

Neural Stem Cells to Treat Diseases of the Central Nervous System

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Introduction

Many diseases and injuries of the central nervous system leave patients with life threatening or life altering injuries. The central nervous system is a complicated system that leaves scientists asking more questions than finding answers.

Huntington's disease, Niemann-Pick's disease, stroke, spinal cord injuries, and malignant glioblastomas are just a few central nervous system diseases and injuries. Huntington's disease is a genetic disorder where the brain degenerates and the patient loses muscle control. Niemann-Pick's disease is when the body lacks an enzyme (acid sphingomyelinase) that breaks down lipids. Malignant glioblastomas are the most common and deadliest form of brain tumors.

Research

Neural stem cell therapy has the potential to cure and treat many central nervous system injuries and diseases. Neural stem cells have been documented to migrate to tumors and injured or degenerated tissues.

Since the treatment will be given by injection, there is no need for risky surgeries, it takes the guess work out of targeting the inflicted site, and it will take care of wide spread damage or degeneration.

These stem cells will be able to be engineered from either pluripotent (embryonic) or multipotent (fetal and adult) stem cells, which makes the treatment more accessible.

Although neural stem cell therapy is not in trial stages for most diseases, it has been tested on subjects with Niemann-Pick's disease with positive results. Neural stem cells that are genetically reprogrammed to express acid sphingomyelinase have been reversing the abnormalities in lysosomal storage. The treatment has also been documented with significant results in animal test subjects with multiple sclerosis.

Problems

There have already been some difficulties while trying to create this treatment. It is not in the trial stages yet, so the full list of complications is still unknown.

One problem is the risk of infection. Since this treatment will be administered through

a needle, there is a risk for infection at the site of injection.

A recent discovery of a new network of cells in brain tumors is making the treatment for glioblastomas more difficult than expected. The most abundant cell in this network is brain tumor stem cells. All of the other cells inside of the brain tumor originate from the brain tumor stem cells. The similarity between brain tumor stem cells and neural stem cells leads to the theory that brain tumor stem cells originate from mutated neural stem cells. With the discovery of brain tumor stem cells, the neural stem cell will have to be genetically engineered to target the cells with "suicide genes" and they have to be monitored to make sure the injected neural stem cells do not mutate.

Future

Since there is not a successful treatment yet, the exact future of the possibility of a neural stem cell treatment is still unclear. Genetic engineering has to advance more to program neural stem cells to target certain cells and to make them secrete high doses of drugs. Discoveries on the cellular level must be made to understand stem cells more and the origins of some of these diseases.

With the discovery of neural stem cells migratory characteristics, other tumors and diseases may be able to be solved in a similar fashion in the future.

Resources

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