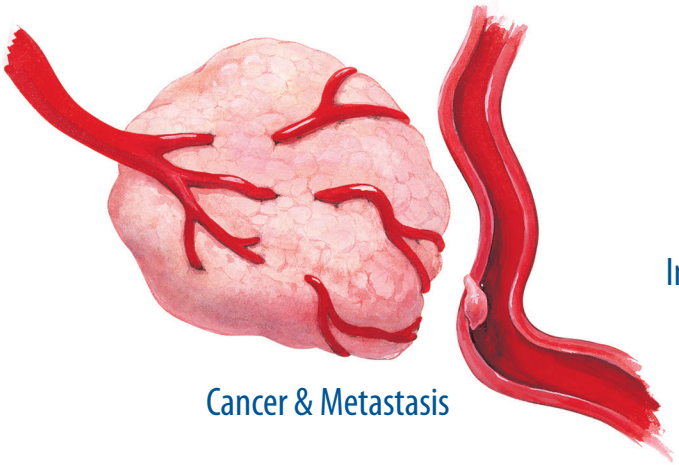
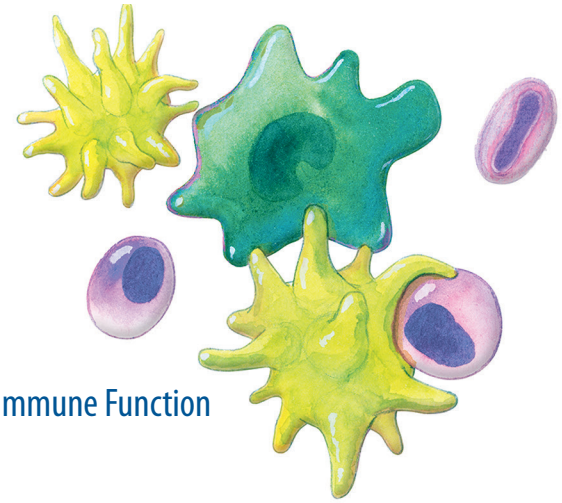
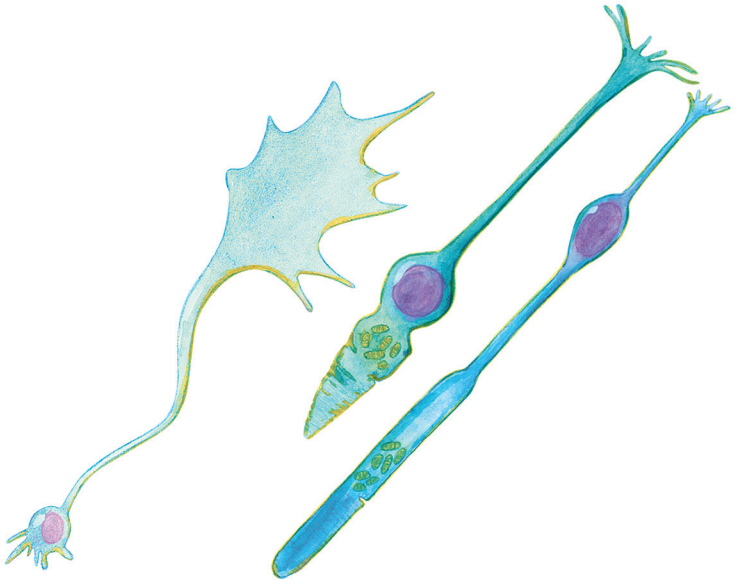
Products for Semaphorin Research



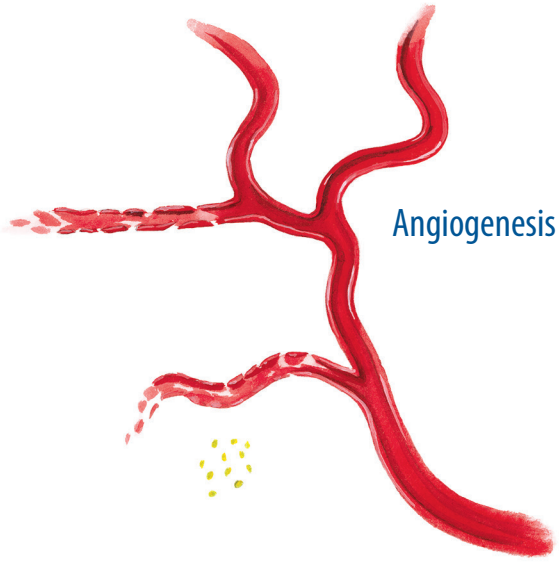
Cancer & Metastasis



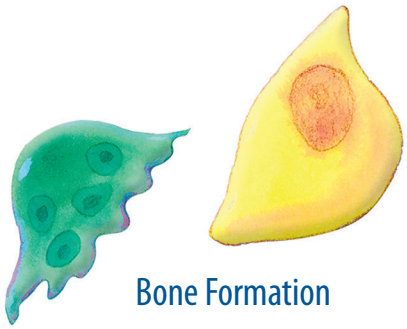
Immune Function



Axon Guidance
& Photoreceptor Development



Angiogenesis



Bone Formation

R&D SYSTEMS®

Semaphorins, Plexins, Neuropilins, & Related Molecules

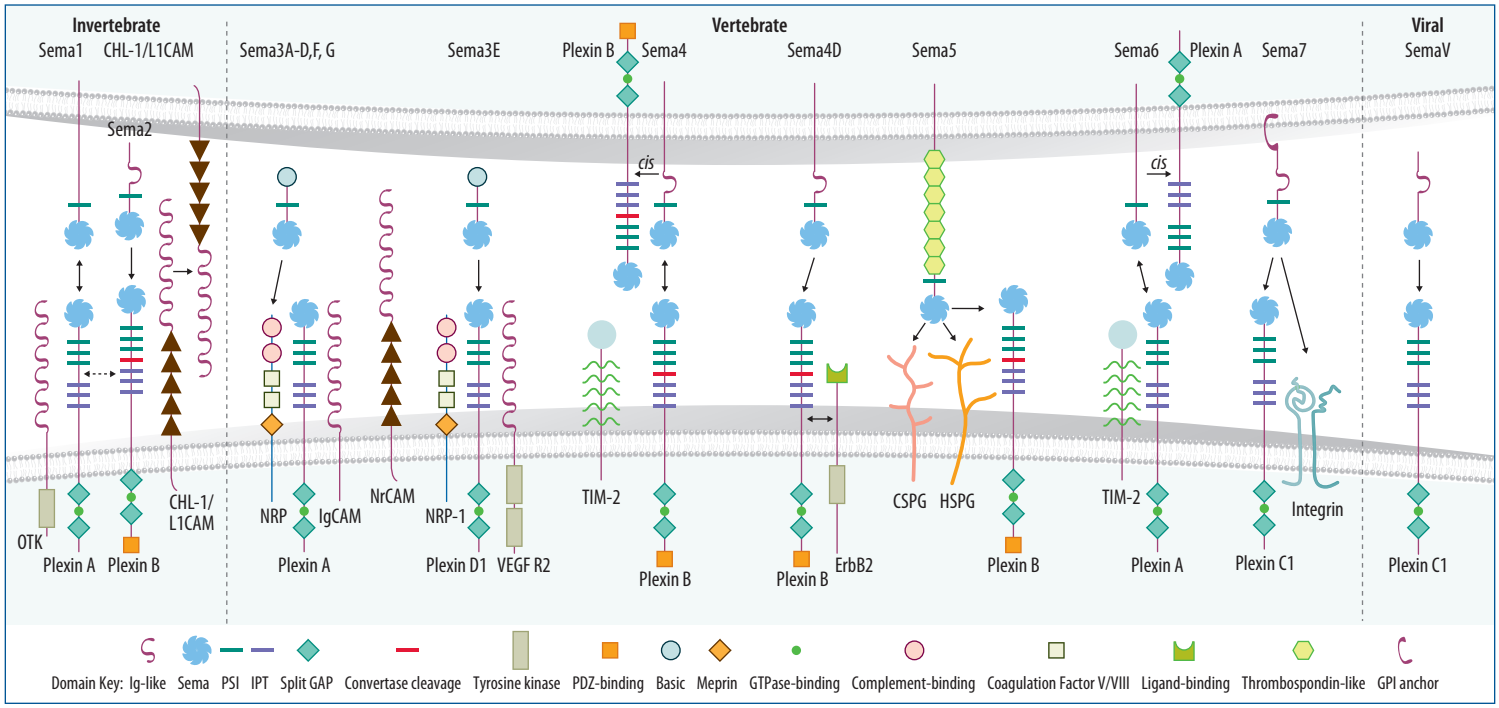
Initially characterized as axon guidance cues, Semaphorins have since been shown to mediate a wide range of biological activities including lymphocyte activation, photoreceptor development and survival, angiogenesis, bone remodeling, cell migration, oncogenesis, and phototransduction.[1-5] Given the broad scope of biological activities, it is not surprising that defects in Semaphorin activity have been implicated in a number of pathological conditions including retinal degeneration, oncogenesis, and neurodegenerative disorders.[6,7]

Semaphorins are an evolutionarily conserved family of secreted and membrane-associated proteins that have been divided into eight subclasses based on sequence and structural similarity. Class 1 and 2 Semaphorins are expressed in invertebrates, Class 3-7 are expressed in vertebrates, and the eighth class, referred to as Class V, includes Semaphorins that are expressed in viruses.[8] Although most Semaphorins share less than 50% amino acid identity, all contain a conserved extracellular domain of approximately 500 amino acids known as the Semaphorin (sema) domain. The sema domain contains several highly conserved cysteine residues and a beta propeller structural motif that is found in other multi-functional proteins such as Integrins.[9]

The diverse biological activities mediated by Semaphorins can be attributed to differences in their expression patterns, receptor binding and mechanisms of signal transduction. Secreted Semaphorins (Classes 2, 3, and V) serve as ligands to elicit biological responses, while membrane-associated Semaphorins (Classes 1, 4, 6, and 7) not only serve as ligands, but also as receptors capable of mediating reverse signaling. Several receptors, co-receptors, and receptor binding partners have been identified, but Plexins and Neuropilins act as the primary Semaphorin receptors.[10] Plexins are divided into four subclasses and enable Semaphorins to exert pleiotropic effects by associating with a variety of co-receptors.[11] While most membrane-bound Semaphorins directly bind to Plexins, Class 3 Semaphorins, with the exception of Sema3E, require Neuropilins as obligate co-receptors. Neuropilins act as the ligand binding domain of the holoreceptor and may facilitate signal transduction by stimulating a conformational change in Plexin.[12] Given their wide range of activities, it is likely that more receptors and co-receptors that mediate Semaphorin activity will be identified.

References

1. Sabag, A.D. *et al.* (2012) PLoS One **7**:e42912.
2. Toyofuku, T. *et al.* (2012) Genes Dev. **26**:816.
3. Fukuda, T. *et al.* (2013) Nature *in press*.
4. Takamatsu, H. & A. Kumanogoh (2012) Trends Immunol. **33**:127.
5. Sakurai, A. *et al.* (2012) Cell Res. **22**:23.
6. Nojima, S. *et al.* (2013) Nat. Commun. **4**:1406.
7. Neufeld, G. *et al.* (2012) Cold Spring Harb. Perspect. Med. **2**:a006718.
8. Goodman, C.S. *et al.* (1999) Cell **97**:551.
9. Love, C.A. *et al.* (2003) Nat. Struct. Biol. **10**:843.
10. Sharma, A. *et al.* (2012) Front. Cell Neurosci. **6**:28.
11. Tamagnone, L. *et al.* (1999) Cell **99**:71.
12. Zhou, Y. *et al.* (2008) Cell **33**:161.

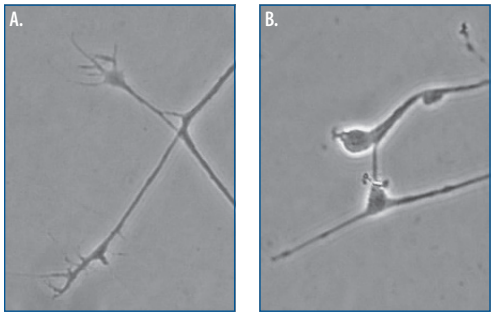


Semaphorin Classification, Domain Structure, and Receptor Interactions. Semaphorins signal via specific receptors and are dependent on a variety of co-receptor molecules.

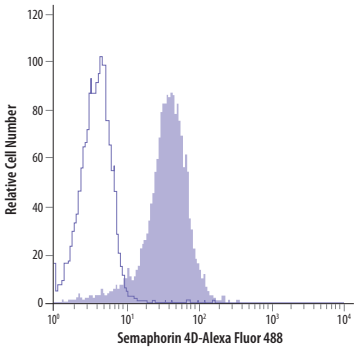
R&D Systems Products for Semaphorins, Plexins, Neuropilins, & Related Molecules

MOLECULE	RECOMBINANT & NATURAL PROTEINS	ANTIBODIES	ELISAs
Semaphorins			
Semaphorin 3A	H	H (FC, WB) M (FC)	
Semaphorin 3B	M		
Semaphorin 3C	H M	H (ICC, WB) M (ICC, IHC, WB)	
Semaphorin 3E	H M	H (FC, ICC, IHC, WB) M (ICC, IHC, WB)	H
Semaphorin 3F	M	H (WB) M (IHC, WB)	
Semaphorin 4A	H	H (FC, IHC, WB)	
Semaphorin 4B		H (FC, WB) M (WB)	
Semaphorin 4C		H (IHC, WB) M (ICC, IHC, WB)	
Semaphorin 4D/CD100	H M	H (FC, ICC, WB) M (FC, IHC, WB)	
Semaphorin 4F	M	M (FC, IHC, WB)	
Semaphorin 4G	H	H (IHC, WB) M (IHC, WB)	
Semaphorin 5A	H M	H (ICC, IHC, WB) M (ICC, IHC, WB) R (ICC, IHC, WB)	
Semaphorin 5B	H M		
Semaphorin 6A	H	H (FC, IHC, WB) M (IHC, WB)	
Semaphorin 6B	H	H (IHC, WB) M (IHC, WB)	
Semaphorin 6C	H M	H (WB) M (IHC, WB)	
Semaphorin 6D	H M	H (FC, WB)	
Semaphorin 7A	H M	H (FC, WB) M (WB)	
Plexins			
Plexin A1	M	H (ICC, WB) M (FC, ICC, IHC, WB)	
Plexin A2	M	H (FC, ICC, WB) M (FC, ICC, WB) R (FC, ICC, WB)	
Plexin A3		M (IHC, WB) R (IHC, WB)	
Plexin A4	H	H (FC, WB) M (WB) R (WB)	
Plexin B1		H (FC, IHC, WB)	
Plexin B2	H M	H (FC, IHC, WB) M (FC, IHC, WB)	
Plexin B3	H	H (WB) M (FC, IHC, WB) R (FC, IHC, WB)	
Plexin C1	H M	H (FC, IHC, WB) M (FC, IHC, WB)	
Plexin D1	H	H (FC, IHC, WB)	
TEM7/PLXDC1		H (WB)	
Neuropilins			
Neuropilin-1	H M R	H (B/N, FC, IHC, WB) M (B/N, FC, IHC, WB) R (B/N, FC, IHC, WB)	
Neuropilin-2	H R	H (B/N, FC, IHC, WB) M (B/N, WB) R (B/N, FC, WB)	
Other Semaphorin-related Molecules			
CD45	H M	H (FC, ICC) M (FA, FC, ICC, IHC, IP, WB)	
CD72	H	H (WB) M (ICC, WB)	
DCBLD2/ESDN	H	H (FC, WB) M (FC, WB)	
ErbB2/Her2	H	H (B/N, ELISA, FC, ICC, IHC, WB) M (FC, IHC, WB)	H
HGF	H M Ca	H (B/N, ELISA, IHC, WB) M (ELISA, IHC, WB) Ca (WB)	H M R
Integrin $\alpha 1\beta 1$	H		
L1CAM	H M	H (IHC, WB) M (FC)	
NrCAM	H	H (ELISA, IHC, WB)	H
TIM-2	M	M (WB)	
TREM-2	H M	H (FC, ICC, WB) M (FC, ICC, WB)	
VEGF R2/KDR/Flk-1	H M	H (B/N, ELISA, FC, ICC, IHC, WB) M (B/N, ELISA, FC, ICC, IHC, WB)	H M

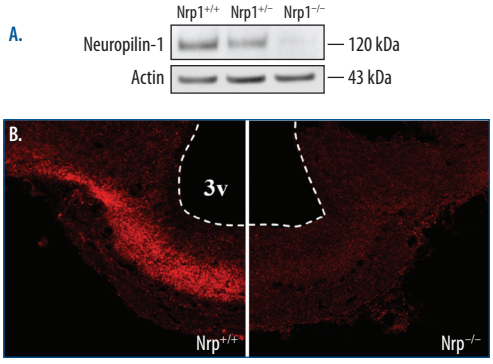
Species Key: **H** Human **M** Mouse **R** Rat **Ca** Canine
Application Key: **B/N** Blocking/Neutralization **ChIP** Chromatin Immunoprecipitation **ELISA** ELISA Capture and/or Detection **FC** Flow Cytometry **ICC** Immunocytochemistry **IHC** Immunohistochemistry **IP** Immunoprecipitation **WB** Western blot



Semaphorin 3A-induced Growth Cone Collapse. A fully extended chick dorsal root ganglion growth cone in the presence of Recombinant Human β-NGF (Catalog # 256-GF) was untreated (**A**) or treated with Recombinant Human Semaphorin 3A (Catalog # 1250-S3; **B**). Treatment with Recombinant Human Semaphorin 3A induced growth cone collapse.



Detection of Semaphorin 4D by Flow Cytometry. The Jurkat human acute T cell leukemia cell line was stained with an Alexa Fluor™ 488-conjugated Mouse Anti-Human Semaphorin 4D Monoclonal Antibody (Catalog # FAB74701G; filled histogram) or an Alexa Fluor 488-conjugated Mouse IgG_1 Isotype Control Antibody (Clone 11711) (Catalog # IC002G; open histogram).



Detection of Neuropilin-1 by Western Blot and Immunohistofluorescence. A. Western blot shows lysates of mouse hypothalamus. The membrane was probed with a Goat Anti-Mouse/Rat Neuropilin-1 Antigen Affinity-purified Polyclonal Antibody (Catalog # AF566) followed by a HRP-conjugated Anti-Goat Secondary Antibody. Neuropilin-1 was detected in lysates from mice homozygous for wild-type Nrp1 ($Nrp1^{+/+}$) as well as heterozygous mice expressing one functional copy of Nrp1 ($Nrp1^{+/-}$). Neuropilin-1 was not detected in mice that are homozygous for non-functional Nrp1 ($Nrp1^{-/-}$). Actin is shown as a loading control. **B.** Neuropilin-1 was detected in immersion-fixed frozen sections of mouse brain using a Goat Anti-Mouse/Rat Neuropilin-1 Antigen Affinity-purified Polyclonal Antibody (Catalog # AF566). The tissue was stained with an Alexa Fluor 568-conjugated Anti-Goat secondary developing reagent (red). Neuropilin-1 immunoreactivity was detected in the median eminence of Nrp1 ($Nrp1^{+/+}$) mice. *Adapted from: Hanchate, N.K. (2012) PLoS Genet. 8:e1002896.*

Explore Additional Data Examples & Product Information at:
RnDSystems.com/Semaphorins

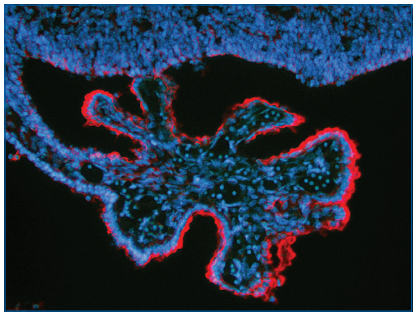
R&D Systems, Inc.
614 McKinley Place NE
Minneapolis, MN 55413
TEL: (800) 343-7475
(612) 379-2956
FAX: (612) 656-4400
RnDSystems.com

PRSRT STD
U.S. POSTAGE
PAID
R&D SYSTEMS

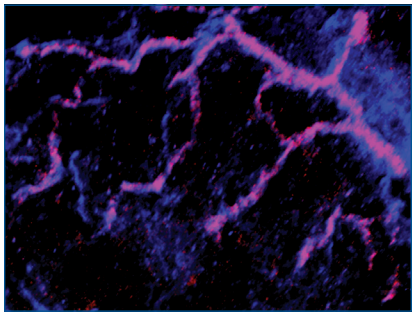
Change Service Requested

MA_Semaphorins_644

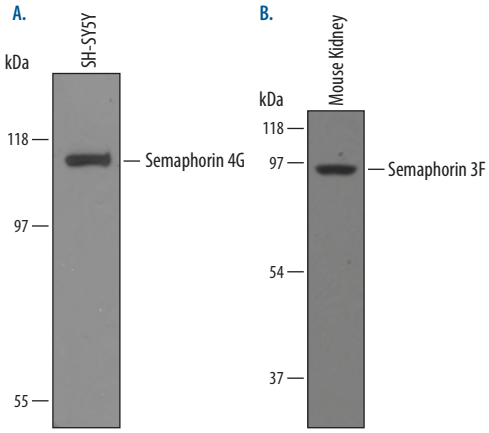
Expect Publication Quality Data from R&D Systems Premium Quality Products



Plexin B2 in Mouse Choroid Plexus. Plexin B2 was detected in perfusion-fixed frozen sections of mouse choroid plexus using a Sheep Anti-Human Plexin B2 Antigen Affinity-purified Polyclonal Antibody (Catalog # AF5329). The tissue was stained with the NorthernLights™ 557-conjugated Donkey Anti-Sheep IgG Secondary Antibody (Catalog # NL010; red) and counterstained with DAPI (blue). Specific immunoreactivity was localized to epithelial cells in choroid plexus.



Neuropilin-2 in Mouse Embryonic Testis. Neuropilin-2 was detected in immersion-fixed sections of embryonic mouse (18.5 dpc) testis using a Goat Anti-Human Neuropilin-2 Antigen Affinity-purified Polyclonal Antibody (Catalog # AF2215). The tissue was stained with Alexa Fluor 596-conjugated Anti-Goat Secondary Antibody (red). Neuropilin-2 immunoreactivity was localized to lymphatic vessels of the testis and co-localized with Prospero-related Homeobox 1 (Prox1; blue), a marker of lymphatic endothelial cells. *Adapted from: Svingen, T. (2012) PLoS One 7:e52620.*



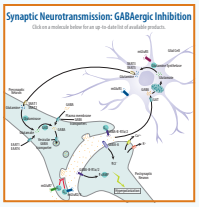
Detection of Semaphorin 4G and Semaphorin 3F by Western Blot. Western blots show lysates of the SH-SY5Y human neuroblastoma cell line and mouse kidney tissue. **A.** The PVDF membrane was probed with a Sheep Anti-Human Semaphorin 4G Antigen Affinity-Purified Polyclonal Antibody (Catalog #AF5840) followed by HRP-conjugated Donkey Anti-Sheep IgG Secondary Antibody (Catalog # HAF016). **B.** The PVDF membrane was probed with a Sheep Anti-Human/Mouse Semaphorin 3F Antigen Affinity-Purified Polyclonal Antibody (Catalog # AF3237) followed by HRP-conjugated Donkey Anti-Sheep IgG Secondary Antibody (Catalog # HAF016). Semaphorin 4G and Semaphorin 3F were detected at 115 kDa and 97 kDa, respectively (as indicated).

R&D Systems is excited to now offer Interactive Pathways & Processes.

Our fully-interactive pathways allow you to explore multiple biological processes, including Synaptic Neurotransmission and Inflammasome Activation pathways. Check back frequently to browse the pathway list for new additions or to revisit your favorite pathways for product updates.

Features

- ✓ Designed by scientists for scientists
  View signaling cascades or processes individually, according to your topic of interest.
- ✓ One click to access the widest collection of products
  Molecules in the pathways are linked to the most referenced collection of bioactive proteins and immunoassays, more than 12,000 premium antibodies, multiplexing assays for a variety of detection platforms, and small molecules for pharmacology.
- ✓ Request your free printed copy, which includes additional resources
  Great for use as a quick reference guide in the lab.



Start Exploring Now!
RnDSystems.com/Pathways