

# Treatment of Brain Cancer using Stem Cell and Neurodegeneration

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## Introduction

Neurodegeneration is the progressive structural and functional loss of neurons, including neuronal death. Neuronal cells do not replace as they cannot replicate resulting in progressive loss of structure and function resulting in brain damage. Few of the noted neurodegenerative disorders among the several are Alzheimer's Disease, Parkinson's Diseases, Huntington's Disease, etc.

Neurodegeneration is the progressive loss of structure or function of neurons, including their death. Many Neurodegenerative Diseases-including amyotrophic lateral sclerosis, multiple sclerosis, Parkinson's disease, Alzheimer's Disease, Huntington's Disease, and Prion Diseases-occur as a result of neurodegenerative processes. Such diseases are incurable, resulting in progressive degeneration of neurons. As research progresses, many similarities appear that relate these diseases to one another on a sub-cellular level. Discovering these similarities offers hope for therapeutic advances that could ameliorate many diseases simultaneously. There are many parallels between different neurodegenerative disorders including atypical protein assemblies as well as induced cell death. Neurodegeneration can be found in many different levels of neuronal circuitry ranging from molecular to systemic.

In multicellular organisms, stem cells are undifferentiated or partially differentiated cells that can differentiate into various types of cells and proliferate indefinitely to produce more of the same stem cell. They are the earliest type of cell in a cell lineage. They are found in both embryonic and adult organisms, but they have slightly different properties in each. They are usually distinguished from progenitor cells, which cannot divide indefinitely, and precursor or blast cells, which are usually committed to differentiating into one cell type. In mammals, roughly 50-150 cells make up the inner cell mass during the blastocyst stage of embryonic development, around days 5-14. These have stem-cell capability. *In Vivo* they eventually differentiate into all of the body's cell types. This process starts with the differentiation into the three germ layers - the ectoderm, mesoderm and endoderm-at the gastrulation stage. However, when they are isolated and cultured *in Vitro*, they can be kept in the stem-cell stage and are known as embryonic stem cells.

Adult stem cells are found in a few select locations in the body, known as niches, such as those in the bone marrow or gonads. They exist to replenish rapidly lost cell types and are multipotent or omnipotent, meaning they only differentiate into a few cell types or one cell type. In mammals, they include, among others, hematopoietic stem cells, which replenish blood and immune cells, basal cells, which maintain the skin epithelium, and mesenchyme stem cells, which maintain bone, cartilage, muscle and fat cells. Adult stem cells are a small minority of cells; they are vastly outnumbered by the progenitor cells and terminally differentiated cells that they differentiate into.

## Conclusion

Research into stem cells grew out of findings by Canadian biologists Ernest A. McCulloch, James E. Till and Andrew J. Becker at the University of Toronto in the 1960s. As of 2016, the only established medical therapy using stem cells is hematopoietic stem cell transplantation, first performed in 1958 by French oncologist Georges Mathew. Since 1998 however, it has been possible to culture and differentiate human embryonic stem cells. The process of isolating these cells has been controversial, because it typically results in the destruction of the embryo. Sources for isolating ESCs have been restricted in some European countries and Canada, but others such as the UK and China have promoted the research. Somatic cell nuclear transfer is a cloning method that can be used to create a cloned embryo for the use of its embryonic stem cells in stem cell therapy. In 2006, a Japanese team led by Shinya Yamanaka discovered a method to convert mature body cells back into stem cells. These were termed induced pluripotent stem cells.

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