Stem cell therapy essay

Health & Medicine

Sepulveda Bio. Anthro. Tues 6-9 Cell Replacement and Stem Cell Therapy to Treat Neurodegenerative Disease Stem cell therapy is being used to treat neurodegenerative diseases such as amyotrophic lateral sclerosis or ALS, commonly referred to as Lou Gehrig’s disease. The disease itself, new therapies and treatments, along with a cure are currently being studied by universities and stem cell researchers. ALS is a progressive neurodegenerative disease which attacks the neurons in the brain and spinal cord that control voluntary movement, eventually leading to respiratoryfailureand death (Kamel et al. 2008). The current course of action for a patient with ALS is physical therapy and, if their budget allows, cell replacement therapy. However there is presently no cure and the patient will eventually have respiratory problems and die from the disease. Adult stem cells (ASCs) and blastocyst or embryonic stem cells (ESCs) are being used to treat amyotrophic lateral sclerosis in cell replacement therapy, yet this only slows the degeneration of their neurons (Goldman, Windrem, 2006).

Research for both adult stem cell and blastocyst stem cell technologies are the only practical option in approaching a cure or more effective treatment for ALS. Both of these technologies require stem cells, but are challenging to safely retrieve and utilize through the current treatment methods, which is why it is essential to continue to support and fund this research. Cell replacement therapy is currently the only stem cell treatment of neurodegenerative diseases such as ALS, but researchers are trying to find new ways of treating and possibly curing ALS.

Cell augmentation using stem cells could be the future of treatment for ALS but scientists are currently working to increase availability of the needed

ESCs and ASCs to treat patients using cell replacement therapy. There are three different ways to harvest the necessary stem cells for neuron replacement: growing ESCs in vitro, harvesting stem cells from the brain or spinal cord of a live donor through biopsy, and harvesting from the brain or spinal cord of a donor post mortem (Sohur et. al. , 2006). The goal of treatment of ALS is to slow and eventually stop cell loss progressing to the point of functional impairment.

To accomplish this goal, protecting the remaining neurons as well as replacing and augmenting damaged neurons is important. The ultimate goal, to cure ALS, is to fully restore authentic neuronal circuitry or " full systemsreconstruction" (Ormerod et. al. 2008). Full systems reconstruction would consist of recreating a map of precisely patterned neurons of the correct type using the stem cells to send projections to the appropriate field within the brain. The cure seems virtually impossible with thetechnologycurrently available, but recreating neurogenesis may be possible in the future.

Adult stem cell harvesting is difficult and costly when retrieving the stem cells needed to treat neurodegenerative diseases from brain matter or spinal fluid. Neurons are very specific cells in the brain and spinal cord and possess a special set of neurotransmitters depending on their function; this poses problems when harvesting ASCs (Zhang et. al. , 2006). The ASCs needed to treat ALS must be able to specialize and replace degenerating neurons affected by the disease. This procedure would not be possible without using stem cells to replace the damaged and degenerating neurons.

However a problem associated with ASCs is rejection of foreign cells when transplanting ASCs taken through biopsy from a donor. Although biopsy from the patient receiving treatment is an option, the ASCs required come from the brain or spinal cord and can be very dangerous to harvest this way. Adult neural stem cells can be harvested from brain tissue, either from a deceased donor or through biopsy, and then grown in aculture(Ormerod et. al. , 2008). ASCs will not expand nearly as much as ESCs in culture and will differentiate into a limited number of neuron types.

When using ESCs, which conform to the necessary specialized type of neurons, the lack of flexibility encountered in the ASCs is eliminated. Human embryonic stem cells (ESCs), however difficult to harvest initially, will multiply greatly when grown in culture. The ESCs are generated by in vitro fertilization and grown into the blastocyst stage before harvesting. The advantages of ESCs are boundless; the results of the therapy would not be obtainable without use of the stem cells to replace the damaged cells.

The ease and frequency with which ESCs can be expanded in culture is a significant advantage over ASCs. Growing such high numbers of stem cells in this fashion can prove problematic though, while the cells reproduce indefinitely they become more susceptible to mutation and may cause tumors following transplant (Ormerod et. al. , 2008). Thus, a challenge rises to differentiate the cells fully before transplant or to grow many more cultures from different donor eggs, which are difficult and expensive to receive.

ESCs are more easily specialized into neurons, oligodendrocytes, and glia needed to treat ALS than ASCs; but the possibility of tumors forming in the patient along with the cost and complication of creating new chains of blastocysts from donor eggs pose a disadvantage of using this technology (Ormerod et. al. , 2008). Taking into consideration ESC technology's advantages and disadvantages, it is equally as viable an approach to a cure for ALS as ASC technology. ALS is an extremely destructive disease which unfortunately plagues a large population.

ALS is difficult to treat because it is a neurodegenerative disease and requires brain surgery and neuron replacement. Both adult stem cell and embryonic stem cell therapies have potential to increase the quality of life for patients with ALS but they both have their own individual inherent risk that must be taken into account by the patient and doctors when choosing a stem cell therapy method. Donors are few and far between and the necessary cells are very specific for this particular procedure.

Through an increase in research and development of new ways to multiply and store stem cells, along with an increase in donors, the road toward a cure will be a short one. Hopefully in the future the treatment will become easier, less costly, and less dangerous for the patient. Works Cited Larsen CS. 2010. Essentials of Physical Anthropology: Discovering Our Origins. New York and London: W. W. Norton & Company Ormerod, B. K. , Palmer, T. D. , & Maeve, A. C. (2008). Neurodegeneration and cell replacement. Philosophical Transactions: Biological , 363(1489), 153-170.

Retrieved from http://www. jstor. org/stable/20210044 Sohur, U. S. , Emsley, J. G. , Mitchell, B. D. , & Macklis, J. D. (2006). Adult neurogenesis and cellular brain repair with neural progenitors, precursors and stem cells. Philosophical Transactions: Biological Sciences, 361(1473), 1477-1497. Retrieved from http://www. jstor. org/stable/20209745 Kamel,, F. , Umbach, D. M. , Stallone, L. , Richards, M. , Hu, H. , & Sandler, D. P. (2008). Association of lead exposure with survival in amyotrophic lateral sclerosis.

EvironmentalHealthPerspectives, 116(7), 943-947. Retrieved from http://www. jstor. org/stable/25071103 Goldman, S. A. , & Windrem, M. S. (2006). Cell replacement therapy in neurological disease. Philosophical Transactions: Biological Sciences, 361(1473), 1463-1475. Retrieved from http://www. jstor. org/stable/20209744 Zhang, S. , Li, X. , Johnson, A. , & Pankratz, M. T. (2006). Human embryonic stem cells for brain repair?. Philosophical Transactions: Biological Sciences, 363(1489), 87-99. Retrieved from http://www. jstor. org/stable/20210040