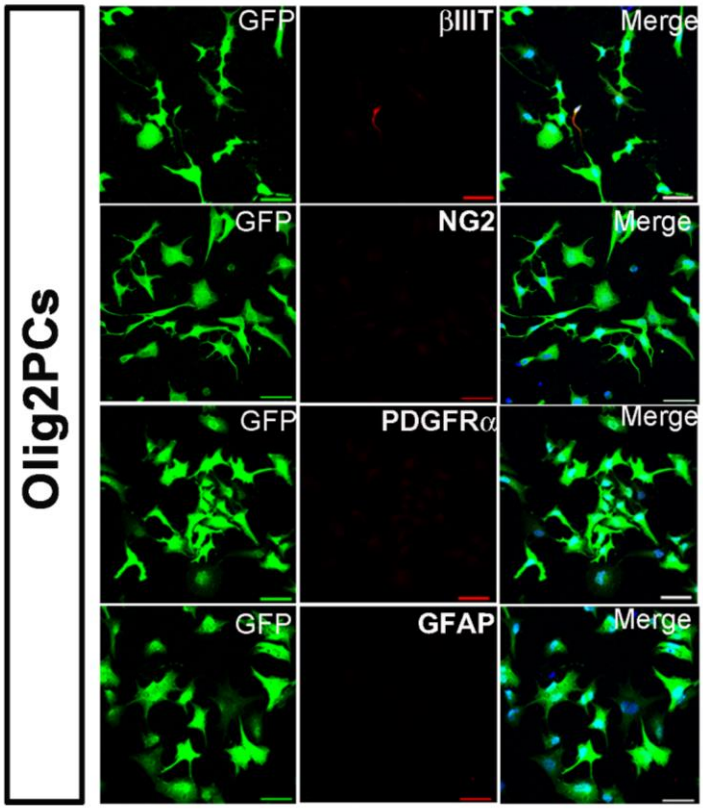
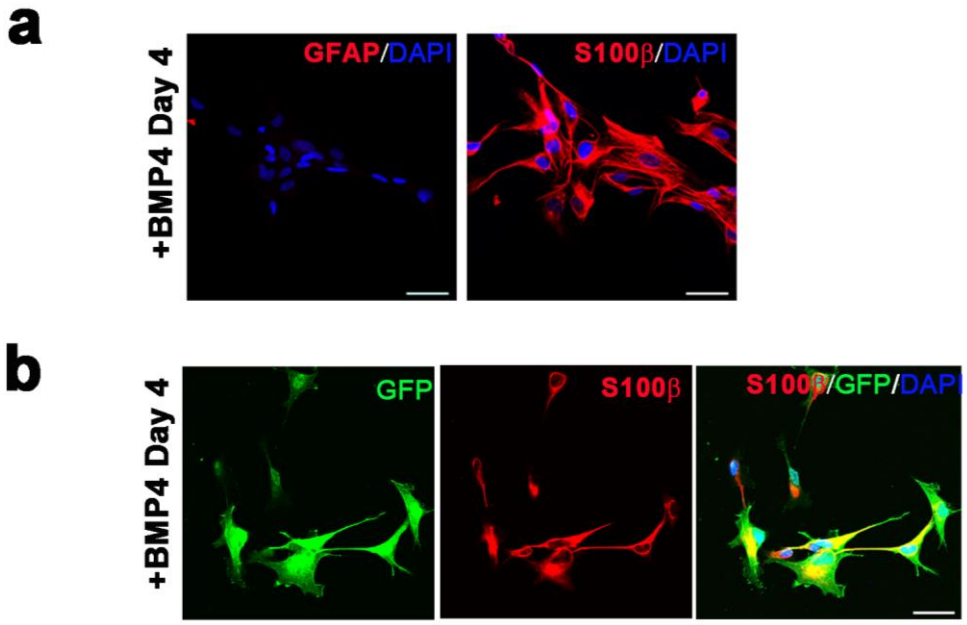
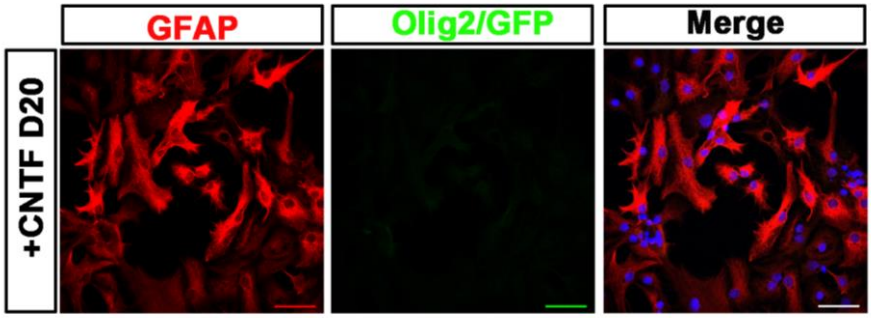


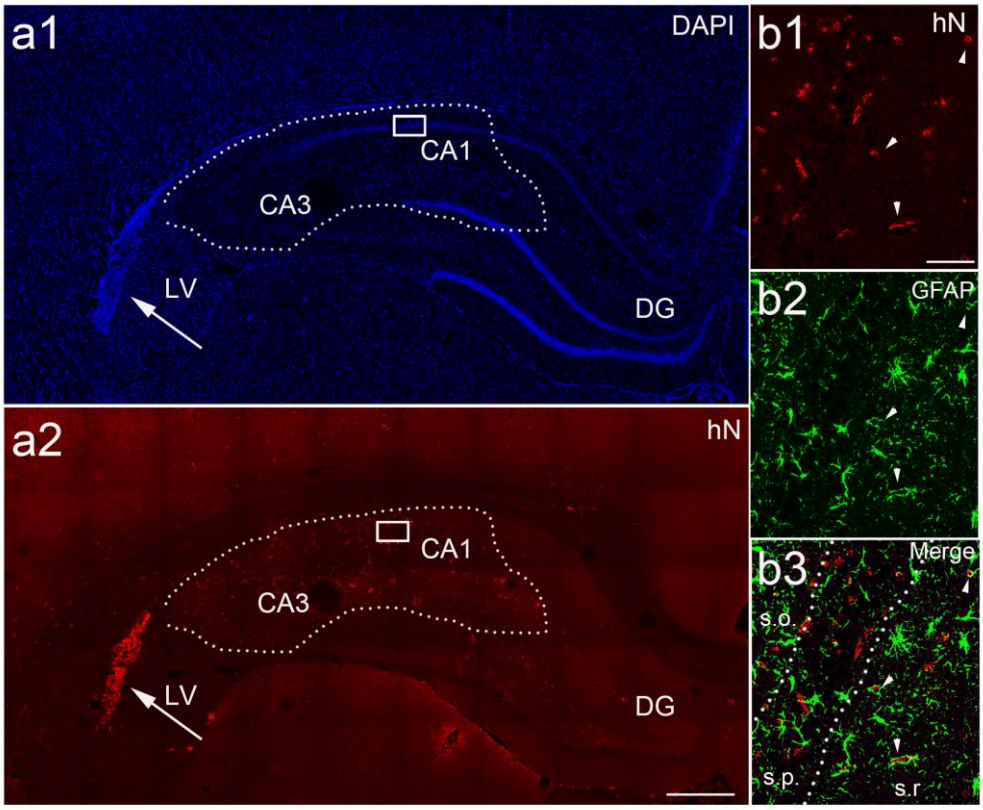
Supplementary Fig S1. The marker expression of Olig2PCs. Representatives showing that, 2 days after FACS purification, Olig2PCs are negative for GFAP and PDGFRα staining. Very few neurons are identified by βIII-tubulin staining. Blue, DAPI-stained nuclei. Scale bars represent 50 μm.



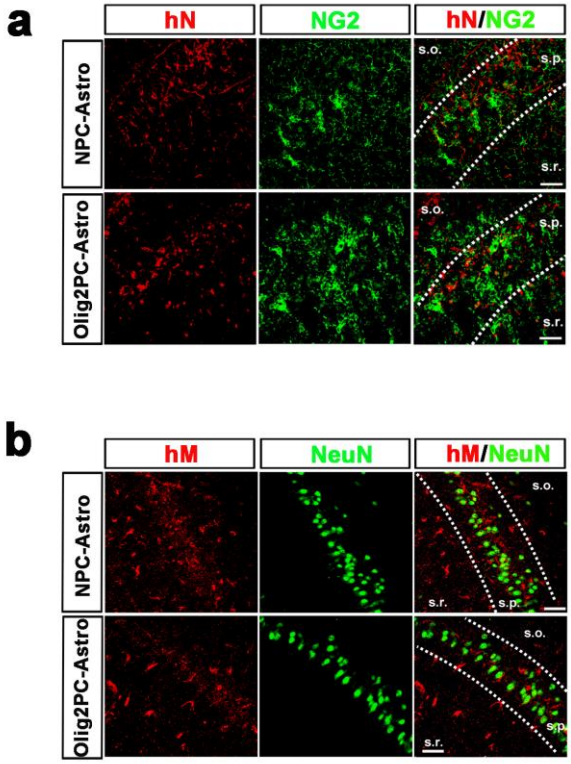
Supplementary Fig S2. BMP4-induced differentiation of Olig2PCs to astroglia. Representatives showing that, cultured in the presence of BMP4 for 4 days, Olig2PCs start to express S100β but not GFAP (a). At this time point, GFP expression can be highlighted using anti-GFP staining and GFP staining overlaps with S100β staining (b). Blue, DAPI-stained nuclei. Scale bars represent 50 μm.



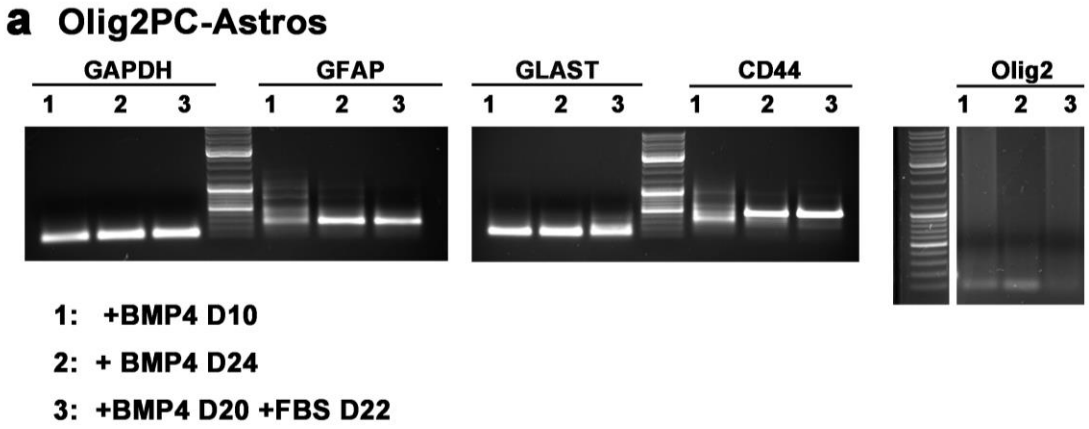
Supplementary Fig S3. CNTF-induced differentiation of Olig2PCs to astroglia. Representatives showing that Olig2PCs can be induced to GFAP$^+$ astroglial cells after cultured in the presence of CNTF for 20 days and these astroglial cells do not express Olig2, as indicated by the absence of the GFP fluorescence. Blue, DAPI-stained nuclei. Scale bars represent 50 μm.

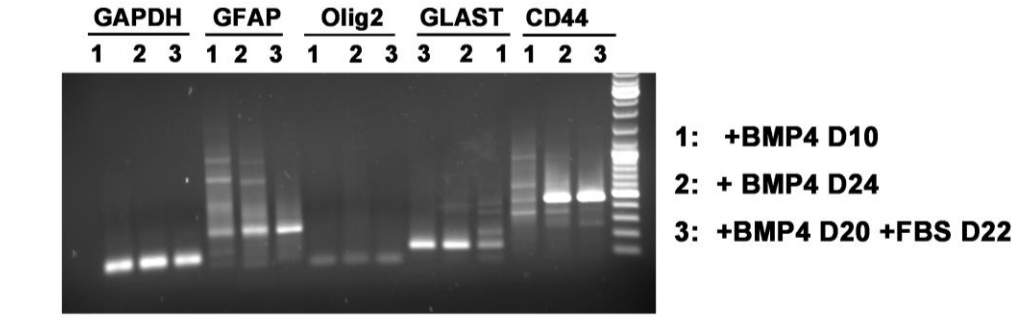


Supplementary Fig S4. Transplantation of NPC-Astros. DAPI (a1) and hN (a2) staining showing that there were many transplanted NPC-Astros in the LV (arrows) and the hippocampal CA1 and CA3 regions (dotted lines). Scar bar in a2 represent 100 μm. The squared area was enlarged in b1-3. The transplanted NPC-Astros migrate into the hippocampal CA1 region (b1, hN; b2, GFAP). Arrowheads in b3 indicate the cells double labeled with hN and GFAP. Scar bar in b1 represents 50 μm.



Supplementary Fig S5. Transplanted astroglia do not generate neurons and OPCs. Representatives showing that Olig2PC-Astros and NPC-Astros labeled by hN or hM do not express OPC marker NG2 (a) and neuronal marker NeuN (b) after transplantation. Scale bars represent 20 μm.





Supplementary Fig S6. Full gel images of RT-PCR results shown in Fig 1j and 2h.

Supplementary Table S1. Gene transcripts encoding secreted factors in Olig2PC-Astros relative to NPC-Astros

Gene Symbol	RefSeq	Fold Change (Olig2PC-Astros over NPC-Astros)	Published associations with neuroprotective effects	Definition
IL6	NM_000600.1	21.15	Hama, 1991-PMID 2027469[55] Toulmond, 1992-PMID 1331914[56] Loddick, 1998-PMID 9469160[57]	interleukin 6 (interferon, beta 2)
NTS	NM_006183.3	14.51	Torup 2003-PMID 14623134[58]	neurotensin
CX3CL1	NM_002996.3	13.36	Cipriani, 2011-PMID 22072684[59]	chemokine (C-X3-C motif) ligand 1
FGF13	NM_004114.2	9.86	Yao, 1999-PMID 9914447[60]	fibroblast growth factor 13, transcript variant 1A.
PDGFA	NM_033023.3	7.56	Andrae, 2008-PMID 18483217[61]	platelet-derived growth factor alpha polypeptide, transcript variant 2
NOG	NM_005450.2	5.61	Samanta, 2010-PMID 20019326[62]	noggin
TNFSF15	NM_005118.2	4.13		tumor necrosis factor (ligand) superfamily, member 15
IL6ST	NM_002184.2	3.59		interleukin 6 signal transducer (gp130, oncostatin M receptor) , transcript variant 1
CXCL1	NM_001511.1	3.25	Omari, 2009-PMID 19095949[63]	chemokine (C-X-C motif) ligand 1 (melanoma growth stimulating activity, alpha)
CXCL6	NM_002993.2	2.95		chemokine (C-X-C motif) ligand 6 (granulocyte chemotactic protein 2)
THBS1	NM_003246.2	2.88	Liauw, 2008-PMID 18594557[64]	thrombospondin 1

TGFB2	NM_003238.1	2.85	Dobolyi, 2012-PMID 22942700[65]	transforming growth factor, beta 2
CTGF	NM_001901.1	2.76		connective tissue growth factor
EDN1	NM_001955.2	2.66	Paczkowska 2013-PMID 23290569[66]	endothelin 1
WNT3	NM_030753.4	2.40	Toledo, 2008-PMID 18786602[67]	wingless-type MMTV integration site family, member 3
PDGFD	NM_025208.4	2.38		platelet derived growth factor D, transcript variant 1
BMP1	NM_006131.1	2.22		bone morphogenetic protein 1, transcript variant BMP1-5
BMP4	NM_001202.2	2.17		bone morphogenetic protein 4 , transcript variant 3
CXCL16	NM_022059.1	2.04	Rosito, 2012-PMID 22378888[68]	chemokine (C-X-C motif) ligand 16
VEGFC	NM_005429.2	2.03	Sun, 2003-PMID 12813020[69]	vascular endothelial growth factor C
BMP2	NM_001200.1	2.03		bone morphogenetic protein 2
JAG1	NM_000214.1	1.97	Kamei, 2012-PMID 22452482[70]	jagged 1 (Alagille syndrome)
BDNF	NM_170733.2	1.79	Hetman, 1999-PMID 10428835[71]	brain-derived neurotrophic factor, transcript variant 5
FGF18	NM_003862.1	1.67	Ellsworth, 2003-PMID 12738892[72]	fibroblast growth factor 18
PDGFC	NM_016205.1	1.65	Su, 2008-PMID 18568034[73]	platelet derived growth factor C
FGF11	NM_004112.2	1.65		fibroblast growth factor 11
GPC4	NM_001448.2	1.57		Glypican 4

EDN3	NM_207034.1	1.52		endothelin 3, transcript variant 2
BMP8B	NM_001720.3	1.46		bone morphogenetic protein 8b
FGF5	NM_004464.3	1.43		fibroblast growth factor 5, transcript variant 1
GPC6	NM_005708.2	1.43		Glypican 6
TGFBRAP1	NM_004257.3	1.39		transforming growth factor, beta receptor associated protein 1
TGFB3	NM_003239.1	1.35		transforming growth factor, beta 3
FGF2	NM_002006.3	1.26	Alzheimer, 2002-PMID 12575827[74]	fibroblast growth factor 2 (basic)
VEGFB	XM_938483.1	1.16	Sun, 2004-PMID 15529014[75]	vascular endothelial growth factor B
PTN	NM_002825.5	0.82	Kadomatsu, 2004-PMID 15013213[76]	pleiotrophin
TNFSF12	NM_003809.2	0.75	Tansey and Szymkowski, 2009 -PMID 19837186[77]	tumor necrosis factor (ligand) superfamily, member 12
TNFSF14	NM_172014.1	0.75	Tansey and Szymkowski, 2009 -PMID 19837186[77]	tumor necrosis factor (ligand) superfamily, member 14 (TNFSF14), transcript variant 2
DKK1	NM_012242.2	0.73	Zhang, 2008-PMID 18716201[78]	dickkopf homolog 1 (Xenopus laevis)
FSTL3	NM_005860.1	0.72		follistatin-like 3 (secreted glycoprotein)
TNFSF13B	NM_006573.3	0.71	Tansey and Szymkowski, 2009 -PMID 19837186[77]	tumor necrosis factor (ligand) superfamily,

				member 13b, transcript variant 1
TNFSF18	NM_005092.2	0.70	Tansey and Szymkowski, 2009 -PMID 19837186[77]	tumor necrosis factor (ligand) superfamily, member 18
FST	NM_006350.2	0.66	Sulyok, 2004-PMID 15451577[79]	follistatin , transcript variant FST317
TNFSF4	NM_003326.2	0.62	Tansey and Szymkowski, 2009 -PMID 19837186[77]	tumor necrosis factor (ligand) superfamily, member 4 (tax-transcriptionally activated glycoprotein 1, 34kDa)
WNT5A	NM_003392.3	0.45	Toledo, 2008-PMID 18786602[67]	wingless-type MMTV integration site family, member 5A
WNT5B	NM_032642.2	0.44	Toledo, 2008-PMID 18786602[67]	wingless-type MMTV integration site family, member 5B, transcript variant 1
CXCL3	NM_002090.2	0.30		chemokine (C-X-C motif) ligand 3
THBS2	NM_003247.2	0.26	Liauw, 2008-PMID 18594557[64]	thrombospondin 2
CXCL14	NM_004887.3	0.17		chemokine (C-X-C motif) ligand 14
CXCL12	NM_199168.2	0.12	Li and Ransohoff, 2008-PMID 18177992[80]	chemokine (C-X-C motif) ligand 12 (stromal cell-derived factor 1), transcript variant 1
CRH	NM_000756.1	0.11	Bayatti and Behl, 2005-PMID 16046283[81]	corticotropin releasing hormone
PENK	NM_006211.2	0.01		proenkephalin
NTF3	NM_002527.3	0.0024	Cheng and Mattson, 1994-PMID 7911729[82]	neurotrophin 3

Supplementary Table S2. List of antibodies

Antibodies	Vendor	Type	Dilution
Pax6	GeneTex GTX113241	Rbt IgG	1:500
Human Nestin	R&D MAB1259	Ms IgG	1:500
NG2	Millipore AB5320	Rabbit IgG	1:200
PDGFRα	R&D MAB322	Ms IgG	1:50
MBP	Millipore MAB386	Rat IgG	1:100
A2B5	Millipore MAb312	Mouse IgM	1:200
Synapsin-1	Millipore MAB1543	Rabbit IgG	1:1000
Olig2	Phosphosolutions 1538	Rabbit IgG	1:1000
βIIItubulin	Millipore MAB1637	Mouse IgG	1:200
s100β	Sigma S2532	Mouse IgG	1:1000
GFAP	Millipore AB5804	Rabbit IgG	1:1000
Human CD44	Abcam ab6124	Ms IgG	1:1000
BDNF	Santa Cruz Biotechnology sc-33904	Goat IgG	1:50
NeuN	Millipore MAB377	Ms IgG	1:500
GFP	Invitrogen A11122	Rabbit IgG	1:1000
GFP	Rockland Immunochemicals 600-141-215	Goat IgG	1:500
Caspase 3 active	Millipore AB3623	Rbt IgG	1:100
Human nuclei	Millipore MAB4383	Ms IgG	1:100
Human mitochondria	Millipore AB3598	Rbt IgG	1:100
Vimentin	Cell Signaling R28 #3932	Rbt IgG	1:500

Supplementary Table S3. PCR Primers

Gene	Forward sequence	Reverse sequence	Length (bp)
GLAST	ATCCTTGGATTTACCCTCCGA	CGCCATTCCTGTGACAAGAC	141
Olig2	CTCCTCAAATCGCATCCAG	AAAAGGTCATCGGGCTCTG	144
GFAP	AGTCCCTGGAGAGGCAGATGCGCGAGC	ATGTTCCTCTTGAGGTGGCCTTCTGAC	313
CD44	AGATCAGTCACAGACCTGCC	GCAAACTGCAAGAATCAAAGCC	471 (standard form)
NFE2L2	TGATTGACATACTTTGGAGGC	TCTTCATCTAGTTGTAACTGAGCG	181
GCLC	GGCACAAGGACGTTCTCAAGT	CAAAGGGTAGGATGGTTTGGG	160
GDNF	TGGGTCTGGGCTATGAAACC	GTCTCAGCTGCATCGCAAGA	73
Total BDNF	CATCCGAGGACAAGGTGGCTTGG	GTCCTCATCCAACAGCTCTTCTATC	148
NT-3	ACGGTACGCGGAGCATAAGA	CTCGGACGTAGGTTTGGGAT	266
TSP1	GCTGCACTGAGTGTCACTGTC	TCAGGAACTGTGGCATTGG	91
TSP2	GTGCAGGAGCGTCAGATGT	GGGTTGGATAAACAGCCATC	62
APOE	ACCCAGGAACTGAGGGC	CTCCTTGGACAGCCGTG	120
APP	GGCGGTGTTGTCATAGCGA	TGCATCTTGGACAGGTGGC	137
GPC4	CTGGAGGGTCCTTTCAACATT	GACATCAGTAACCAGTCGGTC	264
GPC6	TCCTCAGGAATATACATGCTGC	TTCGTCAAATTTCTTATGCCTG	142
GAPDH	GAGTCCACTGGCGTCTTCAC	TTCACACCCATGACGAACAT	119

Supplementary Table S4. Taqman primers

Gene	Gene expression assay catalog number
GLAST	Hs00188193_m1
GLT-1	Hs01102423_m1
GAPDH	Hs02758991_g1

Supplementary References:

55. Hama T., Kushima Y., Miyamoto M., Kubota M., Takei N., Hatanaka H. Interleukin-6 improves the survival of mesencephalic catecholaminergic and septal cholinergic neurons from postnatal, two-week-old rats in cultures. *Neuroscience*. **40,** 445-452 (1991).

56. Toulmond S., Vige X., Fage D., Benavides J. Local infusion of interleukin-6 attenuates the neurotoxic effects of NMDA on rat striatal cholinergic neurons. *Neurosci Lett*. **144,** 49-52 (1992).

57. Loddick S. A., Turnbull A. V., Rothwell N. J. Cerebral interleukin-6 is neuroprotective during permanent focal cerebral ischemia in the rat. *J Cereb Blood Flow Metab*. **18,** 176-179 (1998).

58. Torup L., Borsdal J., Sager T. Neuroprotective effect of the neurotensin analogue JMV-449 in a mouse model of permanent middle cerebral ischaemia. *Neurosci Lett*. **351,** 173-176 (2003).

59. Cipriani R., Villa P., Chece G., Lauro C., Paladini A., Micotti E., *et al.* CX3CL1 is neuroprotective in permanent focal cerebral ischemia in rodents. *J Neurosci*. **31,** 16327-16335 (2011).

60. Yao D. L., Masonic K., Petullo D., Li L. Y., Lincoln C., Wibberley L., *et al.* Pretreatment with intravenous FGF-13 reduces infarct volume and ameliorates neurological deficits following focal cerebral ischemia in rats. *Brain Res*. **818,** 140-146 (1999).

61. Andrae J., Gallini R., Betsholtz C. Role of platelet-derived growth factors in physiology and medicine. *Genes & development*. **22,** 1276-1312 (2008).

62. Samanta J., Alden T., Gobeske K., Kan L., Kessler J. A. Noggin protects against ischemic brain injury in rodents. *Stroke*. **41,** 357-362 (2010).

63. Omari K. M., Lutz S. E., Santambrogio L., Lira S. A., Raine C. S. Neuroprotection and remyelination after autoimmune demyelination in mice that inducibly overexpress CXCL1. *The American journal of pathology*. **174,** 164-176 (2009).

64. Liauw J., Hoang S., Choi M., Eroglu C., Choi M., Sun G. H., *et al.* Thrombospondins 1 and 2 are necessary for synaptic plasticity and functional recovery after stroke. *J Cereb Blood Flow Metab*. **28,** 1722-1732 (2008).

65. Dobolyi A., Vincze C., Pal G., Lovas G. The neuroprotective functions of transforming growth factor Beta proteins. *International journal of molecular sciences*. **13,** 8219-8258 (2012).

66. Paczkowska E., Golab-Janowska M., Bajer-Czajkowska A., Machalinska A., Ustianowski P., Rybicka M., *et al.* Increased circulating endothelial progenitor cells in patients with haemorrhagic and ischaemic stroke: the role of Endothelin-1. *Journal of the neurological sciences*. **325,** 90-99 (2013).

67. Toledo E. M., Colombres M., Inestrosa N. C. Wnt signaling in neuroprotection and stem cell differentiation. *Progress in neurobiology*. **86,** 281-296 (2008).

68. Rosito M., Deflorio C., Limatola C., Trettel F. CXCL16 orchestrates adenosine A3 receptor and MCP-1/CCL2 activity to protect neurons from excitotoxic cell death in the CNS. *J Neurosci*. **32,** 3154-3163 (2012).

69. Sun Y., Jin K., Xie L., Childs J., Mao X. O., Logvinova A., *et al.* VEGF-induced neuroprotection, neurogenesis, and angiogenesis after focal cerebral ischemia. *J Clin Invest*. **111,** 1843-1851 (2003).

70. Kamei N., Kwon S. M., Ishikawa M., Ii M., Nakanishi K., Yamada K., *et al.* Endothelial progenitor cells promote astrogliosis following spinal cord injury through Jagged1-dependent Notch signaling. *Journal of neurotrauma*. **29,** 1758-1769 (2012).

71. Hetman M., Kanning K., Cavanaugh J. E., Xia Z. Neuroprotection by brain-derived neurotrophic factor is mediated by extracellular signal-regulated kinase and phosphatidylinositol 3-kinase. *J Biol Chem*. **274,** 22569-22580 (1999).

72. Ellsworth J. L., Garcia R., Yu J., Kindy M. S. Fibroblast growth factor-18 reduced infarct volumes and behavioral deficits after transient occlusion of the middle cerebral artery in rats. *Stroke*. **34,** 1507-1512 (2003).

73. Su E. J., Fredriksson L., Geyer M., Folestad E., Cale J., Andrae J., *et al.* Activation of PDGF-CC by tissue plasminogen activator impairs blood-brain barrier integrity during ischemic stroke. *Nat Med*. **14,** 731-737 (2008).

74. Alzheimer C., Werner S. Fibroblast growth factors and neuroprotection. *Advances in experimental medicine and biology*. **513,** 335-351 (2002).

75. Sun Y., Jin K., Childs J. T., Xie L., Mao X. O., Greenberg D. A. Increased severity of cerebral ischemic injury in vascular endothelial growth factor-B-deficient mice. *J Cereb Blood Flow Metab*. **24,** 1146-1152 (2004).

76. Kadomatsu K., Muramatsu T. Midkine and pleiotrophin in neural development and cancer. *Cancer letters*. **204,** 127-143 (2004).

77. Tansey M. G., Szymkowski D. E. The TNF superfamily in 2009: new pathways, new indications, and new drugs. *Drug discovery today*. **14,** 1082-1088 (2009).

78. Zhang Q. G., Wang R., Khan M., Mahesh V., Brann D. W. Role of Dickkopf-1, an antagonist of the Wnt/beta-catenin signaling pathway, in estrogen-induced neuroprotection and attenuation of tau phosphorylation. *J Neurosci*. **28,** 8430-8441 (2008).

79. Sulyok S., Wankell M., Alzheimer C., Werner S. Activin: an important regulator of wound repair, fibrosis, and neuroprotection. *Molecular and cellular endocrinology*. **225,** 127-132 (2004).

80. Li M., Ransohoff R. M. Multiple roles of chemokine CXCL12 in the central nervous system: a migration from immunology to neurobiology. *Progress in neurobiology*. **84,** 116-131 (2008).

81. Bayatti N., Behl C. The neuroprotective actions of corticotropin releasing hormone. *Ageing research reviews*. **4,** 258-270 (2005).

82. Cheng B., Mattson M. P. NT-3 and BDNF protect CNS neurons against metabolic/excitotoxic insults. *Brain Res*. **640,** 56-67 (1994).