claudins in developing and adult human perineurium."
Author(s): Pummi KP, Heape AM, Grénman RA, Peltonen JT, Peltonen SA
PubMed Article URL: http://dx.doi.org/10.1369/jhc.3A6217.2004

35-2500 was used in Western Blotting and ICC/IF to investigate the influence of microRNA-155 on the barrier characteristics of human primary brain microvascular endothelial cells.

Human / Not Cited
Journal of the American Heart Association (Jun 2018; 7: )
"Inhibition of MicroRNA-155 Supports Endothelial Tight Junction Integrity Following Oxygen-Glucose Deprivation."
Author(s): Pena-Philippides JC, Gardiner AS, Caballero-Garrido E, Pan R, Zhu Y, Roitbak T
PubMed Article URL: http://dx.doi.org/10.1161/JAHA.118.009244

35-2500 was used in Immunocytochemistry-immunofluorescence to create a neurovascular unit that recapitulates complex BBB functions.

Human / 1:100
35-2500 was used in Immunocytochemistry to demonstrate a method for differentiating human pluripotent stem cells into brain microvascular endothelial cell-like cells.

Human / 1:200
35-2500 was used in Immunocytochemistry to investigate the interaction of microglia with blood-brain barrier cells.

Human / 1:100
Cell stem cell (Jun 2019; 24: 995)
"Human iPSC-Derived Blood-Brain Barrier Chips Enable Disease Modeling and Personalized Medicine Applications."
PubMed Article URL: http://dx.doi.org/10.1016/j.stem.2019.05.011

Human / 1:200
STAR protocols (Jun 2021; 2: )
"Differentiation of human pluripotent stem cells to brain microvascular endothelial cell-like cells suitable to study immune cell interactions."
Author(s): Nishihara H, Gastfriend BD, Kasap P, Palecek SP, Shusta EV, Engelhardt B
PubMed Article URL: http://dx.doi.org/10.1016/j.xpro.2021.100563

35-2500 was used in Immunocytochemistry-immunofluorescence to validate barrier function of our brain microvessel-on-a-chip by measuring permeability of fluorescent dextran and a human monoclonal antibody.

Human / 1:50
Frontiers in cellular neuroscience (Oct 2020; 12: )
"Activated Microglia Disrupt the Blood-Brain Barrier and Induce Chemokines and Cytokines in a Rat <i>in vitro</i> Model."
Author(s): Shigemoto-Mogami Y, Hoshikawa K, Sato K
PubMed Article URL: http://dx.doi.org/10.3389/fncel.2018.00494

35-2500 was used in Immunocytochemistry-immunofluorescence to validate barrier function of our brain microvessel-on-a-chip.

RS: In a mouse model of diabetes, the authors provide evidence for the role of microRNA-155 in the regulation of blood pressure and vascular function.

35-2500 was used in Immunocytochemistry-immunofluorescence to demonstrate a method for differentiating human pluripotent stem cells into brain microvascular endothelial cell-like cells.

35-2500 was used in Immunocytochemistry-immunofluorescence to validate barrier function of our brain microvessel-on-a-chip.

13 Miscellaneous PubMed References

**Species / Dilution**

**Summary**

**Human / Not Cited**
Ophthalmology (Dec 2010; 117: 2407)
"Perifoveal Müller cell depletion in a case of macular telangiectasia type 2."
Author(s): Pownier MB, Gillies MC, Tretiach M, Scott A, Guymer RH, Hageman GS, Fruttiger M
PubMed Article URL: http://dx.doi.org/10.1016/j.ophtha.2010.04.001

35-2500 was used in immunohistochemistry to report a clinical case of macular telangiectasia type 2 with perifoveal m

**Human / Not Cited**
The American journal of surgical pathology (Dec 2011; 35: 1848)
"Claudin-5 as an immunohistochemical marker for angiosarcoma and hemangioendothelioma."
Author(s): Miettinen M, Sarlomo-Rikala M, Wang ZF
PubMed Article URL: http://dx.doi.org/10.1097/PAS.0b013e318229a401


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**Human / Not Cited**
35-2500 was used in Immunocytochemistry to validate barrier function of our brain microvessel-on-a-chip by measuring permeability of fluorescent dextran and a human monoclonal antibody.
35-2500 was used in immunohistochemistry to discuss the role of tight junctions in hair cells.

**Human / Not Cited**

Archives of dermatological research (Sep 2003; 295: 211)

"Expression and localization of tight junction-associated proteins in human hair follicles."

Author(s): Brandner JM, McIntyre M, Kiel S, Wladykowski E, Moll I

PubMed Article URL: http://dx.doi.org/10.1007/s00403-003-0418-3

**Human / 3:50**

35-2500 was used in immunocytochemistry and western blot to test the effect of hypo and hyperglycemic conditions on blood brain barrier integrity and endothelial function in vitro.

**Human / 1:50**

Fluids and barriers of the CNS (Apr 2014; 11: )

"Impact of altered glycaemia on blood-brain barrier endothelium: an in vitro study using the hCMEC/D3 cell line."

Author(s): Saja RK, Prasad S, Cucullo L

PubMed Article URL: http://dx.doi.org/10.1186/2045-8118-11-8

35-2500 was used in immunohistochemistry (paraffin) to examine tight junction and adherens junction proteins in normal human lung, IPF, cryptogenic organizing pneumonia, and asbestosis.

**Human / 1:50**

Human pathology (May 2013; 44: 895)

"Divergence of tight and adherens junction factors in alveolar epithelium in pulmonary fibrosis."

Author(s): Lappi-Bianco E, Lehtonen ST, Sormunen R, Merikallio HM, Soini Y, Kaarteenaho RL

PubMed Article URL: http://dx.doi.org/10.1016/j.humpath.2012.08.016

35-2500 was used in western blot to test if claudin 3 plays an instigating and/or a functional role in the urothelial tight junctions.

**Human / 0.5 µg/ml**

Bladder (San Francisco, Calif.) (Mar 2022; 2: )

"The human urothelial tight junction: claudin 3 and the ZO-1<sup>+</sup> switch."

Author(s): Smith NJ, Hinley J, Varley CL, Eardley I, Tredosiewicz LK, Southgate J

PubMed Article URL: http://dx.doi.org/10.14440/bladder.2015.33

35-2500 was used in western blot to identify annexin 2 as a regulator of endothelial morphogenesis.

**Human / Not Cited**

The Journal of biological chemistry (Dec 2010; 285: 40624)

"Annexin 2 regulates endothelial morphogenesis by controlling AKT activation and junctional integrity."

Author(s): Su SC, Maxwell SA, Bayless KJ

PubMed Article URL: http://dx.doi.org/10.1074/jbc.M110.157271

35-2500 was used in immunocytochemistry to describe methods to differentiate and characterize hPSC-derived brain microvascular endothelial cells.

**Human / 1:50**

Methods (San Diego, Calif.) (May 2016; 101: 93)

"Differentiation and characterization of human pluripotent stem cell-derived brain microvascular endothelial cells."

Author(s): Stebbins MJ, Wilson HK, Canfield SG, Qian T, Palecek SP, Shusta EV

PubMed Article URL: http://dx.doi.org/10.1016/j.ymeth.2015.10.016

35-2500 was used in immunohistochemistry to study the effects of A on the functionality of the blood-CSF barrier.

**Mouse / 1:50**

The Journal of neuroscience : the official journal of the Society for Neuroscience (Sep 2015; 35: 12766)

"Amyloid Oligomers Disrupt Blood-CSF Barrier Integrity by Activating Matrix Metalloproteinases."


PubMed Article URL: http://dx.doi.org/10.1523/JNEUROSCI.0006-15.2015

35-2500 was used in immunohistochemistry to discuss the role of tight junctions in hair cells.

**Sheep / 1:5000**

Neurotoxicology and teratology (Dec 2013; 37: 83)

"Effect of a two-week treatment with a low dose of 2,2',4,4',5,5'-hexachlorobiphenyl (PCB153) on tight junction protein expression in ovine choroid plexus during long and short photoperiods."

Author(s): Szczepkowska A, Lagaraine C, Robert V, Dufounnery L, Thiery JC, Skiper J

PubMed Article URL: http://dx.doi.org/10.1016/j.ntt.2013.03.061

35-2500 was used in western blot to examine the photoperiodically different concentration of polychlorinated biphenyls in the cerebrospinal fluid in sheep.

**Human / 1:125**

Cardiovascular pathology : the official journal of the Society for Cardiovascular Pathology (Mar 2016; 24: 160)

"Claudin-5 levels are reduced from multiple cell types in human failing hearts and are associated with mislocalization of ephrin-B1."


PubMed Article URL: http://dx.doi.org/10.1016/j.carpath.2014.10.006


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35-2500 was used in immunohistochemistry - paraffin section to discuss methods to assess blood brain barrier integrity.

Methods in molecular biology (Clifton, N.J.) (Jun 2011; 686: 1777)
"Detection of multiple proteins in intracerebral vessels by confocal microscopy."
Author(s): Manias JL, Kapadia A, Nag S
PubMed Article URL: http://dx.doi.org/10.1007/978-1-60761-938-3_7

35-2500 was used in immunocytochemistry and western blot to elucidate the effects and mechanism of miR-18a on the permeability of the blood-tumor barrier.

Journal of neuroscience research (Dec 2015; 93: 1891)
"Overexpression of miR-18a negatively regulates myocyte enhancer factor 2D to increase the permeability of the blood-tumor barrier via Krüppel-like factor 4-mediated downregulation of zonula occluden-1, claudin-5, and occludin."
Author(s): Zhao YY, Zhao LN, Wang P, Miao YS, Liu YH, Wang ZH, Ma J, Li Z, Li ZQ, Xue YX
PubMed Article URL: http://dx.doi.org/10.1002/jnr.23628

51 Immunohistochemistry References

<table>
<thead>
<tr>
<th>Species / Dilution</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human / 1:45</td>
<td>35-2500 was used in immunohistochemistry to investigate in vivo the role of Tumor progression locus 2 (Tpl2), a mitogen-activated protein kinase kinase kinase (MAP3K) member with pleiotropic effects in inflammation and cancer.</td>
</tr>
<tr>
<td>Human / 1:50</td>
<td>35-2500 was used in immunohistochemistry to measure the expression of tight junction proteins in human lung squamous cell carcinomas and adenocarcinomas.</td>
</tr>
</tbody>
</table>

Mouse / Not Cited

Cell reports (May 2021; 35: )
"Endothelial Tpl2 regulates vascular barrier function via JNK-mediated degradation of claudin-5 promoting neuroinflammation or tumor metastasis."
Author(s): Nanou A, Bourboul M, Vetrano S, Schaepfer U, Ley S, Kollias G
PubMed Article URL: http://dx.doi.org/10.1016/j.cell.2021.109168

Not Applicable / Not Cited

Modern pathology : an official journal of the United States and Canadian Academy of Pathology, Inc (Sep 2007; 20: 947)
"Claudin-1 and claudin-5 expression patterns differentiate lung squamous cell carcinomas from adenocarcinomas."
Author(s): Paschoud S, Bongiovanni M, Pache JC, Citi S
PubMed Article URL: http://dx.doi.org/10.1038/modpathol.3800835

Mouse / 1:200

Molecular therapy. Nucleic acids (Dec 2021; 26: 148)
"Silencing of IncRNA XIST impairs angiogenesis and exacerabtes cerebral vascular injury after ischemic stroke."
PubMed Article URL: http://dx.doi.org/10.1016/j.molther.2021.06.025

Pig / 1:150

Diabetes & vascular disease research (May 2017; 14: 200)
"Retinal pathology is associated with increased blood-retina barrier permeability in a diabetic and hypercholesterolaemic pig model: Beneficial effects of the LpPLA<sub>2</sub> inhibitor Darapladib."
Author(s): Acharya NK, Qi X, Goldwaser EL, Godsey GA, Wu H, Kosciuk MC, Freeman TA, Macphee CH, Wilensky RL, Venkataraman V, Nagele RG
PubMed Article URL: http://dx.doi.org/10.1177/1479164116683149

Mouse / 1:500

Journal of neurotrauma (Jan 2018; 35: 362)
"Post-Injury Administration of Galantamine Reduces Traumatic Brain Injury Pathology and Improves Outcome."
Author(s): Zhao J, Hylin MJ, Kobori N, Hood KN, Moore AN, Dash PK
PubMed Article URL: http://dx.doi.org/10.1089/neu.2017.5102

35-2500 was used in Immunohistochemistry to show that sonic hedgehog agonist is one of the most promising therapies in treating neonatal stroke thanks to its safety profile and low dosage.

**Pediatric research (Dec 2021; 90: 1161)**

"Neuroprotective effects of Sonic hedgehog agonist SAG in a rat model of neonatal stroke."

Author(s): Nguyen V.Chavali M,Larpthaveesarp A,Kodal S,Gonzalez G,Franklin RJM,Rowitch DH,Gonzalez F

PubMed Article URL:http://dx.doi.org/10.1038/s41390-021-01408-7

35-2500 was used in Western Blot, Immunohistochemistry to demonstrate that the circular RNA of FoxO3 promotes autophagy via mTORC1 inhibition to attenuate BBB collapse under ischemia/reperfusion injury.

**Molecular therapy : the journal of the American Society of Gene Therapy (Mar 2022; 30: 1275)**

"Circular RNA circ-FoxO3 attenuates blood-brain barrier damage by inducing autophagy during ischemia /reperfusion."


PubMed Article URL:http://dx.doi.org/10.1016/j.ymtte.2021.11.004

352500 was used in immunohistochemistry and western blot to elucidate how miR-21-5p alleviates traumatic brain injury in rats

**Brain research (Nov 2016; 1650: 31)**

"miR-21-5p alleviates leakage of injured brain microvascular endothelial barrier in vitro through suppressing inflammation and apoptosis."


35-2500 was used in Immunohistochemistry to confirm apolipoprotein-E as an important modulator of spontaneous Blood Brain Barrier stabilisation following Traumatic Brain Injury.

**Methods in molecular biology (Clifton, N.J.) (Nov 2011; 762: 333)**

"MMP-mediated disruption of claudin-5 in the blood-brain barrier of rat brain after cerebral ischemia."

Author(s): Yang Y,Rosenberg GA

PubMed Article URL:http://dx.doi.org/10.1007/978-1-61779-185-7_24

35-2500 was used in Immunohistochemistry to confirm apolipoprotein-E as an important modulator of spontaneous Blood Brain Barrier stabilisation following Traumatic Brain Injury.

**Journal of neuroinflammation (Sep 2020; 17: )**

"Site-specific opening of the blood-brain barrier by extracellular histones."

Author(s): Villoba N,Baby S,Cha BJ,Yuan SY

PubMed Article URL:http://dx.doi.org/10.12974/020-01950-x

35-2500 was used in Immunohistochemistry to assess the changes of gut microbiome composition, tight junction proteins, and cytokines expression of intestinal mucosa from the duodenum to the distal part of the colon in irritable bowel syndrome patients and healthy volunteers.

**PloS one (Nov 2021; 16: )**

"Disruption of the pro-inflammatory, anti-inflammatory cytokines and tight junction proteins expression, associated with changes of the composition of the gut microbiota in patients with irritable bowel syndrome."


PubMed Article URL:http://dx.doi.org/10.1371/journal.pone.0252930

35-2500 was used in Immunocytochemistry-immunofluorescence to suggest that circulating histones may contribute to cerebrovascular injury or brain dysfunction by altering BBB structure and function.

**Pediatric research (Dec 2021; 90: 1161)**

"The Human Blood-Nerve Barrier Transcriptome."

Author(s): Palladino SP,Helton ES,Jain P,Dong C,Crowley MR,Crossman DK,Uboegu EE

PubMed Article URL:http://dx.doi.org/10.1038/s41598-017-17475-y
Human / Not Cited

"Loss of claudins-1 and -7 and expression of claudins-3 and -4 correlate with prognostic variables in prostatic adenocarcinomas." 
Author(s): Sheehan GM, Kallakury BV, Sheehan CE, Fisher HA, Kaufman RP, Ross JS
PubMed Article URL: http://dx.doi.org/10.1016/j.humpath.2006.11.007

35-2500 was used in Immunohistochemistry-immunofluorescence to examine the correlation between serum levels of CAMs / KLF4 and infarct volume in acute C1S patients.

35-2500 was used in Immunohistochemistry to examine the effect of prolonged hypoxia on blood-brain barrier integrity in vivo

Journal of neuroinflammation (Apr 2020; 17: )
"KLF4 alleviates cerebral vascular injury by ameliorating vascular endothelial inflammation and regulating tight junction protein expression following ischemic stroke."
Author(s): Zhang X, Wang L, Han Z, Dong J, Pang D, Fu Y, Li L
PubMed Article URL: http://dx.doi.org/10.1186/s12974-020-01780-x

Not Applicable / 1:100

"Matrix metalloproteinase-9 mediates hypoxia-induced vascular leakage in the brain via tight junction rearrangement."
Author(s): Bauer AT, Bürgers HF, Rabie T, Marti HH
PubMed Article URL: http://dx.doi.org/10.1038/jcbfm.2009.248

35-2500 was used in Immunohistochemistry to demonstrate brain-region-specific differences in myeloid responses induced by chronic peripheral inflammation.

35-2500 was used in Immunohistochemistry to investigate the effects of zinc oxide nanoparticle exposure on vascular functions, particularly on endothelial barriers, using in vitro and in vivo models.

Cell reports (Mar 2020; 30: 4082)
"Chronic Peripheral Inflammation Causes a Region-Specific Myeloid Response in the Central Nervous System."
PubMed Article URL: http://dx.doi.org/10.1016/j.celrep.2020.02.109

35-2500 was used in Immunohistochemistry to investigate the potential effect of DL-3-n-butylphthalide on the tight junction proteins claudin-5, zonula occludens-1, and occludin during brain ischemia.

35-2500 was used in Immunohistochemistry to demonstrate myeloid responses induced by chronic peripheral inflammation.

International Journal of Molecular Sciences (May 2020; 21: )
"Exposure to Zinc Oxide Nanoparticles Disrupts Endothelial Tight and Adherens Junctions and Induces Pulmonary Inflammatory Cell Infiltration."
Author(s): Chen CM, Wu ML, Ho YC, Gung PY, Tsai MH, Orekhov AN, Sobeni IA, Lin P, Yet SF
PubMed Article URL: http://dx.doi.org/10.3390/ijms21103437

35-2500 was used in Immunohistochemistry to investigate the potential effect of DL-3-n-butylphthalide on the tight junction proteins claudin-5, zonula occludens-1, and occludin during brain ischemia.

Chinese medical journal (Jun 2019; 132: 1344)
"DL-3-n-butylphthalide protects the blood-brain barrier against ischemia/hypoxia injury via upregulation of tight junction proteins."
Author(s): Ye ZY, Xing HY, Wang B, Liu M, Lv PY
PubMed Article URL: http://dx.doi.org/10.1097/CMA.0000000000000232

35-2500 was used in Western Blot, Immunohistochemistry to reveal a novel role for ASM in the control of neurovascular function in aging, suggesting that ASM may represent a new therapeutic target for anti-aging.

"Vascular and Neurogenic Rejuvenation in Aging Mice by Modulation of ASM."
PubMed Article URL: http://dx.doi.org/10.1016/j.neuron.2018.09.010

35-2500 was used in Immunohistochemistry-immunofluorescence to examine the potential effect of DL-3-n-butylphthalide on the tight junction proteins claudin-5, zonula occludens-1, and occludin during brain ischemia.

Nature communications (Dec 2019; 10; )
"Dual microglia effects on blood brain barrier permeability induced by systemic inflammation."
PubMed Article URL: http://dx.doi.org/10.1038/s41467-019-13812-z

35-2500 was used in Flow Cytometry to show microglia play a dual role in maintaining BBB integrity with implications for elucidating how systemic immune-activation impacts neural functions.

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35-2500 was used in Immunohistochemistry to explore new mechanisms related to the neurovascular unit during extravasation and proliferation of triple-negative breast cancer cells in the brain.

**Mouse / 1:100**

Acta neuropathologica communications (Aug 2019; 7: )

"Response of the neurovascular unit to brain metastatic breast cancer cells."


PubMed Article URL: http://dx.doi.org/10.1186/s40478-019-0788-1

**Human / 1:50**


"Claudins 1, 2, 3, 4, 5 and 7 in solar keratosis and squamouscellular carcinoma of the skin."

Author(s): Hintsala HR, Siponen M, Haapasaari KM, Karihtala P, Soini Y


35-2500 was used in Immunohistochemistry to study the essential role of autophagy in maintaining the integrity of endothelial barrier by regulating the localisation of Claudin-5 under starvation.

**Mouse / 1:200**

Frontiers in physiology (Oct 2020; 10: )

"Autophagy Protects the Blood-Brain Barrier Through Regulating the Dynamic of Claudin-5 in Short-Term Starvation."


PubMed Article URL: http://dx.doi.org/10.3389/fphys.2019.00002

35-2500 was used in Immunohistochemistry to report that oligodendrocyte precursor cells (OPCs) contact sprouting endothelial tip cells in mouse, ferret, and human neonatal white matter.

**Mouse / Not Cited**

Neuron (Dec 2020; 108: 1130)

"Wnt-Dependent Oligodendroglial-Endothelial Interactions Regulate White Matter Vascularization and Attenuate Injury."

Author(s): Chavali M, Ulloa-Nava MJ, Pérez-Borredá P, Garcia-Verdugo JM, McQuillen PS, Huang EJ, Rowitch DH

PubMed Article URL: http://dx.doi.org/10.1016/j.neuron.2020.09.033

35-2500 was used in immunohistochemistry to investigate the efficacy of deep-brain stimulation on microvascular integrity in the subthalamic nucleus in Parkinson disease.

**Human / 1:150**

Neurobiology of disease (Feb 2015; 74: 392)

"Deep-brain stimulation associates with improved microvascular integrity in the subthalamic nucleus in Parkinson's disease."

Author(s): Pienaar IS, Lee CH, Elson JL, McGuinness L, Gentleman SM, Kalaria RN, Dexter DT

PubMed Article URL: http://dx.doi.org/10.1016/j.nbd.2014.12.006

35-2500 was used in Immunohistochemistry to show that specific combinations of vascular endothelial growth factors are required to selectively drive fenestrated vessel formation in the zebrafish myelencephalic choroid plexus.

**Zebrafish / 1:500**

eLife (Jan 2021; 10: )

"Endothelial cell-type-specific molecular requirements for angiogenesis drive fenestrated vessel development in the brain."

Author(s): Parab S, Quick RE, Matsuoka RL

PubMed Article URL: http://dx.doi.org/10.7554/eLife.64295

35-2500 was used in Immunohistochemistry to show that KV11 itself has an anti-angiogenic effect through retro-orbital injection, but that this effect was greatly enhanced when delivered with EXOs.

**Mouse / 1:200**

Theranostics (Jul 2021; 11: 5107)

"Exosome-mediated delivery of an anti-angiogenic peptide inhibits pathological retinal angiogenesis."


PubMed Article URL: http://dx.doi.org/10.7150/thno.54755

35-2500 was used in Immunohistochemistry to demonstrate the efficacy of maternal LB supplementation in modulating systemic and central nervous system inflammation as well as promoting neural/oligodendrocyte progenitor development in the offspring.

**Mouse / Not Cited**

Scientific reports (May 2020; 10: )

"Maternal administration of probiotics promotes brain development and protects offspring's brain from postnatal inflammatory insults in C57/BL6J mice."

Author(s): Lu J, Lu L, Yu Y, Baranowski J, Claud EC

PubMed Article URL: http://dx.doi.org/10.1038/s41598-020-65180-0
35-2500 was used in Immunohistochemistry-immunofluorescence to investigate the suitability of using knock-ins at the docking site 5' of Hprt for rapid development of numerous cre-driver strains focused on expression in adulthood.

**Mouse / Not Cited**

*Twenty-Seven Tamoxifen-Inducible iCre-Driver Mouse Strains for Eye and Brain, Including Seventeen Carrying a New Inducible-First Constitutive-Ready Allele.*


PubMed Article URL: http://dx.doi.org/10.1534/genetics.119.301984

**Zebrafish / 1:50**

35-2500 was used in Immunohistochemistry-immunofluorescence to investigate the role of claudin5a in the Zebrafish Kupffer's vesicle lumen.

**Not Applicable / 1:100**

35-2500 was used in Immunohistochemistry-immunofluorescence to suggest that Nef contributes to the chronic inflammation seen in HIV patients, even in those whose viremia is controlled by cART.

**Rat / 1:200**

35-2500 was used in Immunohistochemistry to demonstrate paracellular migration of bacteria across BBB and a critical role for HIF-1/VEGF therein and hence propose targeting this pathway to prevent BBB dysfunction and ensuing brain damage in infections.

**Human / 1:200**

35-2500 was used in Immunohistochemistry to characterize early changes in multiple sclerosis brain tissue, identifying specific microglia and macrophage subsets at different stages of demyelinating lesions.

**Mouse / Not Cited**

*The Wnt Inhibitor Apcdd1 Coordinates Vascular Remodeling and Barrier Maturation of Retinal Blood Vessels.*

Author(s): Mazzoni J, Smith JR, Shahriar S, Cutforth T, Ceja B, Agalli U

PubMed Article URL: http://dx.doi.org/10.1016/j.neuron.2017.10.025

**Human / 1:250**

35-2500 was used in Immunohistochemistry to characterize early changes in multiple sclerosis brain tissue, identifying specific microglia and macrophage subsets at different stages of demyelinating lesions.

**Rat / Not Cited**

*Calcium dobesilate inhibits the alterations in tight junction proteins and leukocyte adhesion to retinal endothelial cells induced by diabetes.*

Author(s): Leal EC, Martins J, Voabil P, Liberal J, Chiavaroli C, Bauer J, Cunha-Vaz J, Ambrósio AF

PubMed Article URL: http://dx.doi.org/10.2337/db09-1421

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35-250 was used in Immunohistochemistry to provide evidence that lethal toxin plays a determinative role in bacterial dissemination and alveolar-capillary barrier dysfunction, and edema toxin may significantly exacerbate pulmonary pathologies in a systemic infection.

Cynomolgus monkey / Not Cited

The American journal of pathology (Oct 2020; 190: 2095)
"Structural Integrity of the Alveolar-Capillary Barrier in Cynomolgus Monkeys Challenged with Fully Virulent and Toxin-Deficient Strains of Bacillus anthracis."
Author(s):D’Agnillo F,Zhang X,Williams MC
PubMed Article URL:http://dx.doi.org/10.1016/j.ajpath.2020.06.007

35-250 was used in Immunohistochemistry to conclude that, in a rat model, high frequency stimulation of the mesencephalic locomotor region not alleviate blood-brain barrier after dysfunction after ischemic stroke.

Not Applicable / Not Cited

"Electrical Stimulation of the Mesencephalic Locomotor Region Has No Impact on Blood-Brain Barrier Alterations after Cerebral Photothermolysis in Rats."
Author(s):Schuhmann MK,Stoll G,Papp L,Bohr A,Volkmann J,Fluri F
PubMed Article URL:http://dx.doi.org/10.3390/ijms20164036

35-250 was used in immunohistochemistry to test if glial dysfunction is a major contributor to the blood-retinal barrier

Not Applicable / 1:100

Journal of neuroscience research (May 2010; 88: 1485)
"Retinal vascular changes after glial disruption in rats."
Author(s):Shen W,Li S,Chung SH,Gillies MC
PubMed Article URL:http://dx.doi.org/10.1002/jnr.22317

35-250 was used in Immunohistochemistry to study the role of ischemia in inducing sustained contraction of pericytes on microvessels in the intact mouse brain

Not Applicable / 1:100

Nature medicine (Sep 2009; 15: 1031)
"Pericyte contraction induced by oxidative-nitrative stress impairs capillary reflow despite successful opening of an occluded cerebral artery."
Author(s):Yemisci M,Gursoy-Ozdemir Y,Vural A,Can A,Topalkara K,Dalkarta K
PubMed Article URL:http://dx.doi.org/10.1038/nm.2022

35-250 was used in Immunohistochemistry to provide a unique perspective of BBB TJs and open new directions for understanding TJ functionality in biological barriers, ultimately enabling restoration in disease or modulation for drug delivery.

Mouse / 1:100

eLife (Dec 2021; 10: )
"Nano-scale architecture of blood-brain barrier tight-junctions."
Author(s):Sasson E,Anzi S,Bell B,Yakovian O,Zorsky M,Deutsch U,Engelhardt B,Sherman E,Vatine G,Dzikowski R,Ben-Zvi A
PubMed Article URL:http://dx.doi.org/10.7554/eLife.63253

35-250 was used in Immunohistochemistry to investigate whether Sema3E-Plexin-D1 signaling was involved in cerebrovascular remodeling after ischemic injury.

Mouse / 1:200

Translational stroke research (Feb 2022; 13: 142)
"Vascular Sema3E-Plexin-D1 Signaling Reactivation Promotes Post-stroke Recovery through VEGF Downregulation in Mice."
Author(s):Yu R,Kim NS,Li Y,Jeong JY,Park SJ,Zhou B,Oh WJ
PubMed Article URL:http://dx.doi.org/10.1007/s12975-021-00914-4

35-250 was used in Immunohistochemistry-immunofluorescence to evaluate the effect of human immunoglobulins from neuromyelitis optica spectrum disorders (NMOSD) patients (NMO-IgG) on blood-brain barrier (BBB) properties.

Human / Not Cited

PloS one (Oct 2020; 15: )
"Purified IgG from aquaporin-4 neuromyelitis optica spectrum disorder patients alters blood-brain barrier permeability."
PubMed Article URL:http://dx.doi.org/10.1371/journal.pone.0238301

35-250 was used in Immunohistochemistry to conclude that, in a rat model, high frequency stimulation of the mesencephalic locomotor region not alleviate blood-brain barrier after dysfunction after ischemic stroke.

Mouse / 1:500

Signal transduction and targeted therapy (Sep 2021; 6: )
"SARS-CoV-2 crosses the blood-brain barrier accompanied with basement membrane disruption without tight junctions alteration."
PubMed Article URL:http://dx.doi.org/10.1038/s41392-021-00719-9
Human / Not Cited

Histochemistry and cell biology (Dec 2012; 138: 861)

"Complexity andvd entations in the expression pattern of claudins at the blood-CSF barrier."
Author(s): Kratzer I, Vasiljevic A, Rey C, Fevre-Montange M, Saunders N, Strazieille N, Ghersi-Egea JF
PubMed Article URL: http://dx.doi.org/10.1007/s00418-012-1001-9

Human / 1:500

35-2500 was used in Immunohistochemistry-immunofluorescence to indicate that the phenotype of systemic AD-EVs is differentially defined by the etiopathology of the disease (SAD or FAD), which results in a differential alteration of the NVU cells implied in neurodegeneration.

Human / Not Cited

Frontiers in aging neuroscience (Dec 2020; 12: )

"Differential Profile of Systemic Extracellular Vesicles From Sporadic and Familial Alzheimer's Disease Leads to Neurological and Endothelial Cell Degeneration."
PubMed Article URL: http://dx.doi.org/10.3389/fnagi.2020.587989

Human / Not Cited

Arteriosclerosis, thrombosis, and vascular biology (Apr 2016; 36: 647)

"Evidence That Cingulin Regulates Endothelial Barrier Function In Vitro and In Vivo."
PubMed Article URL: http://dx.doi.org/10.1161/ATVBAHA.115.307032

Human / 1:300

35-2500 was used in Immunohistochemistry to propose that specific frequency EA can transiently open the BBB and may be related to the change of tight junctions (TJ).

Human / 1:50

"Modeling alpha-synuclein pathology in a human brain-chip to assess blood-brain barrier disruption."
PubMed Article URL: http://dx.doi.org/10.3389/fnins.2020.582324

Human / Not Cited

35-2500 was used in Immunohistochemistry to confirm that genetic expression changes in human synucleinopathies and serve as a testing platform for identification and validation of novel therapeutics.

Mouse / 10 µg/ml

"Novel expression of claudin-5 in glomerular podocytes."
PubMed Article URL: http://dx.doi.org/10.1007/s00441-010-1117-y

7 Immunohistochemistry (Paraffin) References

Species / Dilution

Summary

Human / 1:50

35-2500 was used in immunohistochemistry - paraffin section to ascertain the expression of claudin 1, 3M, 3S, 4, 5, and 7 in vulvar epithelial neoplasia and compare their expression in samples with invasive vulvar squamous cell carcinoma

Tumour biology: the journal of the International Society for Oncodevelopmental Biology and Medicine (Apr 2012; 33: 537)

"Claudins 1, 3M, 3S, 4, 5 and 7 in vulvar neoplasms compared with vulvar squamous cell carcinoma."n
Author(s): Riski M, Santala M, Soini Y, Talvensaari-Mattila A
PubMed Article URL: http://dx.doi.org/10.1007/s13277-011-0289-8

Human / 1:50

35-2500 was used in immunohistochemistry - paraffin section to define the localization of CD81, scavenger receptor class B member I, and Claudin-1 in HCV entry of hepatocytes

Not Applicable / 20 µg/ml

Hepatology (Baltimore, Md.) (Feb 2008; 47: 418)

"Hepatitis C virus receptor expression in normal and diseased liver tissue."
Author(s): Reynolds GM, Harris HJ, Jennings A, Hu K, Groves J, Laird PF, Adams DH, Balef P, Hübersch SG, McKeating JA
PubMed Article URL: http://dx.doi.org/10.1002/hep.22028


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35-2500 was used in immunohistochemistry - paraffin section to correlate expression of claudin-5 to ovarian cancer behavior

Not Applicable / 1:50

Anticancer research (Dec 2009; 29: 5185)
"Claudin-5 overexpression correlates with aggressive behavior in serous ovarian adenocarcinoma."
Author(s): Turunen M, Talvensaari-Mattila A, Soini Y, Santala M

Rat / 1:200

35-2500 was used in Immunohistochemistry (Paraffin) to develop and characterize a grade III and IV GMH model in postnatal day 5 (P5) rats, the equivalent of preterm human brain maturation.

Frontiers in cellular neuroscience (Dec 2020; 14; )
"A Model of Germinal Matrix Hemorrhage in Preterm Rat Pups."
PubMed Article URL: http://dx.doi.org/10.3389/fncel.2020.535320

Human / Not Cited

Molecular pharmaceutics (May 2013; 10: 1473)
"Physiology of blood-brain interfaces in relation to brain disposition of small compounds and macromolecules."
Author(s): Strazielle N, Ghersi-Egea JF
PubMed Article URL: http://dx.doi.org/10.1012/mp300518e

35-2500 was used in immunohistochemistry - paraffin section to discuss factors that regulate the blood brain barrier.

Not Applicable / 1:50

Journal of clinical pathology (Mar 2006; 59: 250)
"Claudins in differential diagnosis between mesothelioma and metastatic pleural adenocarcinoma"

Not Applicable / 1:50

ELISA References

Species / Dilution

Summary

35-2500 was used in ELISA to assess how the amounts of two major tight junction proteins, CLDN5 and OCLN, are correlated with cerebral amyloid angiopathy severity and the levels of several Alzheimer's disease related molecules.

Human / Not Cited

Anticancer research (Aug 2014; 34: 4181)
"Claudins as prognostic factors for renal cell cancer."
Author(s): Virman J, Soini Y, Kujala P, Luukkaala T, Salminen T, Sunela K, Kelokumpu-Lehtinen PL

2 Flow Cytometry References

Species / Dilution

Summary

35-2500 was used in Flow Cytometry to show microglia play a dual role in maintaining BBB integrity with implications for elucidating how systemic immune-activation impacts neural functions.

Mouse / 1:100

Nature communications (Dec 2019; 10: )
"Dual microglia effects on blood brain barrier permeability induced by systemic inflammation."
PubMed Article URL: http://dx.doi.org/10.1038/s41467-019-13812-z
### 1 Immunoprecipitation References

<table>
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<th>Species / Dilution</th>
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<tr>
<td>Human / Not Cited</td>
<td>35-2500 was used in immunoprecipitation to identify and characterize a new type of adherens junction in human meningiomas.</td>
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</table>
| Human / Not Cited  | Biotechnology journal (Feb 2018; 13: )  
"Activation of RAR, RAR, or RXR Increases Barrier Tightness in Human Induced Pluripotent Stem Cell-Derived Brain Endothelial Cells."  
Author(s): Stebbins MJ, Lippmann ES, Faubion MG, Daneman R, Palecek SP, Shusta EV  
PubMed Article URL: http://dx.doi.org/10.1002/biot.201700093 |
| Human / Not Cited  | Cell and tissue research (Feb 2008; 331: 401)  
"Characterization of a novel type of adherens junction in meningiomas and the derived cell line HBL-52."  
Author(s): Akat K, Bleck CK, Lee YM, Haselmann-Weiss U, Kartenbeck J  
PubMed Article URL: http://dx.doi.org/10.1007/s00441-007-0512-5 |