Transplantation of Umbilical Cord Blood Stem Cells for Treating Spinal Cord Injury

Stem Cell Reviews and Reports

March 2011, Volume 7, Issue 1, pp 181–194 | Cite as

- Dong-Hyuk Park (1) Email author (doctorns@korea.com)
- Jeong-Hyun Lee (2)
- Cesario V. Borlongan (3)
- Paul R. Sanberg (3) (4)
- Yong-Gu Chung (1)
- Tai-Hyoung Cho (1) Email author (choth2@unitel.co.kr)

1. Department of Neurosurgery, Korea University Medical Center, Anam Hospital, Korea University College of Medicine, Seoul, Korea
2. Department of Anesthesiology, Samsung Medical Center, Sungkyunkwan University College of Medicine, Seoul, Korea
3. Center of Excellence for Aging & Brain Repair, Department of Neurosurgery, University of South Florida College of Medicine, Tampa, USA
4. Office of Research and Innovation, University of South Florida, Tampa, USA

Article
First Online: 08 June 2010

Abstract

Spinal cord injury (SCI) develops primary and secondary damage to neural tissue and this often results in permanent disability of the motor and sensory functions. However, there is currently no effective treatment except methylprednisolone, and the use of methylprednisolone has also been questioned due to its moderate efficacy and the drug's downside. Regenerative medicine has remarkably developed since the discovery of stem cells, and many studies have suggested the potential of cell-based therapies for neural injury. Especially, the therapeutic potential of human umbilical cord blood cells (hUCB cells) for intractable neurological disorders has been demonstrated using in vitro and vivo models. The hUCB cells are immune naïve and they are able to differentiate into other phenotypes, including the neural lineage. Their ability to produce several neurotropic factors and to modulate immune and inflammatory reactions has also been noted. Recent evidence has emerged suggesting alternative pathways of graft-mediated neural repair that involve neurotrophic effects. These effects are caused by the release of

various growth factors that promote cell survival, angiogenesis and anti-inflammation, and this is all aside from a cell replacement mechanism. In this review, we present the recent findings on the stemness properties and the therapeutic potential of hUCB as a safe, feasible and effective cellular source for transplantation in SCI. These multifaceted protective and restorative effects from hUCB grafts may be interdependent and they act in harmony to promote therapeutic benefits for SCI. Nevertheless, clinical studies with hUCB are still rare because of the concerns about safety and efficiency. Among these concerns, the major histocompatibility in allogeneic transplantation is an important issue to be addressed in future clinical trials for treating SCI.

Keywords

Human umbilical cord blood Stem cells Transplantation Spinal cord injury Animal models

Dong-Hyuk Park and Jeong-Hyun Lee contributed to this article equally.

Notes

Acknowledgement

This study was supported by a Korea University grant.

Conflict of Interest

This contribution is funded by Korea University. Drs. Sanberg and Borlongan serve as consultants to a number of stem cell-based companies. Drs. Park, Sanberg and Borlongan are members of American Society of Neural Therapy and Repair.

References

1. The National Spinal Cord Injury Statistical Center. (2010). Spinal cord injury facts and figures at a glance. https://www.nscisc.uab.edu/public_content/pdf/Facts%20and%20Figures%20at (https://www.nscisc.uab.edu/public_content/pdf/Facts%20and%20Figures%20at%20a%20Glance%202010.pdf). Accessed 16 April 2010.
2. Bracken, M. B., Shepard, M. J., Hellenbrand, K. G., Collins, W. F., Leo, L. S., Freeman, D. F., et al. (1985). Methylprednisolone and neurological function 1 year after spinal cord injury. Results of the National Acute Spinal Cord Injury Study. *Journal of Neurosurgery, 63*(5), 704–713.

CrossRef (https://doi.org/10.3171/jns.1985.63.5.0704)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=3903070)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Methylprednisolone%20and%20neurological%20function%201%20year%20after%20spinal%20cord%20injury.%20Results%20of%20the%20National%20Acute%20Spinal%20Cord%20Injury%20Study&author=MB.%20Bracken&author=MJ.%20Shepard&author=KG.%20Hellenbrand&author=WF.%20Collins&author=LS.%20Leo&author=DF.%20Freeman&journal=Journal%20of%20Neurosurgery&volume=63&issue=5&pages=704-713&publication_year=1985)

3. Bracken, M. B., Shepard, M. J., Collins, W. F., Holford, T. R., Young, W., Baskin, D. S., et al. (1990). A randomized, controlled trial of methylprednisolone or naloxone in the treatment of acute spinal-cord injury. Results of the Second National Acute Spinal Cord Injury Study. *New England Journal of Medicine, 322*(20), 1405–1411.
CrossRef (https://doi.org/10.1056/NEJM199005173222001)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=2278545)
Google Scholar (http://scholar.google.com/scholar_lookup?title=A%20randomized%2C%20controlled%20trial%20of%20methylprednisolone%20or%20naloxone%20in%20the%20treatment%20of%20acute%20spinal-cord%20injury.%20Results%20of%20the%20Second%20National%20Acute%20Spinal%20Cord%20Injury%20Study&author=MB.%20Bracken&author=MJ.%20Shepard&author=WF.%20Collins&author=TR.%20Holford&author=W.%20Young&author=DS.%20Baskin&journal=New%20England%20Journal%20of%20Medicine&volume=322&issue=20&pages=1405-1411&publication_year=1990)

4. Bracken, M. B., Shepard, M. J., Holford, T. R., Leo-Summers, L., Aldrich, E. F., Fazl, M., et al. (1997). Administration of methylprednisolone for 24 or 48 hours or tirilazad mesylate for 48 hours in the treatment of acute spinal cord injury. Results of the Third National Acute Spinal Cord Injury Randomized Controlled Trial. National Acute Spinal Cord Injury Study. *Journal of the American Medical Association, 277*(20), 1597–1604.
CrossRef (https://doi.org/10.1001/jama.277.20.1597)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9168289)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Administration%20of%20methylprednisolone%20for%2024%20or%2048%20hours%20or%20tirilazad%20mesylate%20for%2048%20hours%20in%20the%20treatment%20of%20acute%20spinal%20cord%20injury.%20Results%20of%20the%20Third%20National%20Acute%20Spinal%20Cord%20Injury%20Randomized%20Controlled%20Trial.%20National%20Acute%20Spinal%20Cord%20Injury%20Study&author=MB.%20Bracken&author=MJ.%20Shepard&author=TR.%20Holford&author=L.%20Leo-Summers&author=EF.%20Aldrich&author=M.%20Fazl&journal=Journal%20of%20the%20American%20Medical%20Association&volume=277&issue=20&pages=1597-1604&publication_year=1997)

5. Short, D. J., El Masry, W. S., & Jones, P. W. (2000). High dose methylprednisolone in the management of acute spinal cord injury—a systematic review from a clinical perspective. *Spinal Cord, 38*(5), 273–286.

CrossRef (https://doi.org/10.1038/sj.sc.3100986)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10822400)
Google Scholar (http://scholar.google.com/scholar_lookup?title=High%20dose%20methylprednisolone%20in%20the%20management%20of%20acute%20spinal%20cord%20injury%E2%80%94a%20systematic%20review%20from%20a%20clinical%20perspective&author=DJ.%20Short&author=WS.%20Masry&author=PW.%20Jones&journal=Spinal%20Cord&volume=38&issue=5&pages=273-286&publication_year=2000)

6. Coutts, M., & Keirstead, H. S. (2008). Stem cells for the treatment of spinal cord injury. *Experimental Neurology, 209*(2), 368–377.
CrossRef (https://doi.org/10.1016/j.expneurol.2007.09.002)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17950280)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Stem%20cells%20for%20the%20treatment%20of%20spinal%20cord%20injury&author=M.%20Coutts&author=HS.%20Keirstead&journal=Experimental%20Neurology&volume=209&issue=2&pages=368-377&publication_year=2008)

7. Kim, B. G., Hwang, D. H., Lee, S. I., Kim, E. J., & Kim, S. U. (2007). Stem cell-based cell therapy for spinal cord injury. *Cell Transplantation, 16*(4), 355–364.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17658126)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Stem%20cell-based%20cell%20therapy%20for%20spinal%20cord%20injury&author=BG.%20Kim&author=DH.%20Hwang&author=SI.%20Lee&author=EJ.%20Kim&author=SU.%20Kim&journal=Cell%20Transplantation&volume=16&issue=4&pages=355-364&publication_year=2007)

8. Chang, Y. C., Shyu, W. C., Lin, S. Z., & Li, H. (2007). Regenerative therapy for stroke. *Cell Transplantation, 16*(2), 171–181.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17474298)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Regenerative%20therapy%20for%20stroke&author=YC.%20Chang&author=WC.%20Shyu&author=SZ.%20Lin&author=H.%20Li&journal=Cell%20Transplantation&volume=16&issue=2&pages=171-181&publication_year=2007)

9. Johnson, P. J., Tatara, A., Shiu, A., & Sakiyama-Elbert, S. E. (2010). Controlled release of neurotrophin-3 and platelet-derived growth factor from fibrin scaffolds containing neural progenitor cells enhances survival and differentiation into neurons in a subacute model of SCI. *Cell Transplantation, 19*(1), 89–101.
CrossRef (https://doi.org/10.3727/096368909X477273)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19818206)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Controlled%20release%20of%20neurotrophin-3%20and%20platelet-derived%20growth%20factor%20from%20fibrin%20scaffolds%20containing%20neural%20progenitor%20cells%20enhances%20survival%20and%20differentiation%20into%20neurons%20in%20a%20subacute%20model%20of%20SCI&author=PJ.%20Johnson&author=A.%20Tatara&author=A.%20Shiu&author=SE.%20S

akiyama-Elbert&journal=Cell%20Transplantation&volume=19&issue=1&pages=89-101&publication_year=2010)

10. Mothe, A. J., Kulbatski, I., Parr, A., Mohareb, M., & Tator, C. H. (2008). Adult spinal cord stem/progenitor cells transplanted as neurospheres preferentially differentiate into oligodendrocytes in the adult rat spinal cord. *Cell Transplant, 17*(7), 735–751.
CrossRef (https://doi.org/10.3727/096368908786516756)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19044201)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Adult%20spinal%20cord%20stem%2Fprogenitor%20cells%20transplanted%20as%20neurospheres%20preferentially%20differentiate%20into%20oligodendrocytes%20in%20the%20adult%20rat%20spinal%20cord&author=AJ.%20Mothe&author=I.%20Kulbatski&author=A.%20Parr&author=M.%20Mohareb&author=CH.%20Tator&journal=Cell%20Transplant&volume=17&issue=7&pages=735-751&publication_year=2008)

11. Daar, A. S., Bhatt, A., Court, E., & Singer, P. A. (2004). Stem cell research and transplantation: science leading ethics. *Transplantation Proceedings, 36*(8), 2504–2506.
CrossRef (https://doi.org/10.1016/j.transproceed.2004.08.129)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15561296)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Stem%20cell%20research%20and%20transplantation%3A%20science%20leading%20ethics&author=AS.%20Daar&author=A.%20Bhatt&author=E.%20Court&author=PA.%20Singer&journal=Transplantation%20Proceedings&volume=36&issue=8&pages=2504-2506&publication_year=2004)

12. Henon, P. R. (2003). Human embryonic or adult stem cells: an overview on ethics and perspectives for tissue engineering. *Advances in Experimental Medicine and Biology, 534*, 27–45.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12903709)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20embryonic%20or%20adult%20stem%20cells%3A%20an%20overview%20on%20ethics%20and%20perspectives%20for%20tissue%20engineering&author=PR.%20Henon&journal=Advances%20in%20Experimental%20Medicine%20and%20Biology&volume=534&pages=27-45&publication_year=2003)

13. Riaz, S. S., Jauniaux, E., Stern, G. M., & Bradford, H. F. (2002). The controlled conversion of human neural progenitor cells derived from foetal ventral mesencephalon into dopaminergic neurons in vitro. *Brain Research. Developmental Brain Research, 136*(1), 27–34.
CrossRef (https://doi.org/10.1016/S0165-3806(02)00310-3)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12036514)
Google Scholar (http://scholar.google.com/scholar_lookup?title=The%20controlled%20conversion%20of%20human%20neural%20progenitor%20cells%20derived%20from%20foetal%20ventral%20mesencephalon%20int

o%20dopaminergic%20neurons%20in%20vitro&author=SS.%20Riaz&author=E.%20Jauniaux&author=GM.%20Stern&author=HF.%20Bradford&journal=Brain%20Research.%20Developmental%20Brain%20Research&volume=136&issue=1&pages=27-34&publication_year=2002)

14. Sathananthan, A. H., & Trounson, A. (2005). Human embryonic stem cells and their spontaneous differentiation. *Italian Journal of Anatomy and Embryology, 110*(2 Suppl 1), 151–157.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16101033)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20embryonic%20stem%20cells%20and%20their%20spontaneous%20differentiation&author=AH.%20Sathananthan&author=A.%20Trounson&journal=Italian%20Journal%20of%20Anatomy%20and%20Embryology&volume=110&issue=2%20Suppl%201&pages=151-157&publication_year=2005)

15. Ramsay, N. K., Davies, S., Wagner, J., McGough, E., & McGlave, P. B. (1996). Bone marrow transplantation. New strategies for treating malignant disease. *Minnesota Medicine, 79*(4), 23–28.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=8637486)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Bone%20marrow%20transplantation.%20New%20strategies%20for%20treating%20malignant%20disease&author=NK.%20Ramsay&author=S.%20Davies&author=J.%20Wagner&author=E.%20McGough&author=PB.%20McGlave&journal=Minnesota%20Medicine&volume=79&issue=4&pages=23-28&publication_year=1996)

16. Ferrari, G., Cusella-De Angelis, G., Coletta, M., Paolucci, E., Stornaiuolo, A., Cossu, G., et al. (1998). Muscle regeneration by bone marrow-derived myogenic progenitors. *Science, 279*(5356), 1528–1530.
CrossRef (https://doi.org/10.1126/science.279.5356.1528)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9488650)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Muscle%20regeneration%20by%20bone%20marrow-derived%20myogenic%20progenitors&author=G.%20Ferrari&author=G.%20Cusella-De%20Angelis&author=M.%20Coletta&author=E.%20Paolucci&author=A.%20Stornaiuolo&author=G.%20Cossu&journal=Science&volume=279&issue=5356&pages=1528-1530&publication_year=1998)

17. Petersen, B. E., Bowen, W. C., Patrene, K. D., Mars, W. M., Sullivan, A. K., Murase, N., et al. (1999). Bone marrow as a potential source of hepatic oval cells. *Science, 284*(5417), 1168–1170.
CrossRef (https://doi.org/10.1126/science.284.5417.1168)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10325227)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Bone%20marrow%20as%20a%20potential%20source%20of%20hepatic%20oval%20cells&author=BE.%20Petersen&author=WC.%20Bowen&author=KD.%20Patrene&author=WM.%20Mars&author=AK.%20Sullivan&author=N.%20Mur

ase&journal=Science&volume=284&issue=5417&pages=1168-1170&publication_year=1999)

18. Sanchez-Ramos, J., Song, S., Cardozo-Pelaez, F., Hazzi, C., Stedeford, T., Willing, A., et al. (2000). Adult bone marrow stromal cells differentiate into neural cells in vitro. *Experimental Neurology, 164*(2), 247–256.
CrossRef (https://doi.org/10.1006/exnr.2000.7389)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10915564)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Adult%20bone%20marrow%20stromal%20cells%20differentiate%20into%20neural%20cells%20in%20vitro&author=J.%20Sanchez-Ramos&author=S.%20Song&author=F.%20Cardozo-Pelaez&author=C.%20Hazzi&author=T.%20Stedeford&author=A.%20Willing&journal=Experimental%20Neurology&volume=164&issue=2&pages=247-256&publication_year=2000)

19. Cho, S. R., Kim, Y. R., Kang, H. S., Yim, S. H., Park, C. I., Min, Y. H., et al. (2009). Functional recovery after the transplantation of neurally differentiated mesenchymal stem cells derived from bone barrow in a rat model of spinal cord injury. *Cell Transplantation, 18*(12), 1359–1368.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=20184788)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Functional%20recovery%20after%20the%20transplantation%20of%20neurally%20differentiated%20mesenchymal%20stem%20cells%20derived%20from%20bone%20barrow%20in%20a%20rat%20model%20of%20spinal%20cord%20injury&author=SR.%20Cho&author=YR.%20Kim&author=HS.%20Kang&author=SH.%20Yim&author=CI.%20Park&author=YH.%20Min&journal=Cell%20Transplantation&volume=18&issue=12&pages=1359-1368&publication_year=2009)

20. Armitage, J. O. (1994). Bone marrow transplantation. *New England Journal of Medicine, 330*(12), 827–838.
CrossRef (https://doi.org/10.1056/NEJM199403243301206)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=8114836)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Bone%20marrow%20transplantation&author=JO.%20Armitage&journal=New%20England%20Journal%20of%20Medicine&volume=330&issue=12&pages=827-838&publication_year=1994)

21. Newcomb, J. D., Sanberg, P. R., Klasko, S. K., & Willing, A. E. (2007). Umbilical cord blood research: current and future perspectives. *Cell Transplantation, 16*(2), 151–158.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17474296)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Umbilical%20cord%20blood%20research%3A%20current%20and%20future%20perspectives&author=JD.%20Newcomb&author=PR.%20Sanberg&author=SK.%20Klasko&author=AE.%20Willing&journal=Cell%20Transplantation&volume=16&issue=2&pages=151-158&publication_year=2007)

22. Tse, W. & Laughlin, M. J. (2005). Umbilical cord blood transplantation: a new alternative option. *Hematology/the Education Program of the American Society of Hematology. American Society of Hematology. Education Program*, 377–383.
Google Scholar (https://scholar.google.com/scholar?q=Tse%2C%20W.%20%26%20Laughlin%2C%20M.%20J.%20%282005%29.%20Umbilical%20cord%20blood%20transplantation%3A%20a%20new%20alternative%20option.%20Hematology%2Fthe%20Education%20Program%20of%20the%20American%20Society%20of%20Hematology.%20American%20Society%20of%20Hematology.%20Education%20Program%2C%20377%E2%80%93383.)

23. Knutsen, A. P., & Wall, D. A. (1999). Kinetics of T-cell development of umbilical cord blood transplantation in severe T-cell immunodeficiency disorders. *Journal of Allergy and Clinical Immunology, 103*(5 Pt 1), 823–832.
CrossRef (https://doi.org/10.1016/S0091-6749(99)70426-4)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10329816)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Kinetics%20of%20T-cell%20development%20of%20umbilical%20cord%20blood%20transplantation%20in%20severe%20T-cell%20immunodeficiency%20disorders&author=AP.%20Knutsen&author=DA.%20Wall&journal=Journal%20of%20Allergy%20and%20Clinical%20Immunology&volume=103&issue=5%20Pt%201&pages=823-832&publication_year=1999)

24. Vaziri, H., Dragowska, W., Allsopp, R. C., Thomas, T. E., Harley, C. B., & Lansdorp, P. M. (1994). Evidence for a mitotic clock in human hematopoietic stem cells: loss of telomeric DNA with age. *Proceedings of the National Academy of Sciences of the United States of America, 91*(21), 9857–9860.
CrossRef (https://doi.org/10.1073/pnas.91.21.9857)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7937905)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Evidence%20for%20a%20mitotic%20clock%20in%20human%20hematopoietic%20stem%20cells%3A%20loss%20of%20telomeric%20DNA%20with%20age&author=H.%20Vaziri&author=W.%20Dragowska&author=RC.%20Allsopp&author=TE.%20Thomas&author=CB.%20Harley&author=PM.%20Lansdorp&journal=Proceedings%20of%20the%20National%20Academy%20of%20Sciences%20of%20the%20United%20States%20of%20America&volume=91&issue=21&pages=9857-9860&publication_year=1994)

25. Willing, A. E., Lixian, J., Milliken, M., Poulos, S., Zigova, T., Song, S., et al. (2003). Intravenous versus intrastriatal cord blood administration in a rodent model of stroke. *Journal of Neuroscience Research, 73*(3), 296–307.
CrossRef (https://doi.org/10.1002/jnr.10659)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12868063)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Intravenous%20versus%20intrastriatal%20cord%20blood%20administration%20in%20a%20rodent%20model%20of%20stroke&author=AE.%20Willing&author=J.%20Lixian&author=M.%20Milliken&author=S.%20Poulos&author=T.%20Zigova&author=S.%20Song&journal=Journal%20of%20Neuroscience%20Research&volume=73&issue=3&pages=296-307&publication_year=2003)

26. Erices, A., Conget, P., & Minguell, J. J. (2000). Mesenchymal progenitor cells in human umbilical cord blood. *British Journal of Haematology, 109*(1), 235–242.
CrossRef (https://doi.org/10.1046/j.1365-2141.2000.01986.x)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10848804)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Mesenchymal%20progenitor%20cells%20in%20human%20umbilical%20cord%20blood&author=A.%20Erices&author=P.%20Conget&author=JJ.%20Minguell&journal=British%20Journal%20of%20Haematology&volume=109&issue=1&pages=235-242&publication_year=2000)

27. Berger, M. J., Adams, S. D., Tigges, B. M., Sprague, S. L., Wang, X. J., Collins, D. P., et al. (2006). Differentiation of umbilical cord blood-derived multilineage progenitor cells into respiratory epithelial cells. *Cytotherapy, 8*(5), 480–487.
CrossRef (https://doi.org/10.1080/14653240600941549)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17050253)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Differentiation%20of%20umbilical%20cord%20blood-derived%20multilineage%20progenitor%20cells%20into%20respiratory%20epithelial%20cells&author=MJ.%20Berger&author=SD.%20Adams&author=BM.%20Tigges&author=SL.%20Sprague&author=XJ.%20Wang&author=DP.%20Collins&journal=Cytotherapy&volume=8&issue=5&pages=480-487&publication_year=2006)

28. Kim, J. W., Kim, S. Y., Park, S. Y., Kim, Y. M., Kim, J. M., Lee, M. H., et al. (2004). Mesenchymal progenitor cells in the human umbilical cord. *Annals of Hematology, 83*(12), 733–738.
CrossRef (https://doi.org/10.1007/s00277-004-0918-z)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15372203)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Mesenchymal%20progenitor%20cells%20in%20the%20human%20umbilical%20cord&author=JW.%20Kim&author=SY.%20Kim&author=SY.%20Park&author=YM.%20Kim&author=JM.%20Kim&author=MH.%20Lee&journal=Annals%20of%20Hematology&volume=83&issue=12&pages=733-738&publication_year=2004)

29. Todaro, A. M., Pafumi, C., Pernicone, G., Munda, S., Pilastro, M. R., Russo, A., et al. (2000). Haematopoietic progenitors from umbilical cord blood. *Blood Purification, 18*(2), 144–147.
CrossRef (https://doi.org/10.1159/000014438)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10838474)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Haematopoietic%20progenitors%20from%20umbilical%20cord%20blood&author=AM.%20Todaro&author=C.%20Pafumi&author=G.%20Pernicone&author=S.%20Munda&author=MR.%20Pilastro&author=A.%20Russo&journal=Blood%20Purification&volume=18&issue=2&pages=144-147&publication_year=2000)

30. Nayar, B., Raju, G. M., & Deka, D. (2002). Hematopoietic stem/progenitor cell harvesting from umbilical cord blood. *International Journal of Gynaecology and*

Obstetrics, 79(1), 31–32.
CrossRef (https://doi.org/10.1016/S0020-7292(02)00187-X)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12399089)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Hematopoietic%20stem%2Fprogenitor%20cell%20harvesting%20from%20umbilical%20cord%20blood&author=B.%20Nayar&author=GM.%20Raju&author=D.%20Deka&journal=International%20Journal%20of%20Gynaecology%20and%20Obstetrics&volume=79&issue=1&pages=31-32&publication_year=2002)

31. Broxmeyer, H. E., Hangoc, G., Cooper, S., Ribeiro, R. C., Graves, V., Yoder, M., et al. (1992). Growth characteristics and expansion of human umbilical cord blood and estimation of its potential for transplantation in adults. *Proceedings of the National Academy of Sciences of the United States of America, 89*(9), 4109–4113.
CrossRef (https://doi.org/10.1073/pnas.89.9.4109)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=1373894)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Growth%20characteristics%20and%20expansion%20of%20human%20umbilical%20cord%20blood%20and%20estimation%20of%20its%20potential%20for%20transplantation%20in%20adults&author=HE.%20Broxmeyer&author=G.%20Hangoc&author=S.%20Cooper&author=RC.%20Ribeiro&author=V.%20Graves&author=M.%20Yoder&journal=Proceedings%20of%20the%20National%20Academy%20of%20Sciences%20of%20the%20United%20States%20of%20America&volume=89&issue=9&pages=4109-4113&publication_year=1992)

32. Nakahata, T., & Ogawa, M. (1982). Hemopoietic colony-forming cells in umbilical cord blood with extensive capability to generate mono- and multipotential hemopoietic progenitors. *Journal of Clinical Investigation, 70*(6), 1324–1328.
CrossRef (https://doi.org/10.1172/JCI110734)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7174797)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Hemopoietic%20colony-forming%20cells%20in%20umbilical%20cord%20blood%20with%20extensive%20capability%20to%20generate%20mono-%20and%20multipotential%20hemopoietic%20progenitors&author=T.%20Nakahata&author=M.%20Ogawa&journal=Journal%20of%20Clinical%20Investigation&volume=70&issue=6&pages=1324-1328&publication_year=1982)

33. Frassoni, F., Podesta, M., Maccario, R., Giorgiani, G., Rossi, G., Zecca, M., et al. (2003). Cord blood transplantation provides better reconstitution of hematopoietic reservoir compared with bone marrow transplantation. *Blood, 102*(3), 1138–1141.
CrossRef (https://doi.org/10.1182/blood-2003-03-0720)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12689932)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Cord%20blood%20transplantation%20provides%20better%20reconstitution%20of%20hematopoietic%20reservoir%20compared%20with%20bone%20marrow%20transplantation&author=F.%20Frassoni&author=M.%20Podesta&author=R.%20Maccario&author=G.%20Giorgiani&author=G.%20Rossi&author=M.%20

Zecca&journal=Blood&volume=102&issue=3&pages=1138-1141&publication_year=2003)

34. Pranke, P., Failace, R. R., Allebrandt, W. F., Steibel, G., Schmidt, F., & Nardi, N. B. (2001). Hematologic and immunophenotypic characterization of human umbilical cord blood. *Acta Haematologica, 105*(2), 71–76.
CrossRef (https://doi.org/10.1159/000046537)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11408707)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Hematologic%20and%20immunophenotypic%20characterization%20of%20human%20umbilical%20cord%20blood&author=P.%20Pranke&author=RR.%20Failace&author=WF.%20Allebrandt&author=G.%20Steibel&author=F.%20Schmidt&author=NB.%20Nardi&journal=Acta%20Haematologica&volume=105&issue=2&pages=71-76&publication_year=2001)

35. Chen, N., Hudson, J. E., Walczak, P., Misiuta, I., Garbuzova-Davis, S., Jiang, L., et al. (2005). Human umbilical cord blood progenitors: the potential of these hematopoietic cells to become neural. *Stem Cells, 23*(10), 1560–1570.
CrossRef (https://doi.org/10.1634/stemcells.2004-0284)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16081669)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood%20progenitors%3A%20the%20potential%20of%20these%20hematopoietic%20cells%20to%20become%20neural&author=N.%20Chen&author=JE.%20Hudson&author=P.%20Walczak&author=I.%20Misiuta&author=S.%20Garbuzova-Davis&author=L.%20Jiang&journal=Stem%20Cells&volume=23&issue=10&pages=1560-1570&publication_year=2005)

36. Mikami, T., Eguchi, M., Kurosawa, H., Sato, Y., Sugita, K., Suzumura, H., et al. (2002). Ultrastructural and cytochemical characterization of human cord blood cells. *Medical Electron Microscopy, 35*(2), 96–101.
CrossRef (https://doi.org/10.1007/s007950200012)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12181651)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Ultrastructural%20and%20cytochemical%20characterization%20of%20human%20cord%20blood%20cells&author=T.%20Mikami&author=M.%20Eguchi&author=H.%20Kurosawa&author=Y.%20Sato&author=K.%20Sugita&author=H.%20Suzumura&journal=Medical%20Electron%20Microscopy&volume=35&issue=2&pages=96-101&publication_year=2002)

37. Harris, D. T., Schumacher, M. J., Locascio, J., Besencon, F. J., Olson, G. B., DeLuca, D., et al. (1992). Phenotypic and functional immaturity of human umbilical cord blood T lymphocytes. *Proceedings of the National Academy of Sciences of the United States of America, 89*(21), 10006–10010.
CrossRef (https://doi.org/10.1073/pnas.89.21.10006)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=1438190)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Phenotypic%20and%20functional%20immaturity%20of%20human%20um

bilical%20cord%20blood%20T%20lymphocytes&author=DT.%20Harris&author=MJ.%20Schumacher&author=J.%20Locascio&author=FJ.%20Besencon&author=GB.%20Olson&author=D.%20DeLuca&journal=Proceedings%20of%20the%20National%20Academy%20of%20Sciences%20of%20the%20United%20States%20of%20America&volume=89&issue=21&pages=10006-10010&publication_year=1992)

38. D'Arena, G., Musto, P., Cascavilla, N., Di Giorgio, G., Fusilli, S., Zendoli, F., et al. (1998). Flow cytometric characterization of human umbilical cord blood lymphocytes: immunophenotypic features. *Haematologica, 83*(3), 197–203.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9573672)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Flow%20cytometric%20characterization%20of%20human%20umbilical%20cord%20blood%20lymphocytes%3A%20immunophenotypic%20features&author=G.%20D%E2%80%99Arena&author=P.%20Musto&author=N.%20Cascavilla&author=G.%20Giorgio&author=S.%20Fusilli&author=F.%20Zendoli&journal=Haematologica&volume=83&issue=3&pages=197-203&publication_year=1998)

39. Zola, H., Fusco, M., Macardle, P. J., Flego, L., & Roberton, D. (1995). Expression of cytokine receptors by human cord blood lymphocytes: comparison with adult blood lymphocytes. *Pediatric Research, 38*(3), 397–403.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7494666)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Expression%20of%20cytokine%20receptors%20by%20human%20cord%20blood%20lymphocytes%3A%20comparison%20with%20adult%20blood%20lymphocytes&author=H.%20Zola&author=M.%20Fusco&author=PJ.%20Macardle&author=L.%20Flego&author=D.%20Roberton&journal=Pediatric%20Research&volume=38&issue=3&pages=397-403&publication_year=1995)

40. Gluckman, E., & Rocha, V. (2005). History of the clinical use of umbilical cord blood hematopoietic cells. *Cytotherapy, 7*(3), 219–227.
CrossRef (https://doi.org/10.1080/14653240510027136)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16081348)
Google Scholar (http://scholar.google.com/scholar_lookup?title=History%20of%20the%20clinical%20use%20of%20umbilical%20cord%20blood%20hematopoietic%20cells&author=E.%20Gluckman&author=V.%20Rocha&journal=Cytotherapy&volume=7&issue=3&pages=219-227&publication_year=2005)

41. Rainsford, E., & Reen, D. J. (2002). Interleukin 10, produced in abundance by human newborn T cells, may be the regulator of increased tolerance associated with cord blood stem cell transplantation. *British Journal of Haematology, 116*(3), 702–709.
CrossRef (https://doi.org/10.1046/j.0007-1048.2001.03321.x)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11849236)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Interleukin%2010%2C%20produced%20in%20abundance%20by%20human%20newborn%20T%20cells%2C%20may%20be%20the%20regulator%20of%20

increased%20tolerance%20associated%20with%20cord%20blood%20stem%20cell%20transplantation&author=E.%20Rainsford&author=DJ.%20Reen&journal=British%20Journal%20of%20Haematology&volume=116&issue=3&pages=702-709&publication_year=2002)

42. Asseman, C., & Powrie, F. (1998). Interleukin 10 is a growth factor for a population of regulatory T cells. *Gut, 42*(2), 157–158.
CrossRef (https://doi.org/10.1136/gut.42.2.157)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9536936)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Interleukin%2010%20is%20a%20growth%20factor%20for%20a%20population%20of%20regulatory%20T%20cells&author=C.%20Asseman&author=F.%20Powrie&journal=Gut&volume=42&issue=2&pages=157-158&publication_year=1998)

43. Jiang, Q., Azuma, E., Hirayama, M., Iwamoto, S., Kumamoto, T., Kobayashi, M., et al. (2001). Functional immaturity of cord blood monocytes as detected by impaired response to hepatocyte growth factor. *Pediatrics International, 43*(4), 334–339.
CrossRef (https://doi.org/10.1046/j.1442-200X.2001.01420.x)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11472574)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Functional%20immaturity%20of%20cord%20blood%20monocytes%20as%20detected%20by%20impaired%20response%20to%20hepatocyte%20growth%20factor&author=Q.%20Jiang&author=E.%20Azuma&author=M.%20Hirayama&author=S.%20Iwamoto&author=T.%20Kumamoto&author=M.%20Kobayashi&journal=Pediatrics%20International&volume=43&issue=4&pages=334-339&publication_year=2001)

44. Theilgaard-Monch, K., Raaschou-Jensen, K., Palm, H., Schjodt, K., Heilmann, C., Vindelov, L., et al. (2001). Flow cytometric assessment of lymphocyte subsets, lymphoid progenitors, and hematopoietic stem cells in allogeneic stem cell grafts. *Bone Marrow Transplantation, 28*(11), 1073–1082.
CrossRef (https://doi.org/10.1038/sj.bmt.1703270)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11781619)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Flow%20cytometric%20assessment%20of%20lymphocyte%20subsets%2C%20lymphoid%20progenitors%2C%20and%20hematopoietic%20stem%20cells%20in%20allogeneic%20stem%20cell%20grafts&author=K.%20Theilgaard-Monch&author=K.%20Raaschou-Jensen&author=H.%20Palm&author=K.%20Schjodt&author=C.%20Heilmann&author=L.%20Vindelov&journal=Bone%20Marrow%20Transplantation&volume=28&issue=11&pages=1073-1082&publication_year=2001)

45. Willing, A. E., Eve, D. J., & Sanberg, P. R. (2007). Umbilical cord blood transfusions for prevention of progressive brain injury and induction of neural recovery: an immunological perspective. *Regenerative Medicine, 2*(4), 457–464.
CrossRef (https://doi.org/10.2217/17460751.2.4.457)

PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17635052)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Umbilical%20cord%20blood%20transfusions%20for%20prevention%20of%20progressive%20brain%20injury%20and%20induction%20of%20neural%20recovery%3A%20an%20immunological%20perspective&author=AE.%20Willing&author=DJ.%20Eve&author=PR.%20Sanberg&journal=Regenerative%20Medicine&volume=2&issue=4&pages=457-464&publication_year=2007)

46. Arpinati, M., Green, C. L., Heimfeld, S., Heuser, J. E., & Anasetti, C. (2000). Granulocyte-colony stimulating factor mobilizes T helper 2-inducing dendritic cells. *Blood, 95*(8), 2484–2490.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10753825)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Granulocyte-colony%20stimulating%20factor%20mobilizes%20T%20helper%202-inducing%20dendritic%20cells&author=M.%20Arpinati&author=CL.%20Green&author=S.%20Heimfeld&author=JE.%20Heuser&author=C.%20Anasetti&journal=Blood&volume=95&issue=8&pages=2484-2490&publication_year=2000)

47. Garderet, L., Dulphy, N., Douay, C., Chalumeau, N., Schaeffer, V., Zilber, M. T., et al. (1998). The umbilical cord blood alphabeta T-cell repertoire: characteristics of a polyclonal and naive but completely formed repertoire. *Blood, 91*(1), 340–346.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9414303)
Google Scholar (http://scholar.google.com/scholar_lookup?title=The%20umbilical%20cord%20blood%20alphabeta%20T-cell%20repertoire%3A%20characteristics%20of%20a%20polyclonal%20and%20naive%20but%20completely%20formed%20repertoire&author=L.%20Garderet&author=N.%20Dulphy&author=C.%20Douay&author=N.%20Chalumeau&author=V.%20Schaeffer&author=MT.%20Zilber&journal=Blood&volume=91&issue=1&pages=340-346&publication_year=1998)

48. Thomson, B. G., Robertson, K. A., Gowan, D., Heilman, D., Broxmeyer, H. E., Emanuel, D., et al. (2000). Analysis of engraftment, graft-versus-host disease, and immune recovery following unrelated donor cord blood transplantation. *Blood, 96*(8), 2703–2711.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11023501)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Analysis%20of%20engraftment%2C%20graft-versus-host%20disease%2C%20and%20immune%20recovery%20following%20unrelated%20donor%20cord%20blood%20transplantation&author=BG.%20Thomson&author=KA.%20Robertson&author=D.%20Gowan&author=D.%20Heilman&author=HE.%20Broxmeyer&author=D.%20Emanuel&journal=Blood&volume=96&issue=8&pages=2703-2711&publication_year=2000)

49. Cardoso, A. A., Li, M. L., Batard, P., Hatzfeld, A., Brown, E. L., Levesque, J. P., et al. (1993). Release from quiescence of CD34+ CD38− human umbilical cord blood cells reveals their potentiality to engraft adults. *Proceedings of the National Academy of Sciences of the United States of America, 90*(18), 8707–8711.
CrossRef (https://doi.org/10.1073/pnas.90.18.8707)

PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7690969)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Release%20from%20quiescence%20of%20CD34%2B%20CD38%E2%88%92%20human%20umbilical%20cord%20blood%20cells%20reveals%20their%20potentiality%20to%20engraft%20adults&author=AA.%20Cardoso&author=ML.%20Li&author=P.%20Batard&author=A.%20Hatzfeld&author=EL.%20Brown&author=JP.%20Levesque&journal=Proceedings%20of%20the%20National%20Academy%20of%20Sciences%20of%20the%20United%20States%20of%20America&volume=90&issue=18&pages=8707-8711&publication_year=1993)

50. Conrad, P. D., & Emerson, S. G. (1998). Ex vivo expansion of hematopoietic cells from umbilical cord blood for clinical transplantation. *Journal of Leukocyte Biology, 64*(2), 147–155.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9715252)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Ex%20vivo%20expansion%20of%20hematopoietic%20cells%20from%20umbilical%20cord%20blood%20for%20clinical%20transplantation&author=PD.%20Conrad&author=SG.%20Emerson&journal=Journal%20of%20Leukocyte%20Biology&volume=64&issue=2&pages=147-155&publication_year=1998)

51. Yin, A. H., Miraglia, S., Zanjani, E. D., Almeida-Porada, G., Ogawa, M., Leary, A. G., et al. (1997). AC133, a novel marker for human hematopoietic stem and progenitor cells. *Blood, 90*(12), 5002–5012.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9389720)
Google Scholar (http://scholar.google.com/scholar_lookup?title=AC133%2C%20a%20novel%20marker%20for%20human%20hematopoietic%20stem%20and%20progenitor%20cells&author=AH.%20Yin&author=S.%20Miraglia&author=ED.%20Zanjani&author=G.%20Almeida-Porada&author=M.%20Ogawa&author=AG.%20Leary&journal=Blood&volume=90&issue=12&pages=5002-5012&publication_year=1997)

52. Kobari, L., Giarratana, M. C., Pflumio, F., Izac, B., Coulombel, L., & Douay, L. (2001). CD133+ cell selection is an alternative to CD34+ cell selection for ex vivo expansion of hematopoietic stem cells. *Journal of Hematotherapy and Stem Cell Research, 10*(2), 273–281.
CrossRef (https://doi.org/10.1089/15258160151134980)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11359674)
Google Scholar (http://scholar.google.com/scholar_lookup?title=CD133%2B%20cell%20selection%20is%20an%20alternative%20to%20CD34%2B%20cell%20selection%20for%20ex%20vivo%20expansion%20of%20hematopoietic%20stem%20cells&author=L.%20Kobari&author=MC.%20Giarratana&author=F.%20Pflumio&author=B.%20Izac&author=L.%20Coulombel&author=L.%20Douay&journal=Journal%20of%20Hematotherapy%20and%20Stem%20Cell%20Research&volume=10&issue=2&pages=273-281&publication_year=2001)

53. Hao, S. G., Sun, G. L., Wu, W. L., & Wu, Y. L. (2003). Studies on the dynamics of biological characteristics of CD133+ cells from human umbilical cord blood during short-term culture. *Zhongguo Shi Yan Xue Ye Xue Za Zhi, 11*(6), 569–575.

PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=14706136)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Studies%20on%20the%20dynamics%20of%20biological%20characteristics%20of%20CD133%2B%20cells%20from%20human%20umbilical%20cord%20blood%20during%20short-term%20culture&author=SG.%20Hao&author=GL.%20Sun&author=WL.%20Wu&author=YL.%20Wu&journal=Zhongguo%20Shi%20Yan%20Xue%20Ye%20Xue%20Za%20Zhi&volume=11&issue=6&pages=569-575&publication_year=2003)

54. Ma, Y., Zou, P., Xiao, J., & Huang, S. (2002). The expression and functional characteristics of AC133 antigen in cord blood hematopoietic cells. *Zhonghua Nei Ke Za Zhi, 41*(12), 798–800.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12654230)
Google Scholar (http://scholar.google.com/scholar_lookup?title=The%20expression%20and%20functional%20characteristics%20of%20AC133%20antigen%20in%20cord%20blood%20hematopoietic%20cells&author=Y.%20Ma&author=P.%20Zou&author=J.%20Xiao&author=S.%20Huang&journal=Zhonghua%20Nei%20Ke%20Za%20Zhi&volume=41&issue=12&pages=798-800&publication_year=2002)

55. Garbuzova-Davis, S., Willing, A. E., Saporta, S., Bickford, P. C., Gemma, C., Chen, N., et al. (2006). Novel cell therapy approaches for brain repair. *Progress in Brain Research, 157*, 207–222.
CrossRef (https://doi.org/10.1016/S0079-6123(06)57014-1)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17046673)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Novel%20cell%20therapy%20approaches%20for%20brain%20repair&author=S.%20Garbuzova-Davis&author=AE.%20Willing&author=S.%20Saporta&author=PC.%20Bickford&author=C.%20Gemma&author=N.%20Chen&journal=Progress%20in%20Brain%20Research&volume=157&pages=207-222&publication_year=2006)

56. Tamaki, S., Eckert, K., He, D., Sutton, R., Doshe, M., Jain, G., et al. (2002). Engraftment of sorted/expanded human central nervous system stem cells from fetal brain. *Journal of Neuroscience Research, 69*(6), 976–986.
CrossRef (https://doi.org/10.1002/jnr.10412)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12205691)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Engraftment%20of%20sorted%2Fexpanded%20human%20central%20nervous%20system%20stem%20cells%20from%20fetal%20brain&author=S.%20Tamaki&author=K.%20Eckert&author=D.%20He&author=R.%20Sutton&author=M.%20Doshe&author=G.%20Jain&journal=Journal%20of%20Neuroscience%20Research&volume=69&issue=6&pages=976-986&publication_year=2002)

57. Uchida, N., Buck, D. W., He, D., Reitsma, M. J., Masek, M., Phan, T. V., et al. (2000). Direct isolation of human central nervous system stem cells. *Proceedings of the National Academy of Sciences of the United States of America, 97*(26), 14720–14725.

CrossRef (https://doi.org/10.1073/pnas.97.26.14720)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11121071)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Direct%20isolation%20of%20human%20central%20nervous%20system%20stem%20cells&author=N.%20Uchida&author=DW.%20Buck&author=D.%20He&author=MJ.%20Reitsma&author=M.%20Masek&author=TV.%20Phan&journal=Proceedings%20of%20the%20National%20Academy%20of%20Sciences%20of%20the%20United%20States%20of%20America&volume=97&issue=26&pages=14720-14725&publication_year=2000)

58. Cheshier, S. H., Kalani, M. Y., Lim, M., Ailles, L., Huhn, S. L., & Weissman, I. L. (2009). A neurosurgeon's guide to stem cells, cancer stem cells, and brain tumor stem cells. *Neurosurgery, 65*(2), 237–249. discussion 249–250; quiz N236.
CrossRef (https://doi.org/10.1227/01.NEU.0000349921.14519.2A)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19625901)
Google Scholar (http://scholar.google.com/scholar_lookup?title=A%20neurosurgeon%E2%80%99s%20guide%20to%20stem%20cells%2C%20cancer%20stem%20cells%2C%20and%20brain%20tumor%20stem%20cells&author=SH.%20Cheshier&author=MY.%20Kalani&author=M.%20Lim&author=L.%20Ailles&author=SL.%20Huhn&author=IL.%20Weissman&journal=Neurosurgery&volume=65&issue=2&pages=237-249&publication_year=2009)

59. Sanchez-Ramos, J. R., Song, S., Kamath, S. G., Zigova, T., Willing, A., Cardozo-Pelaez, F., et al. (2001). Expression of neural markers in human umbilical cord blood. *Experimental Neurology, 171*(1), 109–115.
CrossRef (https://doi.org/10.1006/exnr.2001.7748)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11520125)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Expression%20of%20neural%20markers%20in%20human%20umbilical%20cord%20blood&author=JR.%20Sanchez-Ramos&author=S.%20Song&author=SG.%20Kamath&author=T.%20Zigova&author=A.%20Willing&author=F.%20Cardozo-Pelaez&journal=Experimental%20Neurology&volume=171&issue=1&pages=109-115&publication_year=2001)

60. Bicknese, A. R., Goodwin, H. S., Quinn, C. O., Henderson, V. C., Chien, S. N., & Wall, D. A. (2002). Human umbilical cord blood cells can be induced to express markers for neurons and glia. *Cell Transplantation, 11*(3), 261–264.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12075991)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood%20cells%20can%20be%20induced%20to%20express%20markers%20for%20neurons%20and%20glia&author=AR.%20Bicknese&author=HS.%20Goodwin&author=CO.%20Quinn&author=VC.%20Henderson&author=SN.%20Chien&author=DA.%20Wall&journal=Cell%20Transplantation&volume=11&issue=3&pages=261-264&publication_year=2002)

61. Buzanska, L., Machaj, E. K., Zablocka, B., Pojda, Z., & Domanska-Janik, K. (2002). Human cord blood-derived cells attain neuronal and glial features in vitro.

Journal of Cell Science, 115(Pt 10), 2131–2138.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11973354)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20cord%20blood-derived%20cells%20attain%20neuronal%20and%20glial%20features%20in%20vitro&author=L.%20Buzanska&author=EK.%20Machaj&author=B.%20Zablocka&author=Z.%20Pojda&author=K.%20Domanska-Janik&journal=Journal%20of%20Cell%20Science&volume=115&issue=Pt%2010&pages=2131-2138&publication_year=2002)

62. Jurga, M., Markiewicz, I., Sarnowska, A., Habich, A., Kozlowska, H., Lukomska, B., et al. (2006). Neurogenic potential of human umbilical cord blood: neural-like stem cells depend on previous long-term culture conditions. *Journal of Neuroscience Research, 83*(4), 627–637.
CrossRef (https://doi.org/10.1002/jnr.20766)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16435396)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Neurogenic%20potential%20of%20human%20umbilical%20cord%20blood%3A%20neural-like%20stem%20cells%20depend%20on%20previous%20long-term%20culture%20conditions&author=M.%20Jurga&author=I.%20Markiewicz&author=A.%20Sarnowska&author=A.%20Habich&author=H.%20Kozlowska&author=B.%20Lukomska&journal=Journal%20of%20Neuroscience%20Research&volume=83&issue=4&pages=627-637&publication_year=2006)

63. Zigova, T., Song, S., Willing, A. E., Hudson, J. E., Newman, M. B., Saporta, S., et al. (2002). Human umbilical cord blood cells express neural antigens after transplantation into the developing rat brain. *Cell Transplantation, 11*(3), 265–274.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12075992)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood%20cells%20express%20neural%20antigens%20after%20transplantation%20into%20the%20developing%20rat%20brain&author=T.%20Zigova&author=S.%20Song&author=AE.%20Willing&author=JE.%20Hudson&author=MB.%20Newman&author=S.%20Saporta&journal=Cell%20Transplantation&volume=11&issue=3&pages=265-274&publication_year=2002)

64. Goodwin, H. S., Bicknese, A. R., Chien, S. N., Bogucki, B. D., Quinn, C. O., & Wall, D. A. (2001). Multilineage differentiation activity by cells isolated from umbilical cord blood: expression of bone, fat, and neural markers. *Biology of Blood and Marrow Transplantation, 7*(11), 581–588.
CrossRef (https://doi.org/10.1053/bbmt.2001.v7.pm11760145)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11760145)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Multilineage%20differentiation%20activity%20by%20cells%20isolated%20from%20umbilical%20cord%20blood%3A%20expression%20of%20bone%2C%20fat%2C%20and%20neural%20markers&author=HS.%20Goodwin&author=AR.%20Bicknese&author=SN.%20Chien&author=BD.%20Bogucki&author=CO.%20Qu

inn&author=DA.%20Wall&journal=Biology%20of%20Blood%20and%20Marrow%20Transplantation&volume=7&issue=11&pages=581-588&publication_year=2001)

65. McGuckin, C. P., Forraz, N., Allouard, Q., & Pettengell, R. (2004). Umbilical cord blood stem cells can expand hematopoietic and neuroglial progenitors in vitro. *Experimental Cell Research, 295*(2), 350–359.
CrossRef (https://doi.org/10.1016/j.yexcr.2003.12.028)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15093735)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Umbilical%20cord%20blood%20stem%20cells%20can%20expand%20hematopoietic%20and%20neuroglial%20progenitors%20in%20vitro&author=CP.%20McGuckin&author=N.%20Forraz&author=Q.%20Allouard&author=R.%20Pettengell&journal=Experimental%20Cell%20Research&volume=295&issue=2&pages=350-359&publication_year=2004)

66. Garbuzova-Davis, S., Willing, A. E., Zigova, T., Saporta, S., Justen, E. B., Lane, J. C., et al. (2003). Intravenous administration of human umbilical cord blood cells in a mouse model of amyotrophic lateral sclerosis: distribution, migration, and differentiation. *Journal of Hematotherapy and Stem Cell Research, 12*(3), 255–270.
CrossRef (https://doi.org/10.1089/152581603322022990)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12857367)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Intravenous%20administration%20of%20human%20umbilical%20cord%20blood%20cells%20in%20a%20mouse%20model%20of%20amyotrophic%20lateral%20sclerosis%3A%20distribution%2C%20migration%2C%20and%20differentiation&author=S.%20Garbuzova-Davis&author=AE.%20Willing&author=T.%20Zigova&author=S.%20Saporta&author=EB.%20Justen&author=JC.%20Lane&journal=Journal%20of%20Hematotherapy%20and%20Stem%20Cell%20Research&volume=12&issue=3&pages=255-270&publication_year=2003)

67. Chen, N., Kamath, S., Newcomb, J., Hudson, J., Garbuzova-Davis, S., Bickford, P., et al. (2007). Trophic factor induction of human umbilical cord blood cells in vitro and in vivo. *Journal of Neural Engineering, 4*(2), 130–145.
CrossRef (https://doi.org/10.1088/1741-2560/4/2/013)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17409487)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Trophic%20factor%20induction%20of%20human%20umbilical%20cord%20blood%20cells%20in%20vitro%20and%20in%20vivo&author=N.%20Chen&author=S.%20Kamath&author=J.%20Newcomb&author=J.%20Hudson&author=S.%20Garbuzova-Davis&author=P.%20Bickford&journal=Journal%20of%20Neural%20Engineering&volume=4&issue=2&pages=130-145&publication_year=2007)

68. Darian-Smith, C. (2009). Synaptic plasticity, neurogenesis, and functional recovery after spinal cord injury. *Neuroscientist, 15*(2), 149–165.
CrossRef (https://doi.org/10.1177/1073858408331372)

PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19307422)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Synaptic%20plasticity%2C%20neurogenesis%2C%20and%20functional%20recovery%20after%20spinal%20cord%20injury&author=C.%20Darian-Smith&journal=Neuroscientist&volume=15&issue=2&pages=149-165&publication_year=2009)

69. Schwab, M. E., & Bartholdi, D. (1996). Degeneration and regeneration of axons in the lesioned spinal cord. *Physiological Reviews, 76*(2), 319–370.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=8618960)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Degeneration%20and%20regeneration%20of%20axons%20in%20the%20lesioned%20spinal%20cord&author=ME.%20Schwab&author=D.%20Bartholdi&journal=Physiological%20Reviews&volume=76&issue=2&pages=319-370&publication_year=1996)

70. Waxman, S. G., Ransom, B. R., & Stys, P. K. (1991). Non-synaptic mechanisms of Ca(2+)-mediated injury in CNS white matter. *Trends in Neuroscience, 14*(10), 461–468.
CrossRef (https://doi.org/10.1016/0166-2236(91)90046-W)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Non-synaptic%20mechanisms%20of%20Ca%282%2B%29-mediated%20injury%20in%20CNS%20white%20matter&author=SG.%20Waxman&author=BR.%20Ransom&author=PK.%20Stys&journal=Trends%20in%20Neuroscience&volume=14&issue=10&pages=461-468&publication_year=1991)

71. Li, Y., & Raisman, G. (1994). Schwann cells induce sprouting in motor and sensory axons in the adult rat spinal cord. *Journal of Neuroscience, 14*(7), 4050–4063.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=8027762)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Schwann%20cells%20induce%20sprouting%20in%20motor%20and%20sensory%20axons%20in%20the%20adult%20rat%20spinal%20cord&author=Y.%20Li&author=G.%20Raisman&journal=Journal%20of%20Neuroscience&volume=14&issue=7&pages=4050-4063&publication_year=1994)

72. Fawcett, J. W., & Asher, R. A. (1999). The glial scar and central nervous system repair. *Brain Research Bulletin, 49*(6), 377–391.
CrossRef (https://doi.org/10.1016/S0361-9230(99)00072-6)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10483914)
Google Scholar (http://scholar.google.com/scholar_lookup?title=The%20glial%20scar%20and%20central%20nervous%20system%20repair&author=JW.%20Fawcett&author=RA.%20Asher&journal=Brain%20Research%20Bulletin&volume=49&issue=6&pages=377-391&publication_year=1999)

73. Finkelstein, S. D., Gillespie, J. A., Markowitz, R. S., Johnson, D. D., & Black, P. (1990). Experimental spinal cord injury: qualitative and quantitative histopathologic evaluation. *Journal of Neurotrauma, 7*(1), 29–40.
CrossRef (https://doi.org/10.1089/neu.1990.7.29)

PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=2342117)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Experimental%20spinal%20cord%20injury%3A%20qualitative%20and%20quantitative%20histopathologic%20evaluation&author=SD.%20Finkelstein&author=JA.%20Gillespie&author=RS.%20Markowitz&author=DD.%20Johnson&author=P.%20Black&journal=Journal%20of%20Neurotrauma&volume=7&issue=1&pages=29-40&publication_year=1990)

74. Guest, J. D., Hiester, E. D., & Bunge, R. P. (2005). Demyelination and Schwann cell responses adjacent to injury epicenter cavities following chronic human spinal cord injury. *Experimental Neurology, 192*(2), 384–393.
CrossRef (https://doi.org/10.1016/j.expneurol.2004.11.033)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15755556)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Demyelination%20and%20Schwann%20cell%20responses%20adjacent%20to%20injury%20epicenter%20cavities%20following%20chronic%20human%20spinal%20cord%20injury&author=JD.%20Guest&author=ED.%20Hiester&author=RP.%20Bunge&journal=Experimental%20Neurology&volume=192&issue=2&pages=384-393&publication_year=2005)

75. Crowe, M. J., Bresnahan, J. C., Shuman, S. L., Masters, J. N., & Beattie, M. S. (1997). Apoptosis and delayed degeneration after spinal cord injury in rats and monkeys. *Nature Medicine, 3*(1), 73–76.
CrossRef (https://doi.org/10.1038/nm0197-73)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=8986744)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Apoptosis%20and%20delayed%20degeneration%20after%20spinal%20cord%20injury%20in%20rats%20and%20monkeys&author=MJ.%20Crowe&author=JC.%20Bresnahan&author=SL.%20Shuman&author=JN.%20Masters&author=MS.%20Beattie&journal=Nature%20Medicine&volume=3&issue=1&pages=73-76&publication_year=1997)

76. Dong, H., Fazzaro, A., Xiang, C., Korsmeyer, S. J., Jacquin, M. F., & McDonald, J. W. (2003). Enhanced oligodendrocyte survival after spinal cord injury in Bax-deficient mice and mice with delayed Wallerian degeneration. *J Neurosci, 23*(25), 8682–8691.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=14507967)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Enhanced%20oligodendrocyte%20survival%20after%20spinal%20cord%20injury%20in%20Bax-deficient%20mice%20and%20mice%20with%20delayed%20Wallerian%20degeneration&author=H.%20Dong&author=A.%20Fazzaro&author=C.%20Xiang&author=SJ.%20Korsmeyer&author=MF.%20Jacquin&author=JW.%20McDonald&journal=J%20Neurosci&volume=23&issue=25&pages=8682-8691&publication_year=2003)

77. David, S., & Aguayo, A. J. (1981). Axonal elongation into peripheral nervous system “bridges” after central nervous system injury in adult rats. *Science,*

214(4523), 931–933.
CrossRef (https://doi.org/10.1126/science.6171034)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=6171034)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Axonal%20elongation%20into%20peripheral%20nervous%20system%20%E2%80%9Cbridges%E2%80%9D%20after%20central%20nervous%20system%20injury%20in%20adult%20rats&author=S.%20David&author=AJ.%20Aguayo&journal=Science&volume=214&issue=4523&pages=931-933&publication_year=1981)

78. Caroni, P., & Schwab, M. E. (1988). Antibody against myelin-associated inhibitor of neurite growth neutralizes nonpermissive substrate properties of CNS white matter. *Neuron, 1*(1), 85–96.
CrossRef (https://doi.org/10.1016/0896-6273(88)90212-7)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=3272156)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Antibody%20against%20myelin-associated%20inhibitor%20of%20neurite%20growth%20neutralizes%20nonpermissive%20substrate%20properties%20of%20CNS%20white%20matter&author=P.%20Caroni&author=ME.%20Schwab&journal=Neuron&volume=1&issue=1&pages=85-96&publication_year=1988)

79. Chen, M. S., Huber, A. B., van der Haar, M. E., Frank, M., Schnell, L., Spillmann, A. A., et al. (2000). Nogo-A is a myelin-associated neurite outgrowth inhibitor and an antigen for monoclonal antibody IN-1. *Nature, 403*(6768), 434–439.
CrossRef (https://doi.org/10.1038/35000219)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10667796)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Nogo-A%20is%20a%20myelin-associated%20neurite%20outgrowth%20inhibitor%20and%20an%20antigen%20for%20monoclonal%20antibody%20IN-1&author=MS.%20Chen&author=AB.%20Huber&author=ME.%20Haar&author=M.%20Frank&author=L.%20Schnell&author=AA.%20Spillmann&journal=Nature&volume=403&issue=6768&pages=434-439&publication_year=2000)

80. McKerracher, L., David, S., Jackson, D. L., Kottis, V., Dunn, R. J., & Braun, P. E. (1994). Identification of myelin-associated glycoprotein as a major myelin-derived inhibitor of neurite growth. *Neuron, 13*(4), 805–811.
CrossRef (https://doi.org/10.1016/0896-6273(94)90247-X)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7524558)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Identification%20of%20myelin-associated%20glycoprotein%20as%20a%20major%20myelin-derived%20inhibitor%20of%20neurite%20growth&author=L.%20McKerracher&author=S.%20David&author=DL.%20Jackson&author=V.%20Kottis&author=RJ.%20Dunn&author=PE.%20Braun&journal=Neuron&volume=13&issue=4&pages=805-811&publication_year=1994)

81. Prinjha, R., Moore, S. E., Vinson, M., Blake, S., Morrow, R., Christie, G., et al. (2000). Inhibitor of neurite outgrowth in humans. *Nature, 403*(6768), 383–384.
CrossRef (https://doi.org/10.1038/35000287)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10667780)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Inhibitor%20of%20neurite%20outgrowth%20in%20humans&author=R.%20Prinjha&author=SE.%20Moore&author=M.%20Vinson&author=S.%20Blake&author=R.%20Morrow&author=G.%20Christie&journal=Nature&volume=403&issue=6768&pages=383-384&publication_year=2000)

82. Wang, K. C., Koprivica, V., Kim, J. A., Sivasankaran, R., Guo, Y., Neve, R. L., et al. (2002). Oligodendrocyte-myelin glycoprotein is a Nogo receptor ligand that inhibits neurite outgrowth. *Nature, 417*(6892), 941–944.
CrossRef (https://doi.org/10.1038/nature00867)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12068310)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Oligodendrocyte-myelin%20glycoprotein%20is%20a%20Nogo%20receptor%20ligand%20that%20inhibits%20neurite%20outgrowth&author=KC.%20Wang&author=V.%20Koprivica&author=JA.%20Kim&author=R.%20Sivasankaran&author=Y.%20Guo&author=RL.%20Neve&journal=Nature&volume=417&issue=6892&pages=941-944&publication_year=2002)

83. Hannila, S. S., Siddiq, M. M., & Filbin, M. T. (2007). Therapeutic approaches to promoting axonal regeneration in the adult mammalian spinal cord. *International Review of Neurobiology, 77*, 57–105.
CrossRef (https://doi.org/10.1016/S0074-7742(06)77003-9)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17178472)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Therapeutic%20approaches%20to%20promoting%20axonal%20regeneration%20in%20the%20adult%20mammalian%20spinal%20cord&author=SS.%20Hannila&author=MM.%20Siddiq&author=MT.%20Filbin&journal=International%20Review%20of%20Neurobiology&volume=77&pages=57-105&publication_year=2007)

84. Davies, S. J., Fitch, M. T., Memberg, S. P., Hall, A. K., Raisman, G., & Silver, J. (1997). Regeneration of adult axons in white matter tracts of the central nervous system. *Nature, 390*(6661), 680–683.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9414159)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Regeneration%20of%20adult%20axons%20in%20white%20matter%20tracts%20of%20the%20central%20nervous%20system&author=SJ.%20Davies&author=MT.%20Fitch&author=SP.%20Memberg&author=AK.%20Hall&author=G.%20Raisman&author=J.%20Silver&journal=Nature&volume=390&issue=6661&pages=680-683&publication_year=1997)

85. McDonald, J. W., & Belegu, V. (2006). Demyelination and remyelination after spinal cord injury. *Journal of Neurotrauma, 23*(3–4), 345–359.

CrossRef (https://doi.org/10.1089/neu.2006.23.345)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16629621)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Demyelination%20and%20remyelination%20after%20spinal%20cord%20injury&author=JW.%20McDonald&author=V.%20Belegu&journal=Journal%20of%20Neurotrauma&volume=23&issue=3%E2%80%934&pages=345-359&publication_year=2006)

86. Zhao, Z. M., Li, H. J., Liu, H. Y., Lu, S. H., Yang, R. C., Zhang, Q. J., et al. (2004). Intraspinal transplantation of CD34+ human umbilical cord blood cells after spinal cord hemisection injury improves functional recovery in adult rats. *Cell Transplantation, 13*(2), 113–122.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15129757)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Intraspinal%20transplantation%20of%20CD34%2B%20human%20umbilical%20cord%20blood%20cells%20after%20spinal%20cord%20hemisection%20injury%20improves%20functional%20recovery%20in%20adult%20rats&author=ZM.%20Zhao&author=HJ.%20Li&author=HY.%20Liu&author=SH.%20Lu&author=RC.%20Yang&author=QJ.%20Zhang&journal=Cell%20Transplantation&volume=13&issue=2&pages=113-122&publication_year=2004)

87. Dasari, V. R., Spomar, D. G., Gondi, C. S., Sloffer, C. A., Saving, K. L., Gujrati, M., et al. (2007). Axonal remyelination by cord blood stem cells after spinal cord injury. *Journal of Neurotrauma, 24*(2), 391–410.
CrossRef (https://doi.org/10.1089/neu.2006.0142)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17376002)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Axonal%20remyelination%20by%20cord%20blood%20stem%20cells%20after%20spinal%20cord%20injury&author=VR.%20Dasari&author=DG.%20Spomar&author=CS.%20Gondi&author=CA.%20Sloffer&author=KL.%20Saving&author=M.%20Gujrati&journal=Journal%20of%20Neurotrauma&volume=24&issue=2&pages=391-410&publication_year=2007)

88. Cho, S. R., Yang, M. S., Yim, S. H., Park, J. H., Lee, J. E., Eom, Y. W., et al. (2008). Neurally induced umbilical cord blood cells modestly repair injured spinal cords. *Neuroreport, 19*(13), 1259–1263.
CrossRef (https://doi.org/10.1097/WNR.0b013e3283089234)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=18695504)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Neurally%20induced%20umbilical%20cord%20blood%20cells%20modestly%20repair%20injured%20spinal%20cords&author=SR.%20Cho&author=MS.%20Yang&author=SH.%20Yim&author=JH.%20Park&author=JE.%20Lee&author=YW.%20Eom&journal=Neuroreport&volume=19&issue=13&pages=1259-1263&publication_year=2008)

89. Saporta, S., Kim, J. J., Willing, A. E., Fu, E. S., Davis, C. D., & Sanberg, P. R. (2003). Human umbilical cord blood stem cells infusion in spinal cord injury:

engraftment and beneficial influence on behavior. *Journal of Hematotherapy and Stem Cell Research, 12*(3), 271–278.
CrossRef (https://doi.org/10.1089/152581603322023007)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12857368)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood%20stem%20cells%20infusion%20in%20spinal%20cord%20injury%3A%20engraftment%20and%20beneficial%20influence%20on%20behavior&author=S.%20Saporta&author=JJ.%20Kim&author=AE.%20Willing&author=ES.%20Fu&author=CD.%20Davis&author=PR.%20Sanberg&journal=Journal%20of%20Hematotherapy%20and%20Stem%20Cell%20Research&volume=12&issue=3&pages=271-278&publication_year=2003)

90. Kao, C. H., Chen, S. H., Chio, C. C., & Lin, M. T. (2008). Human umbilical cord blood-derived CD34+ cells may attenuate spinal cord injury by stimulating vascular endothelial and neurotrophic factors. *Shock, 29*(1), 49–55.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17666954)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood-derived%20CD34%2B%20cells%20may%20attenuate%20spinal%20cord%20injury%20by%20stimulating%20vascular%20endothelial%20and%20neurotrophic%20factors&author=CH.%20Kao&author=SH.%20Chen&author=CC.%20Chio&author=MT.%20Lin&journal=Shock&volume=29&issue=1&pages=49-55&publication_year=2008)

91. Kuh, S. U., Cho, Y. E., Yoon, D. H., Kim, K. N., & Ha, Y. (2005). Functional recovery after human umbilical cord blood cells transplantation with brain-derived neutrophic factor into the spinal cord injured rat. *Acta Neurochirurgica (Wien), 147*(9), 985–992. discussion 992.
CrossRef (https://doi.org/10.1007/s00701-005-0538-y)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Functional%20recovery%20after%20human%20umbilical%20cord%20blood%20cells%20transplantation%20with%20brain-derived%20neutrophic%20factor%20into%20the%20spinal%20cord%20injured%20rat&author=SU.%20Kuh&author=YE.%20Cho&author=DH.%20Yoon&author=KN.%20Kim&author=Y.%20Ha&journal=Acta%20Neurochirurgica%20%28Wien%29&volume=147&issue=9&pages=985-992&publication_year=2005)

92. Lim, J. H., Byeon, Y. E., Ryu, H. H., Jeong, Y. H., Lee, Y. W., Kim, W. H., et al. (2007). Transplantation of canine umbilical cord blood-derived mesenchymal stem cells in experimentally induced spinal cord injured dogs. *Journal of Veterinary Science, 8*(3), 275–282.
CrossRef (https://doi.org/10.4142/jvs.2007.8.3.275)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17679775)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Transplantation%20of%20canine%20umbilical%20cord%20blood-derived%20mesenchymal%20stem%20cells%20in%20experimentally%20induced%20spinal%20cord%20injured%20dogs&author=JH.%20Lim&author=YE.%20Byeon&author=HH.%20Ryu&author=YH.%20Jeong&author=YW.%20Lee&autho

r=WH.%20Kim&journal=Journal%20of%20Veterinary%20Science&volume=8&issue=3&pages=275-282&publication_year=2007)

93. Young, W. (2009). Review of lithium effects on brain and blood. *Cell Transplantation, 18*(9), 951–975.
CrossRef (https://doi.org/10.3727/096368909X471251)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19523343)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Review%20of%20lithium%20effects%20on%20brain%20and%20blood&author=W.%20Young&journal=Cell%20Transplantation&volume=18&issue=9&pages=951-975&publication_year=2009)

94. Kang, K. S., Kim, S. W., Oh, Y. H., Yu, J. W., Kim, K. Y., Park, H. K., et al. (2005). A 37-year-old spinal cord-injured female patient, transplanted of multipotent stem cells from human UC blood, with improved sensory perception and mobility, both functionally and morphologically: a case study. *Cytotherapy, 7*(4), 368–373.
CrossRef (https://doi.org/10.1080/14653240500238160)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16162459)
Google Scholar (http://scholar.google.com/scholar_lookup?title=A%2037-year-old%20spinal%20cord-injured%20female%20patient%2C%20transplanted%20of%20multipotent%20stem%20cells%20from%20human%20UC%20blood%2C%20with%20improved%20sensory%20perception%20and%20mobility%2C%20both%20functionally%20and%20morphologically%3A%20a%20case%20study&author=KS.%20Kang&author=SW.%20Kim&author=YH.%20Oh&author=JW.%20Yu&author=KY.%20Kim&author=HK.%20Park&journal=Cytotherapy&volume=7&issue=4&pages=368-373&publication_year=2005)

95. Ha, Y., Choi, J. U., Yoon, D. H., Yeon, D. S., Lee, J. J., Kim, H. O., et al. (2001). Neural phenotype expression of cultured human cord blood cells in vitro. *Neuroreport, 12*(16), 3523–3527.
CrossRef (https://doi.org/10.1097/00001756-200111160-00030)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11733704)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Neural%20phenotype%20expression%20of%20cultured%20human%20cord%20blood%20cells%20in%20vitro&author=Y.%20Ha&author=JU.%20Choi&author=DH.%20Yoon&author=DS.%20Yeon&author=JJ.%20Lee&author=HO.%20Kim&journal=Neuroreport&volume=12&issue=16&pages=3523-3527&publication_year=2001)

96. Xiao, J., Nan, Z., Motooka, Y., & Low, W. C. (2005). Transplantation of a novel cell line population of umbilical cord blood stem cells ameliorates neurological deficits associated with ischemic brain injury. *Stem Cells and Development, 14*(6), 722–733.
CrossRef (https://doi.org/10.1089/scd.2005.14.722)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16433627)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Transplantation%20of%20a%20novel%20cell%20line%20population%20of

%20umbilical%20cord%20blood%20stem%20cells%20ameliorates%20neurological%20deficits%20associated%20with%20ischemic%20brain%20injury&author=J.%20Xiao&author=Z.%20Nan&author=Y.%20Motooka&author=WC.%20Low&journal=Stem%20Cells%20and%20Development&volume=14&issue=6&pages=722-733&publication_year=2005)

97. Borlongan, C. V., Hadman, M., Sanberg, C. D., & Sanberg, P. R. (2004). Central nervous system entry of peripherally injected umbilical cord blood cells is not required for neuroprotection in stroke. *Stroke, 35*(10), 2385–2389.
CrossRef (https://doi.org/10.1161/01.STR.0000141680.49960.d7)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15345799)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Central%20nervous%20system%20entry%20of%20peripherally%20injected%20umbilical%20cord%20blood%20cells%20is%20not%20required%20for%20neuroprotection%20in%20stroke&author=CV.%20Borlongan&author=M.%20Hadman&author=CD.%20Sanberg&author=PR.%20Sanberg&journal=Stroke&volume=35&issue=10&pages=2385-2389&publication_year=2004)

98. Arien-Zakay, H., Lecht, S., Bercu, M. M., Tabakman, R., Kohen, R., Galski, H., et al. (2009). Neuroprotection by cord blood neural progenitors involves antioxidants, neurotrophic and angiogenic factors. *Experimental Neurology, 216*(1), 83–94.
CrossRef (https://doi.org/10.1016/j.expneurol.2008.11.006)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19070617)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Neuroprotection%20by%20cord%20blood%20neural%20progenitors%20involves%20antioxidants%2C%20neurotrophic%20and%20angiogenic%20factors&author=H.%20Arien-Zakay&author=S.%20Lecht&author=MM.%20Bercu&author=R.%20Tabakman&author=R.%20Kohen&author=H.%20Galski&journal=Experimental%20Neurology&volume=216&issue=1&pages=83-94&publication_year=2009)

99. Li, H. J., Liu, H. Y., Zhao, Z. M., Lu, S. H., Yang, R. C., Zhu, H. F., et al. (2004). Transplantation of human umbilical cord stem cells improves neurological function recovery after spinal cord injury in rats. *Zhongguo Yi Xue Ke Xue Yuan Xue Bao, 26*(1), 38–42.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15052772)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Transplantation%20of%20human%20umbilical%20cord%20stem%20cells%20improves%20neurological%20function%20recovery%20after%20spinal%20cord%20injury%20in%20rats&author=HJ.%20Li&author=HY.%20Liu&author=ZM.%20Zhao&author=SH.%20Lu&author=RC.%20Yang&author=HF.%20Zhu&journal=Zhongguo%20Yi%20Xue%20Ke%20Xue%20Yuan%20Xue%20Bao&volume=26&issue=1&pages=38-42&publication_year=2004)

100. Nishio, Y., Koda, M., Kamada, T., Someya, Y., Yoshinaga, K., Okada, S., et al. (2006). The use of hemopoietic stem cells derived from human umbilical cord blood to promote restoration of spinal cord tissue and recovery of hindlimb function in adult rats. *Journal of Neurosurgery Spine, 5*(5), 424–433.

CrossRef (https://doi.org/10.3171/spi.2006.5.5.424)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17120892)
Google Scholar (http://scholar.google.com/scholar_lookup?title=The%20use%20of%20hemopoietic%20stem%20cells%20derived%20from%20human%20umbilical%20cord%20blood%20to%20promote%20restoration%20of%20spinal%20cord%20tissue%20and%20recovery%20of%20hindlimb%20function%20in%20adult%20rats&author=Y.%20Nishio&author=M.%20Koda&author=T.%20Kamada&author=Y.%20Someya&author=K.%20Yoshinaga&author=S.%20Okada&journal=Journal%20of%20Neurosurgery%20Spine&volume=5&issue=5&pages=424-433&publication_year=2006)

101. Dasari, V. R., Spomar, D. G., Li, L., Gujrati, M., Rao, J. S., & Dinh, D. H. (2008). Umbilical cord blood stem cell mediated downregulation of fas improves functional recovery of rats after spinal cord injury. *Neurochemistry Research, 33*(1), 134–149.
CrossRef (https://doi.org/10.1007/s11064-007-9426-6)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Umbilical%20cord%20blood%20stem%20cell%20mediated%20downregulation%20of%20fas%20improves%20functional%20recovery%20of%20rats%20after%20spinal%20cord%20injury&author=VR.%20Dasari&author=DG.%20Spomar&author=L.%20Li&author=M.%20Gujrati&author=JS.%20Rao&author=DH.%20Dinh&journal=Neurochemistry%20Research&volume=33&issue=1&pages=134-149&publication_year=2008)

102. Dasari, V. R., Veeravalli, K. K., Tsung, A. J., Gondi, C. S., Gujrati, M., Dinh, D., et al. (2009). Neuronal apoptosis inhibited by cord blood stem cells after spinal cord injury. *Journal of Neurotrauma, 26*(11), 2057–2069.
CrossRef (https://doi.org/10.1089/neu.2008.0725)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=19469692)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Neuronal%20apoptosis%20inhibited%20by%20cord%20blood%20stem%20cells%20after%20spinal%20cord%20injury&author=VR.%20Dasari&author=KK.%20Veeravalli&author=AJ.%20Tsung&author=CS.%20Gondi&author=M.%20Gujrati&author=D.%20Dinh&journal=Journal%20of%20Neurotrauma&volume=26&issue=11&pages=2057-2069&publication_year=2009)

103. Hall, A. A., Guyer, A. G., Leonardo, C. C., Ajmo, C. T., Jr., Collier, L. A., Willing, A. E., et al. (2009). Human umbilical cord blood cells directly suppress ischemic oligodendrocyte cell death. *Journal of Neuroscience Research, 87*(2), 333–341.
CrossRef (https://doi.org/10.1002/jnr.21857)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=18924174)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood%20cells%20directly%20suppress%20ischemic%20oligodendrocyte%20cell%20death&author=AA.%20Hall&author=AG.%20Guyer&author=CC.%20Leonardo&author=CT.%20Ajmo&author=LA.%20Collier&author=AE.%20Willing&journal=Journal%20of%20Neuroscience%20Research&volume=87&issue=2&pages=333-341&publication_year=2009)

104. Veeravalli, K. K., Dasari, V. R., Tsung, A. J., Dinh, D. H., Gujrati, M., Fassett, D., et al. (2009). Stem cells downregulate the elevated levels of tissue plasminogen activator in rats after spinal cord injury. *Neurochemistry Research, 34*(7), 1183–1194.
CrossRef (https://doi.org/10.1007/s11064-008-9894-3)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Stem%20cells%20downregulate%20the%20elevated%20levels%20of%20tissue%20plasminogen%20activator%20in%20rats%20after%20spinal%20cord%20injury&author=KK.%20Veeravalli&author=VR.%20Dasari&author=AJ.%20Tsung&author=DH.%20Dinh&author=M.%20Gujrati&author=D.%20Fassett&journal=Neurochemistry%20Research&volume=34&issue=7&pages=1183-1194&publication_year=2009)

105. Krupinski, J., Kaluza, J., Kumar, P., Kumar, S., & Wang, J. M. (1994). Role of angiogenesis in patients with cerebral ischemic stroke. *Stroke, 25*(9), 1794–1798.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7521076)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Role%20of%20angiogenesis%20in%20patients%20with%20cerebral%20ischemic%20stroke&author=J.%20Krupinski&author=J.%20Kaluza&author=P.%20Kumar&author=S.%20Kumar&author=JM.%20Wang&journal=Stroke&volume=25&issue=9&pages=1794-1798&publication_year=1994)

106. Teng, H., Zhang, Z. G., Wang, L., Zhang, R. L., Zhang, L., Morris, D., et al. (2008). Coupling of angiogenesis and neurogenesis in cultured endothelial cells and neural progenitor cells after stroke. *Journal of Cerebral Blood Flow and Metabolism, 28*(4), 764–771.
CrossRef (https://doi.org/10.1038/sj.jcbfm.9600573)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17971789)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Coupling%20of%20angiogenesis%20and%20neurogenesis%20in%20cultured%20endothelial%20cells%20and%20neural%20progenitor%20cells%20after%20stroke&author=H.%20Teng&author=ZG.%20Zhang&author=L.%20Wang&author=RL.%20Zhang&author=L.%20Zhang&author=D.%20Morris&journal=Journal%20of%20Cerebral%20Blood%20Flow%20and%20Metabolism&volume=28&issue=4&pages=764-771&publication_year=2008)

107. Rizvanov, A. A., Kiyasov, A. P., Gaziziov, I. M., Yilmaz, T. S., Kaligin, M. S., Andreeva, D. I., et al. (2008). Human umbilical cord blood cells transfected with VEGF and L(1)CAM do not differentiate into neurons but transform into vascular endothelial cells and secrete neuro-trophic factors to support neuro-genesis-a novel approach in stem cell therapy. *Neurochemistry International, 53*(6–8), 389–394.
CrossRef (https://doi.org/10.1016/j.neuint.2008.09.011)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=18948156)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Human%20umbilical%20cord%20blood%20cells%20transfected%20with%20VEGF%20and%20L%281%29CAM%20do%20not%20differentiate%20into%20neurons%20but%20transform%20into%20vascular%20endothelial%20cells%20and%20secrete%20neuro-trophic%20factors%20to%20support%20neuro-

genesis-a%20novel%20approach%20in%20stem%20cell%20therapy&author=AA.%20Rizvanov&author=AP.%20Kiyasov&author=IM.%20Gaziziov&author=TS.%20Yilmaz&author=MS.%20Kaligin&author=DI.%20Andreeva&journal=Neurochemistry%20International&volume=53&issue=6%E2%80%938&pages=389-394&publication_year=2008)

108. Vendrame, M., Gemma, C., de Mesquita, D., Collier, L., Bickford, P. C., Sanberg, C. D., et al. (2005). Anti-inflammatory effects of human cord blood cells in a rat model of stroke. *Stem Cells and Development, 14*(5), 595–604.
CrossRef (https://doi.org/10.1089/scd.2005.14.595)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16305344)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Anti-inflammatory%20effects%20of%20human%20cord%20blood%20cells%20in%20a%20rat%20model%20of%20stroke&author=M.%20Vendrame&author=C.%20Gemma&author=D.%20Mesquita&author=L.%20Collier&author=PC.%20Bickford&author=CD.%20Sanberg&journal=Stem%20Cells%20and%20Development&volume=14&issue=5&pages=595-604&publication_year=2005)

109. Vendrame, M., Gemma, C., Pennypacker, K. R., Bickford, P. C., Davis Sanberg, C., Sanberg, P. R., et al. (2006). Cord blood rescues stroke-induced changes in splenocyte phenotype and function. *Experimental Neurology, 199*(1), 191–200.
CrossRef (https://doi.org/10.1016/j.expneurol.2006.03.017)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16713598)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Cord%20blood%20rescues%20stroke-induced%20changes%20in%20splenocyte%20phenotype%20and%20function&author=M.%20Vendrame&author=C.%20Gemma&author=KR.%20Pennypacker&author=PC.%20Bickford&author=C.%20Davis%20Sanberg&author=PR.%20Sanberg&journal=Experimental%20Neurology&volume=199&issue=1&pages=191-200&publication_year=2006)

110. Hu, C. H., Wu, G. F., Wang, X. Q., Yang, Y. H., Du, Z. M., He, X. H., et al. (2006). Transplanted human umbilical cord blood mononuclear cells improve left ventricular function through angiogenesis in myocardial infarction. *Chinese Medical Journal (Engl), 119*(18), 1499–1506.
Google Scholar (http://scholar.google.com/scholar_lookup?title=Transplanted%20human%20umbilical%20cord%20blood%20mononuclear%20cells%20improve%20left%20ventricular%20function%20through%20angiogenesis%20in%20myocardial%20infarction&author=CH.%20Hu&author=GF.%20Wu&author=XQ.%20Wang&author=YH.%20Yang&author=ZM.%20Du&author=XH.%20He&journal=Chinese%20Medical%20Journal%20%28Engl%29&volume=119&issue=18&pages=1499-1506&publication_year=2006)

111. Kim, B. O., Tian, H., Prasongsukarn, K., Wu, J., Angoulvant, D., Wnendt, S., et al. (2005). Cell transplantation improves ventricular function after a myocardial infarction: a preclinical study of human unrestricted somatic stem cells in a porcine model. *Circulation, 112*(9 Suppl), I96–104.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16159872)

Google Scholar (http://scholar.google.com/scholar_lookup?title=Cell%20transplantation%20improves%20ventricular%20function%20after%20a%20myocardial%20infarction%3A%20a%20preclinical%20study%20of%20human%20unrestricted%20somatic%20stem%20cells%20in%20a%20porcine%20model&author=BO.%20Kim&author=H.%20Tian&author=K.%20Prasongsukarn&author=J.%20Wu&author=D.%20Angoulvant&author=S.%20Wnendt&journal=Circulation&volume=112&issue=9%20Suppl&pages=I96-104&publication_year=2005)

112. Pesce, M., Orlandi, A., Iachininoto, M. G., Straino, S., Torella, A. R., Rizzuti, V., et al. (2003). Myoendothelial differentiation of human umbilical cord blood-derived stem cells in ischemic limb tissues. *Circulation Research, 93*(5), e51–62.
CrossRef (https://doi.org/10.1161/01.RES.0000090624.04507.45)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12919944)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Myoendothelial%20differentiation%20of%20human%20umbilical%20cord%20blood-derived%20stem%20cells%20in%20ischemic%20limb%20tissues&author=M.%20Pesce&author=A.%20Orlandi&author=MG.%20Iachininoto&author=S.%20Straino&author=AR.%20Torella&author=V.%20Rizzuti&journal=Circulation%20Research&volume=93&issue=5&pages=e51-62&publication_year=2003)

113. Jang, J. H., Kim, S. K., Choi, J. E., Kim, Y. J., Lee, H. W., Kang, S. Y., et al. (2007). Endothelial progenitor cell differentiation using cryopreserved, umbilical cord blood-derived mononuclear cells. *Acta Pharmacologica Sinica, 28*(3), 367–374.
CrossRef (https://doi.org/10.1111/j.1745-7254.2007.00519.x)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17302999)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Endothelial%20progenitor%20cell%20differentiation%20using%20cryopreserved%2C%20umbilical%20cord%20blood-derived%20mononuclear%20cells&author=JH.%20Jang&author=SK.%20Kim&author=JE.%20Choi&author=YJ.%20Kim&author=HW.%20Lee&author=SY.%20Kang&journal=Acta%20Pharmacologica%20Sinica&volume=28&issue=3&pages=367-374&publication_year=2007)

114. Ding, D. C., Shyu, W. C., Chiang, M. F., Lin, S. Z., Chang, Y. C., Wang, H. J., et al. (2007). Enhancement of neuroplasticity through upregulation of beta1-integrin in human umbilical cord-derived stromal cell implanted stroke model. *Neurobiology of Disease, 27*(3), 339–353.
CrossRef (https://doi.org/10.1016/j.nbd.2007.06.010)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17651977)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Enhancement%20of%20neuroplasticity%20through%20upregulation%20of%20beta1-integrin%20in%20human%20umbilical%20cord-derived%20stromal%20cell%20implanted%20stroke%20model&author=DC.%20Ding&author=WC.%20Shyu&author=MF.%20Chiang&author=SZ.%20Lin&author=YC.%20Chang&author=HJ.%20Wang&journal=Neurobiology%20of%20Disease&volume=27&issue=3&pages=339-353&publication_year=2007)

115. Taguchi, A., Soma, T., Tanaka, H., Kanda, T., Nishimura, H., Yoshikawa, H., et al. (2004). Administration of CD34+ cells after stroke enhances neurogenesis via angiogenesis in a mouse model. *Journal of Clinical Investigation, 114*(3), 330–338.
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15286799)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Administration%20of%20CD34%2B%20cells%20after%20stroke%20enhances%20neurogenesis%20via%20angiogenesis%20in%20a%20mouse%20model&author=A.%20Taguchi&author=T.%20Soma&author=H.%20Tanaka&author=T.%20Kanda&author=H.%20Nishimura&author=H.%20Yoshikawa&journal=Journal%20of%20Clinical%20Investigation&volume=114&issue=3&pages=330-338&publication_year=2004)

116. Chen, C. T., Foo, N. H., Liu, W. S., & Chen, S. H. (2008). Infusion of human umbilical cord blood cells ameliorates hind limb dysfunction in experimental spinal cord injury through anti-inflammatory, vasculogenic and neurotrophic mechanisms. *Pediatrics and Neonatology, 49*(3), 77–83.
CrossRef (https://doi.org/10.1016/S1875-9572(08)60017-0)
PubMed (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=18947003)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Infusion%20of%20human%20umbilical%20cord%20blood%20cells%20ameliorates%20hind%20limb%20dysfunction%20in%20experimental%20spinal%20cord%20injury%20through%20anti-inflammatory%2C%20vasculogenic%20and%20neurotrophic%20mechanisms&author=CT.%20Chen&author=NH.%20Foo&author=WS.%20Liu&author=SH.%20Chen&journal=Pediatrics%20and%20Neonatology&volume=49&issue=3&pages=77-83&publication_year=2008)

Copyright information

About this article

Cite this article as:
Park, DH., Lee, JH., Borlongan, C.V. et al. Stem Cell Rev and Rep (2011) 7: 181. https://doi.org/10.1007/s12015-010-9163-0

- DOI (Digital Object Identifier) https://doi.org/10.1007/s12015-010-9163-0
- Publisher Name Humana Press Inc
- Print ISSN 1550-8943
- Online ISSN 1558-6804

- About this journal
- Reprints and Permissions

Personalised recommendations