

Datasheet: MCA1957T

Description:	RAT ANTI MOUSE CD68
Specificity:	CD68
Other names:	MACROSIALIN
Format:	Purified
Product Type:	Monoclonal Antibody
Clone:	FA-11
Isotype:	IgG2a
Quantity:	25 µg

Product Details

Applications

This product has been reported to work in the following applications. This information is derived from testing within our laboratories, peer-reviewed publications or personal communications from the originators. Please refer to references indicated for further information. For general protocol recommendations, please visit www.bio-rad-antibodies.com/protocols.

	Yes	No	Not Determined	Suggested Dilution
Flow Cytometry (1)	▪			1/50 - 1/100
Immunohistology - Frozen	▪			
Immunohistology - Paraffin (2)	▪			
ELISA			▪	
Immunoprecipitation	▪			
Western Blotting (3)	▪			
Immunofluorescence	▪			
In vitro Assay			▪	

Where this product has not been tested for use in a particular technique this does not necessarily exclude its use in such procedures. Suggested working dilutions are given as a guide only. It is recommended that the user titrates the product for use in their own system using appropriate negative/positive controls.

(1) **Membrane permeabilisation is required for this application. Bio-Rad recommends the use of Leucoperm™ (Product Code [BUF09](#)) for this purpose.**

(2) **This product may require antigen retrieval using heat treatment prior to staining of paraffin sections. Either sodium citrate buffer or Tris/EDTA buffer may be used for this purpose. See [Martin-Manso](#) for details. Staining has also been achieved without antigen retrieval, see [Lu](#) for details.**

(3) **Non-reducing conditions recommended.**

Target Species	Mouse
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Product Form	Purified IgG - liquid
Preparation	Purified IgG prepared by affinity chromatography on Protein G from tissue culture supernatant
Buffer Solution	Phosphate buffered saline
Preservative Stabilisers	0.09% Sodium Azide
Carrier Free	Yes
Approx. Protein Concentrations	IgG concentration 1.0mg/ml
Immunogen	Purified Concanavalin A acceptor glycoprotein from P815 cell line.
External Database Links	<p>UniProt: P31996 Related reagents</p> <p>Entrez Gene: 12514 Cd68 Related reagents</p>
RRID	AB_2074849
Specificity	<p>Rat anti Mouse CD68 antibody, clone FA-11 recognizes mouse macrosialin, a heavily glycosylated transmembrane protein and murine homolog of human CD68, which is classified as a unique scavenger receptor (ScR) family member, due to the presence of a lysosome associated membrane protein (LAMP)-like domain.</p> <p>CD68 is considered a pan macrophage marker, predominantly expressed on the intracellular lysosomes of tissue macrophages/monocytes, including Kupffer cells, microglia, histiocytes and osteoclasts, and is expressed to a lesser extent by dendritic cells and peripheral blood granulocytes.</p> <p>CD68 is expressed by many tumor types including some B cell lymphomas, blastic NK lymphomas, melanomas, granulocytic (myeloid) sarcomas, hairy cell leukemias, and renal, urinary and pancreatic tumors, and can be used in cancer studies to demonstrate the presence/localization of macrophages.</p> <p>Rat anti mouse CD68 antibody, clone FA-11, has been used in many mouse models for the identification of CD68 in immunohistochemical studies, using both frozen and paraffin-embedded tissues (Masaki et al. 2003) and (Devey et al. 2009).</p> <p>Rat anti mouse CD68 antibody, clone FA-11 can be used in flow cytometry to detect intracellular CD68, following permeabilization, and can detect surface macrosialin at low levels in resident mouse peritoneal macrophages which can be enhanced with thioglycollate stimulation.</p>

References

1. Ramprasad, M.P. *et al.* (1996) Cell surface expression of mouse macrosialin and human CD68 and their role as macrophage receptors for oxidized low density lipoprotein. [Proc Natl Acad Sci U S A. 93 \(25\): 14833-8.](#)
2. Rabinowitz, S.S. & Gordon, S. (1991) Macrosialin, a macrophage-restricted membrane sialoprotein differentially glycosylated in response to inflammatory stimuli. [J Exp Med. 174 \(4\): 827-36.](#)
3. da Silva, R.P. & Gordon, S. (1999) Phagocytosis stimulates alternative glycosylation of macrosialin (mouse CD68), a macrophage-specific endosomal protein. [Biochem J. 338 \(Pt 3\): 687-94.](#)
4. Schleicher, U. *et al.* (2005) Minute numbers of contaminant CD8+ T cells or CD11b+CD11c+ NK cells are the source of IFN- γ in IL-12/IL-18-stimulated mouse macrophage populations. [Blood 105: 1319-1328.](#)
5. Choi, E.J. *et al.* (2014) Novel brain arteriovenous malformation mouse models for type 1 hereditary hemorrhagic telangiectasia. [PLoS One. 9\(2\): e88511.](#)
6. Kassim, S. *et al.* (2010) Gene therapy in a humanized mouse model of familial hypercholesterolemia leads to marked regression of atherosclerosis. [PloS ONE 5: e13424.](#)
7. Rahaman, S.O. *et al.* (2011) Vav family Rho guanine nucleotide exchange factors regulate CD36-mediated macrophage foam cell formation. [J Biol Chem. 286: 7010-7.](#)
8. Frossard, J.L. *et al.* (2011) Role of CCL-2, CCR-2 and CCR-4 in cerulein-induced acute pancreatitis and pancreatitis-associated lung injury. [J Clin Pathol. 64: 387-93](#)
9. West, E.L. *et al.* (2010) Long-term survival of photoreceptors transplanted into the adult murine neural retina requires immune modulation. [Stem Cells. 28: 1997-2007.](#)
10. Lopez, M.E. *et al.* (2011) Anatomically defined neuron-based rescue of neurodegenerative niemann-pick type C disorder. [J Neurosci. 31: 4367-78.](#)
11. Jayagopal, A. *et al.* (2009) Quantum dot mediated imaging of atherosclerosis. [Nanotechnology. 20: 165102.](#)
12. Leung, V.W. *et al.* (2009) Decay-accelerating factor suppresses complement C3 activation and retards atherosclerosis in low-density lipoprotein receptor-deficient mice. [Am J Pathol. 175: 1757-67.](#)
13. Devey, L. *et al.* (2009) Tissue-resident macrophages protect the liver from ischemia reperfusion injury via a heme oxygenase-1-dependent mechanism. [Mol Ther. 17: 65-72.](#)
14. Lu, W. *et al.* (2010) Photoacoustic imaging of living mouse brain vasculature using hollow gold nanospheres. [Biomaterials. 31: 2617-26.](#)
15. de Beer, M.C. *et al.* (2003) Lack of a direct role for macrosialin in oxidized LDL metabolism. [J Lipid Res. 44: 674-85.](#)
16. Song, L. *et al.* (2011) Deletion of the murine scavenger receptor CD68. [J Lipid Res. 52: 1542-50.](#)
17. Daldrop-Link, H.E. *et al.* (2011) MR Imaging of Tumor Associated Macrophages with Clinically-Applicable Iron Oxide Nanoparticles. [Clin Cancer Res. 17: 5695-704.](#)
18. Macauley, S.L. *et al.* (2011) The Role of Attenuated Astrocyte Activation in Infantile Neuronal Ceroid Lipofuscinosis [J. Neurosci 31: 15575-85.](#)
19. Martin-Manso, G. *et al.* (2008) Thrombospondin 1 promotes tumor macrophage recruitment and enhances tumor cell cytotoxicity of differentiated U937 cells. [Cancer Res. 68: 7090-9.](#)

20. Lazarini, F. *et al.* (2012) Early Activation of Microglia Triggers Long-Lasting Impairment of Adult Neurogenesis in the Olfactory Bulb [J Neurosci 32: 3652-64](#)
21. Hemmi, H. *et al.* (2009) A new triggering receptor expressed on myeloid cells (Trem) family member, Trem-like 4, binds to dead cells and is a DNAX activation protein 12-linked marker for subsets of mouse macrophages and dendritic cells. [J Immunol. 182: 1278-86.](#)
22. Akbarshahi, H. *et al.* (2012) Enrichment of Murine CD68(+)CCR2(+) and CD68(+)CD206(+) Lung Macrophages in Acute Pancreatitis-Associated Acute Lung Injury. [PLoS One. 7: e42654.](#)
23. Xiang, X. *et al.* (2016) TREM2 deficiency reduces the efficacy of immunotherapeutic amyloid clearance. [EMBO Mol Med. 8 \(9\): 992-1004.](#)
24. Masaki, T. *et al.* (2003) Heterogeneity of antigen expression explains controversy over glomerular macrophage accumulation in mouse glomerulonephritis. [Nephrol. Dial. Transplant 18:178-81.](#)
25. Dormishian, M. *et al.* (2013) Prokineticin receptor-1 is a new regulator of endothelial insulin uptake and capillary formation to control insulin sensitivity and cardiovascular and kidney functions. [J Am Heart Assoc. 2 \(5\): e000411.](#)
26. von Bargen, K. *et al.* (2014) Cervical Lymph Nodes as a Selective Niche for Brucella during Oral Infections. [PLoS One. 10 \(4\): e0121790.](#)
27. Hamour, S. *et al.* (2015) Local IL-17 Production Exerts a Protective Role in Murine Experimental Glomerulonephritis. [PLoS One. 10 \(8\): e0136238.](#)
28. Wang L *et al.* (2016) Bone Fracture Pre-Ischemic Stroke Exacerbates Ischemic Cerebral Injury in Mice. [PLoS One. 11 \(4\): e0153835.](#)
29. Nguyen, T.V. *et al.* (2016) Multiplex immunoassay characterization and species comparison of inflammation in acute and non-acute ischemic infarcts in human and mouse brain tissue. [Acta Neuropathol Commun. 4 \(1\): 100.](#)
30. Pena-Philippides, J.C. *et al.* (2016) *In vivo* inhibition of miR-155 significantly alters post-stroke inflammatory response. [J Neuroinflammation. 13 \(1\): 287.](#)
31. Paiva, A. A. *et al.* (2017) Apolipoprotein CIII Overexpression-Induced Hypertriglyceridemia Increases Nonalcoholic Fatty Liver Disease in Association with Inflammation and Cell Death. [Oxidative Med Cellular Longev. 2017: 1-18.](#)
32. Giraldo, J.A. *et al.* (2016) The impact of cell surface PEGylation and short-course immunotherapy on islet graft survival in an allogeneic murine model. [Acta Biomater. pii: S1742-7061\(16\)30656-0. \[Epub ahead of print\]](#)
33. Masuda, T. *et al.* (2017) Growth Factor Midkine Promotes Nuclear Factor of Activated T Cells-Regulated T-Cell-Activation and Th1 Cell Differentiation in Lupus Nephritis. [Am J Pathol. Feb 6. pii: S0002-9440\(17\)30029-9. \[Epub ahead of print\]](#)
34. Garofalo, S. *et al.* (2017) The glycoside oleandrin reduces glioma growth with direct and indirect effects on tumor cells. [J Neurosci. Mar 14. pii: 2296-16. \[Epub ahead of print\]](#)
35. Maeda, K. *et al.* (2017) Inhibition of H3K9 methyltransferase G9a ameliorates methylglyoxal-induced peritoneal fibrosis. [PLoS One. 12 \(3\): e0173706.](#)
36. Nishikawa, K. *et al.* (2015) Resveratrol increases CD68⁺ Kupffer cells colocalized with adipose differentiation-related protein and ameliorates high-fat-diet-induced fatty liver in mice. [Mol Nutr Food Res. 59 \(6\): 1155-70.](#)
37. Nagy, B. *et al.* (2017) Different patterns of neuronal activity trigger distinct responses of oligodendrocyte precursor cells in the corpus callosum. [PLoS Biol. 15 \(8\): e2001993.](#)
38. Koh, A.J. *et al.* (2017) The skeletal impact of the chemotherapeutic agent etoposide. [Osteoporos Int. 28 \(8\): 2321-33.](#)

39. Menzies, R.I. *et al.* (2017) Hyperglycemia-induced Renal P2X7 Receptor Activation Enhances Diabetes-related Injury. [EBioMedicine. 19: 73-83.](#)
40. Takane, K. *et al.* (2017) Detrimental Effects of Centrally Administered Angiotensin II are Enhanced in a Mouse Model of Alzheimer Disease Independently of Blood Pressure. [J Am Heart Assoc. 6 \(4\)Apr 20 \[Epub ahead of print\].](#)
41. Xuan, H. *et al.* (2017) Inhibition or deletion of angiotensin II type 1 receptor suppresses elastase-induced experimental abdominal aortic aneurysms. [J Vasc Surg. Apr 20 \[Epub ahead of print\].](#)
42. Metghalchi, S. *et al.* (2018) Indoleamine 2 3-dioxygenase knockout limits angiotensin II-induced aneurysm in low density lipoprotein receptor-deficient mice fed with high fat diet. [PLoS One. 13 \(3\): e0193737.](#)
43. Hill, N.R. *et al.* (2018) RIPK3-deficient mice were not protected from nephrotoxic nephritis. [BMC Nephrol. 19 \(1\): 61.](#)
44. Fumagalli, S. *et al.* (2019) The phagocytic state of brain myeloid cells after ischemia revealed by superresolution structured illumination microscopy. [J Neuroinflammation. 16 \(1\): 9.](#)
45. Gratuze, M. *et al.* (2020) Impact of TREM2R47H variant on tau pathology-induced gliosis and neurodegeneration [J Clin Invest130\(9\):4954-68.](#)
46. Garrett, M.C. *et al.* (2020) Injectable diblock copolypeptide hydrogel provides platform to deliver effective concentrations of paclitaxel to an intracranial xenograft model of glioblastoma. [PLoS One. 15 \(7\): e0219632.](#)
47. Rahman, K. *et al.* (2017) Inflammatory Ly6Chi monocytes and their conversion to M2 macrophages drive atherosclerosis regression. [J Clin Invest. 127 \(8\): 2904-15.](#)
48. Santiago-Raber, M.L. *et al.* (2020) Atherosclerotic plaque vulnerability is increased in mouse model of lupus. [Sci Rep. 10 \(1\): 18324.](#)
49. Zhang, X. *et al.* (2020) Targeted suppression of microRNA-33 in lesional macrophages using pH low-insertion peptides (pHLIP) improves atherosclerotic plaque regression [Oct 28. \[Epub ahead of print\].](#)
50. Hada, Y. *et al.* (2020) Inhibition of interleukin-6 signaling attenuates aortitis, left ventricular hypertrophy and arthritis in interleukin-1 receptor antagonist deficient mice. [Clin Sci \(Lond\). 134 \(20\): 2771-87.](#)
51. Souza, C.L.S.E. *et al.* (2020) Ovarian hormones influence immune response to *Staphylococcus aureus* infection. [Braz J Infect Dis. Nov 10 \[Epub ahead of print\].](#)
52. Grundmann, S.M. *et al.* (2020) High-phosphorus diets reduce aortic lesions and cardiomyocyte size and modify lipid metabolism in Ldl receptor knockout mice. [Sci Rep. 10 \(1\): 20748.](#)
53. Mia, M.M. *et al.* (2020) YAP/TAZ deficiency reprograms macrophage phenotype and improves infarct healing and cardiac function after myocardial infarction. [PLoS Biol. 18 \(12\): e3000941.](#)
54. Zaghoul, N. *et al.* (2020) Prophylactic inhibition of NF-κB expression in microglia leads to attenuation of hypoxic ischemic injury of the immature brain. [J Neuroinflammation. 17 \(1\): 365.](#)
55. Huang, J. *et al.* (2020) Bone Fracture Enhanced Blood-Brain Barrier Breakdown in the Hippocampus and White Matter Damage of Stroke Mice. [Int J Mol Sci. 21 \(22\)Nov 11 \[Epub ahead of print\].](#)
56. Lowe, P.P. *et al.* (2020) Chronic alcohol-induced neuroinflammation involves CCR2/5-dependent peripheral macrophage infiltration and microglia alterations. [J](#)

[Neuroinflammation. 17 \(1\): 296.](#)

57. Stroobants, S. *et al.* (2020) Aged Tmem106b knockout mice display gait deficits in coincidence with Purkinje cell loss and only limited signs of non-motor dysfunction. [Brain Pathol. : e12903.](#)
58. Alberti, S. *et al.* (2020) The antiplatelet agent revacept prevents the increase of systemic thromboxane A₂ biosynthesis and neointima hyperplasia. [Sci Rep. 10 \(1\): 21420.](#)
59. Härdtner, C. *et al.* (2020) Inhibition of macrophage proliferation dominates plaque regression in response to cholesterol lowering. [Basic Res Cardiol. 115 \(6\): 78.](#)
60. Ribeiro, P.C. *et al.* (2020) Therapeutic potential of human induced pluripotent stem cells and renal progenitor cells in experimental chronic kidney disease. [Stem Cell Res Ther. 11 \(1\): 530.](#)
61. Miró, L. *et al.* (2020) Dietary Supplementation with Spray-Dried Porcine Plasma Attenuates Colon Inflammation in a Genetic Mouse Model of Inflammatory Bowel Disease. [Int J Mol Sci. 21\(18\): 6760.](#)
62. Zhou, F. *et al.* (2020) β -Carotene conversion to vitamin A delays atherosclerosis progression by decreasing hepatic lipid secretion in mice. [J Lipid Res. 61 \(11\): 1491-1503.](#)
63. Nelvagal, H.R. *et al.* (2020) Comparative proteomic profiling reveals mechanisms for early spinal cord vulnerability in CLN1 disease. [Sci Rep. 10 \(1\): 15157.](#)
64. Grubišić, V. *et al.* (2020) Enteric Glia Modulate Macrophage Phenotype and Visceral Sensitivity following Inflammation. [Cell Rep. 32 \(10\): 108100.](#)
65. Riedl, K.A. *et al.* (2020) Wall shear stress analysis using 17.6 Tesla MRI: A longitudinal study in ApoE^{-/-} mice with histological analysis. [PLoS One. 15 \(8\): e0238112.](#)
66. Rojanathammanee, L. *et al.* (2013) Pomegranate polyphenols and extract inhibit nuclear factor of activated T-cell activity and microglial activation *in vitro* and in a transgenic mouse model of Alzheimer disease. [J Nutr. 143 \(5\): 597-605.](#)
67. Shahraz, A. *et al.* (2021) Phagocytosis-related NADPH oxidase 2 subunit gp91phox contributes to neurodegeneration after repeated systemic challenge with lipopolysaccharides. [Glia. 69 \(1\): 137-50.](#)
68. Shi, Q. *et al.* (2021) Ultrasound-mediated blood-brain barrier disruption improves anti-pyrogamate3 A β antibody efficacy and enhances phagocyte infiltration into brain in aged Alzheimer's disease-like mice [bioRxiv preprint: Jan 17 \[Epub ahead of print\].](#)
69. Alam, M.M. *et al.* (2021) Deficiency of microglial autophagy increases the density of oligodendrocytes and susceptibility to severe forms of seizures. [eNeuro. Jan 14 \[Epub ahead of print\].](#)
70. Langin, L. *et al.* (2020) A tailored Cln3^{Q352X} mouse model for testing therapeutic interventions in CLN3 Batten disease. [Sci Rep. 10 \(1\): 10591.](#)
71. Allen, B.D. *et al.* (2020) Mitigation of helium irradiation-induced brain injury by microglia depletion. [J Neuroinflammation. 17 \(1\): 159.](#)
72. Drost, N. *et al.* (2020) The Amyloid-beta rich CNS environment alters myeloid cell functionality independent of their origin. [Sci Rep. 10 \(1\): 7152.](#)
73. Vandestienne, M. *et al.* (2021) TREM-1 orchestrates angiotensin II-induced monocyte trafficking and promotes experimental abdominal aortic aneurysm. [J Clin Invest. 131 \(2\): e142468.](#)
74. Apodaca, L.A. *et al.* (2021) Human neural stem cell-derived extracellular vesicles mitigate hallmarks of Alzheimer's disease. [Alzheimers Res Ther. 13 \(1\): 57.](#)
75. Colombo, A. *et al.* (2021) Loss of NPC1 enhances phagocytic uptake and impairs lipid trafficking in microglia. [Nat Commun. 12 \(1\): 1158.](#)

76. Galle-Treger, L. *et al.* (2020) Targeted invalidation of SR-B1 in macrophages reduces macrophage apoptosis and accelerates atherosclerosis. [Cardiovasc Res. 116 \(3\): 554-565.](#)
77. Sun, Y. *et al.* (2008) Temporal gene expression profiling reveals CEBPD as a candidate regulator of brain disease in prosaposin deficient mice. [BMC Neurosci. 9: 76.](#)
78. Miteva, K. *et al.* (2020) Cardiotrophin-1 Deficiency Abrogates Atherosclerosis Progression. [Sci Rep. 10 \(1\): 5791.](#)
79. El Gaamouch, F. *et al.* (2020) VGF-derived peptide TLQP-21 modulates microglial function through C3aR1 signaling pathways and reduces neuropathology in 5xFAD mice. [Mol Neurodegener. 15 \(1\): 4.](#)
80. Chen, Y. *et al.* (2018) Progranulin associates with hexosaminidase A and ameliorates GM2 ganglioside accumulation and lysosomal storage in Tay-Sachs disease. [J Mol Med \(Berl\). 96 \(12\): 1359-73.](#)
81. Gökbüget, D. *et al.* (2018) The miRNA biogenesis pathway prevents inappropriate expression of injury response genes in developing and adult Schwann cells. [Glia. 66 \(12\): 2632-2644.](#)
82. Papaneophytou, C.P. *et al.* (2018) Regulatory role of oligodendrocyte gap junctions in inflammatory demyelination. [Glia. 66 \(12\): 2589-603.](#)
83. Lim, S.L. *et al.* (2020) Genetic Ablation of Hematopoietic Cell Kinase Accelerates Alzheimer's Disease-Like Neuropathology in Tg2576 Mice. [Mol Neurobiol. 57 \(5\): 2447-60.](#)
84. Gajeton, J. *et al.* (2021) Hyperglycemia-Induced miR-467 Drives Tumor Inflammation and Growth in Breast Cancer. [Cancers \(Basel\). 13\(6\):1346.](#)
85. Leipner, J. *et al.* (2021) Myeloid cell-specific *Irf5* deficiency stabilizes atherosclerotic plaques in *ApoE*^{-/-} mice. [Mol Metab. May 12 : 101250 \[Epub ahead of print\].](#)
86. Shariq, M. *et al.* (2021) Adult neural stem cells have latent inflammatory potential that is kept suppressed by *Tcf4* to facilitate adult neurogenesis. [Sci Adv. 7 \(21\)May 21 \[Epub ahead of print\].](#)
87. Martínez-Beamonte, R. *et al.* (2021) Dietary Avian Proteins Are Comparable to Soybean Proteins on the Atherosclerosis Development and Fatty Liver Disease in *ApoE*-Deficient Mice [Nutrients. 13 \(6\): 1838.](#)
88. Colombo, A.V. *et al.* (2021) Microbiota-derived short chain fatty acids modulate microglia and promote A β plaque deposition. [Elife. 10:e59826.](#)
89. Ilyas, G. *et al.* (2019) Decreased Macrophage Autophagy Promotes Liver Injury and Inflammation from Alcohol. [Alcohol Clin Exp Res. 43 \(7\): 1403-13.](#)
90. Riester, K. *et al.* (2020) *In vivo*. characterization of functional states of cortical microglia during peripheral inflammation. [Brain Behav Immun. 87: 243-55.](#)
91. Yuan, C. *et al.* (2018) Human Aldose Reductase Expression Prevents Atherosclerosis Regression in Diabetic Mice. [Diabetes. 67 \(9\): 1880-91.](#)
92. Johnson, T.B. *et al.* (2019) Changes in motor behavior, neuropathology, and gut microbiota of a Batten disease mouse model following administration of acidified drinking water. [Sci Rep. 9 \(1\): 14962.](#)
93. Kaji, N. *et al.* (2018) Disruption of the pacemaker activity of interstitial cells of Cajal via nitric oxide contributes to postoperative ileus. [Neurogastroenterol Motil. Mar 15 \[Epub ahead of print\].](#)
94. Soto, I. *et al.* (2016) *Meox2* haploinsufficiency increases neuronal cell loss in a mouse model of Alzheimer's disease. [Neurobiol Aging. 42: 50-60.](#)

95. Wagner, M. *et al.* (2019) Clinical improvement and enhanced collateral vessel growth after xenogenic monocyte transplantation. [Am J Transl Res. 11 \(7\): 4063-76.](#)
96. Zhang, Y. *et al.* (2019) Angiotensin II deteriorates advanced atherosclerosis by promoting MerTK cleavage and impairing efferocytosis through the AT₁R/ROS/p38 MAPK/ADAM17 pathway. [Am J Physiol Cell Physiol. 317 \(4\): C776-C787.](#)
97. Guo, S.D. *et al.* (2019) Nasal delivery of Fasudil-modified immune cells exhibits therapeutic potential in experimental autoimmune encephalomyelitis. [CNS Neurosci Ther. 25 \(6\): 783-95.](#)
98. Säälik, P. *et al.* (2019) Peptide-guided nanoparticles for glioblastoma targeting. [J Control Release. 308: 109-18.](#)
99. Welc, S.S. *et al.* (2019) Targeting a therapeutic LIF transgene to muscle via the immune system ameliorates muscular dystrophy. [Nat Commun. 10 \(1\): 2788.](#)
100. Matsumoto, K. *et al.* (2021) Juvenile social defeat stress exposure favors in later onset of irritable bowel syndrome-like symptoms in male mice. [Sci Rep. 11 \(1\): 16276.](#)
101. Martínez-Beamonte, R. *et al.* (2021) Dietary Avian Proteins Are Comparable to Soybean Proteins on the Atherosclerosis Development and Fatty Liver Disease in *ApoE*-Deficient Mice. [Nutrients. 13 \(6\):1838.](#)
102. Burgaz, S. *et al.* (2021) Neuroprotection with the Cannabidiol Quinone Derivative VCE-004.8 (EHP-101) against 6-Hydroxydopamine in Cell and Murine Models of Parkinson's Disease. [Molecules. 26 \(11\): 3245.](#)
103. Stachowicz, A. *et al.* (2021) Diminazene Aceturate Stabilizes Atherosclerotic Plaque and Attenuates Hepatic Steatosis in apoE-Knockout Mice by Influencing Macrophages Polarization and Taurine Biosynthesis. [Int J Mol Sci. 22 \(11\): 5861](#)
104. Park, G.T. *et al.* (2021) Echinochrome A Treatment Alleviates Fibrosis and Inflammation in Bleomycin-Induced Scleroderma. [Mar Drugs. 19 \(5\): 237.](#)
105. Götze, A.M. *et al.* (2020) IL10 Alters Peri-Collateral Macrophage Polarization and Hind-Limb Reperfusion in Mice after Femoral Artery Ligation. [Int J Mol Sci. 21 \(8\): 2821.](#)
106. Flores, I. *et al.* (2021) Myeloid cell-mediated targeting of LIF to dystrophic muscle causes transient increases in muscle fiber lesions by disrupting the recruitment and dispersion of macrophages in muscle. [Hum Mol Genet. Aug 14 \[Epub ahead of print\].](#)
107. Nakata, Y. *et al.* (2021) Role of podoplanin and Kupffer cells in liver injury after ischemia-reperfusion in mice. [Surg Today. Sep 26 \[Epub ahead of print\].](#)
108. Cheah, F.C. *et al.* (2021) Studying the Effects of Granulocyte-Macrophage Colony-Stimulating Factor on Fetal Lung Macrophages During the Perinatal Period Using the Mouse Model. [Front Pediatr. 9: 614209.](#)
109. Dorighello, G.G. *et al.* (2021) Mild Mitochondrial Uncoupling Decreases Experimental Atherosclerosis, A Proof of Concept. [J Atheroscler Thromb. Jun 04 \[Epub ahead of print\].](#)
110. Wiśniewska, A. *et al.* (2021) Inhibition of Atherosclerosis and Liver Steatosis by Agmatine in Western Diet-Fed apoE-Knockout Mice Is Associated with Decrease in Hepatic *De Novo* Lipogenesis and Reduction in Plasma Triglyceride/High-Density Lipoprotein Cholesterol Ratio. [Int J Mol Sci.22 \(19\): 10688.](#)
111. Bourel, J. *et al.* (2021) Complement C3 mediates early hippocampal neurodegeneration and memory impairment in experimental multiple sclerosis [Neurobiology of Disease. 160: 105533.](#)
112. Freeley, S.J. *et al.* (2021) The lectin pathway does not contribute to glomerular injury in the nephrotoxic nephritis model. [Nephrology \(Carlton\). Oct 21 \[Epub ahead of print\].](#)
113. Schippers, M. *et al.* (2020) Phosphate Groups in the Lipid A Moiety Determine the

- Effects of LPS on Hepatic Stellate Cells: A Role for LPS-Dephosphorylating Activity in Liver Fibrosis. [Cells. 9 \(12\): 2708.](#)
114. Härdtner, C. *et al.* (2020) Inhibition of macrophage proliferation dominates plaque regression in response to cholesterol lowering. [Basic Res Cardiol. 115 \(6\): 78.](#)
115. Yeo, K.P. *et al.* (2020) Efficient aortic lymphatic drainage is necessary for atherosclerosis regression induced by ezetimibe. [Sci Adv. 6 \(50\): eabc2697.](#)
116. Perez-Canamas, A. *et al.* (2021) Fronto-temporal dementia risk gene *TMEM106B* has opposing effects in different lysosomal storage disorders. [Brain Commun. 3 \(1\): fcaa200.](#)
117. Stavropoulos, F. *et al.* (2021) Aberrant Mitochondrial Dynamics and Exacerbated Response to Neuroinflammation in a Novel Mouse Model of CMT2A. [Int J Mol Sci. 22 \(21\): 11569.](#)
118. Tang, X. *et al.* (2021) Aloe-emodin derivative produces anti-atherosclerosis effect by reinforcing AMBRA1-mediated endothelial autophagy. [Eur J Pharmacol.2021 Nov 17 : 174641.](#)
119. Gómez-Almería, M. *et al.* (2021) BiP Heterozygosity Aggravates Pathological Deterioration in Experimental Amyotrophic Lateral Sclerosis. [Int J Mol Sci. 22\(22\):12533.](#)
120. Xiong, L. *et al.* (2021) Inflammation-dependent oxidative stress metabolites as a hallmark of amyotrophic lateral sclerosis. [Free Radic Biol Med. 178: 125-33.](#)
121. Merlin, J. *et al.* (2021) Non-canonical glutamine transamination sustains efferocytosis by coupling redox buffering to oxidative phosphorylation. [Nat Metab. 3 \(10\): 1313-26.](#)
122. Gratuze, M. *et al.* (2021) Activated microglia mitigate A β -associated tau seeding and spreading. [J Exp Med. 218\(8\):e20210542.](#)
123. Palandri, A. *et al.* (2022) Ablation of arginyl-tRNA-protein transferase in oligodendrocytes impairs central nervous system myelination. [Glia. 70 \(2\): 303-20.](#)
124. Rothe, R. *et al.* (2021) A modular, injectable, non-covalently assembled hydrogel system features widescale tunable degradability for controlled release and tissue integration. [Biomaterials. 269: 120637.](#)
125. Lee, H.J. *et al.* (2022) Effects of electroacupuncture on the functionality of NG2-expressing cells in perilesional brain tissue of mice following ischemic stroke [Neural Regeneration Research. 17 \(7\): 1556.](#)
126. Venturino, A. & Siegert, S. (2021) Minimally invasive protocols and quantification for microglia-mediated perineuronal net disassembly in mouse brain [STAR Protocols. 2 \(4\): 101012.](#)
127. Bonaterra, G.A. *et al.* (2021) Characterization of atherosclerotic plaques in blood vessels with low oxygenated blood and blood pressure (Pulmonary trunk): role of growth differentiation factor-15 (GDF-15) [BMC Cardiovascular Disorders. 21: 601.](#)
128. van Gemst, J.J. *et al.* (2021) Blocking of inflammatory heparan sulfate domains by specific antibodies is not protective in experimental glomerulonephritis. [PLoS One. 16 \(12\): e0261722.](#)
129. Burgaz, S. *et al.* (2021) Preclinical Investigation in Neuroprotective Effects of the GPR55 Ligand VCE-006.1 in Experimental Models of Parkinson's Disease and Amyotrophic Lateral Sclerosis. [Molecules. 26 \(24\):7643.](#)
130. Jia, W. *et al.* (2022) MircoRNA-126-5p inhibits apoptosis of endothelial cell in vascular arterial walls via NF- κ B/PI3K/AKT/mTOR signaling pathway in atherosclerosis. [J Mol Histol. Jan 04 \[Epub ahead of print\].](#)
131. Luo, Y. *et al.* (2022) M1 macrophages impair tight junctions between endothelial cells

after spinal cord injury [Brain Research Bulletin. 04 Jan \[Epub ahead of print\]](#).
 132. Chute, M. *et al.* (2022) ADAM15 is required for optimal collagen cross-linking and scar formation following myocardial infarction [Matrix Biology. 05 Jan \[Epub ahead of print\]](#).
 133. He, D. *et al.* (2021) Disruption of the IL-33-ST2-AKT signaling axis impairs neurodevelopment by inhibiting microglial metabolic adaptation and phagocytic function. [Immunity. S1074-7613\(21\)00534-3](#).
 134. Xiong, L. *et al.* (2022) Inflammation-dependent oxidative stress metabolites as a hallmark of amyotrophic lateral sclerosis. [Free Radic Biol Med. 178: 125-3](#).

Storage This product is shipped at ambient temperature. It is recommended to aliquot and store at -20°C on receipt. When thawed, aliquot the sample as needed. Keep aliquots at 2-8°C for short term use (up to 4 weeks) and store the remaining aliquots at -20°C.

Avoid repeated freezing and thawing as this may denature the antibody. Storage in frost-free freezers is not recommended.

Guarantee 12 months from date of despatch

Health And Safety Information Material Safety Datasheet documentation #10040 available at: 10040: <https://www.bio-rad-antibodies.com/uploads/MSDS/10040.pdf>

Regulatory For research purposes only

Related Products

Recommended Secondary Antibodies

Goat Anti Rat IgG (STAR69...)	FITC
Goat Anti Rat IgG (STAR73...)	RPE
Rabbit Anti Rat IgG (STAR16...)	DyLight@800
Rabbit Anti Rat IgG (STAR21...)	HRP
Rabbit Anti Rat IgG (STAR17...)	FITC
Goat Anti Rat IgG (STAR131...)	Alk. Phos. , Biotin
Goat Anti Rat IgG (STAR72...)	HRP
Goat Anti Rat IgG (MOUSE ADSORBED) (STAR71...)	DyLight@650 , DyLight@800

Recommended Negative Controls

[RAT IgG2a NEGATIVE CONTROL \(MCA1212\)](#)

Recommended Useful Reagents

[ANTIGEN RETRIEVAL BUFFER, pH8.0 \(BUF025A\)](#)
[100x ANTIGEN RETRIEVAL BUFFER, pH8.0 \(BUF025C\)](#)
[LEUCOPERM \(BUF09\)](#)

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