

Nerve Regeneration Part II

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There are four main approaches that scientists are exploring to try to regenerate nerves. They are: gene therapy, stem cell therapy, guidance channels, and neurotrophic growth factors.

Gene therapy is defined as the genetic modification of cells to produce a therapeutic effect. The genetic modifications can be carried out in cultured cells that are then administered to the patient (ex vivo approach) or involve modifications of cells (in vivo approach). Most early studies of gene therapy involved attempts to replace a defective gene with a normal copy of that gene in patients with single gene-genetic disorders. Other work involves the genetic modification of cells to produce a therapeutic effect in complex diseases in which the genetic bases are not completely understood.

Stem cell therapy is another approach to nerve regeneration. Stem cells are considered to be the wonder cells of the body by many scientists because they are capable of dividing as well as providing any of the differentiated or specialized cells of the body. Stem cells may be used as a source of therapy for any of the cells found in the body, including bone marrow cells, muscle cells, and nerve cells. There are two main types of stem cells, embryonic stem cells and adult stem cells. Embryonic stem cells are present at such an early stage of development and because of that they have the potential to grow into and

possess the function of any cell found in the body. Adult stem cells are found within many organs of the body and have the ability to differentiate into several different cell types.

Nerve guidance channels are also another approach to nerve regeneration. A nerve guidance channel can be considered as a scaffold, which is important for the reconstruction of severed nerves. It acts like bridge between the two ends of the regenerating nerve. The primary function is to act as a guide for the growth cone of the proximal stump to navigate toward the distal stump.

Neurotrophic factors are another approach to nerve regeneration. Neurotrophins are a family of growth factors that serve to promote the growth and survival of neurons. They are large protein molecules produced by the nervous system cells that regulate cell division, cell survival, and neurite outgrowth. Neurotrophins will bind to a specific tyrosine kinase receptor on a nerve terminal. The signal can then be carried through the axon to the cell body where it tells the cell what to do. Some types of neurotrophic growth factors include: Nerve Growth Factor (NGF), Neurotrophin-3 (NT-3), and Fibroblast Growth Factor, basic (bFGF).