Regenerative Medicine

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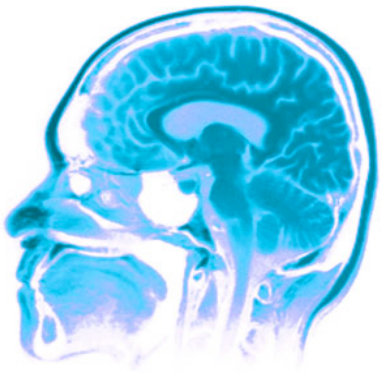

Regenerative medicine is a new and exciting field of biotechnology that has a promising future. Scientist and engineers are able to grow cells and tissues that can be used to replace or repair damaged tissues and organs.

Fetal tissue grafts are a new procedure that helps alleviate the symptoms of neurodegenerative diseases such as Parkinson's and Alzheimer's disease. Unlike most adult neurons that cannot repair themselves, fetal neurons can divide. These fetal neurons are then introduced into the injured area(s) of the brain with hopes that they will establish connections with other neurons and replace the damaged ones.

Fetal tissue grafts are also being used to help fix spinal cord injuries. The approach is to graft fetal or adult neurons into the damaged area of the spinal cord. This is to "bridge" the severed cord.

Approximately 8 million organ and tissue transplantation surgeries occur in the United States each year.

An autograft is when a patient's own tissue is transplanted from one area of the body to another. This procedure is used in coronary bypass operations. They remove segments of vein from the leg and connect them to arteries in the heart.

Organ transplantations can be rejected if the immune system of the recipient recognizes that the organ is foreign. Tissue typing proteins are used to see if the organ is compatible with the recipient. These proteins are a group of genes called the major histocompatability complex (MHC).

Xenotransplantation is the transfer of organs from different species.

The first animal-human organ transplant in a child was performed in 1984 by doctors at Loma Linda University Medical Center in California. This involved transplanting a baboon heart into Baby Fae, a 12-day-old girl. The transplant lasted for 3 weeks due to organ rejection complications.

Although primates are great candidates for providing organs, pigs are being used in trials. Worries are that pigs may transmit viruses causing organ rejection. Scientists have now cloned pigs that may help overcome those fears. By using nuclear transfer cloning and gene knockout techniques, researchers have created cloned piglets that lack a gene that causes the immune system of humans to reject the organs. This gene is called GGTA1; which produces a sugar on the surface of pig tissues, which would cause rejection.

Cellular therapeutics "involves using cells to replace defective tissues or to deliver important biological molecules." By using living cells that have been encapsulated into tiny plastic beads or tubes called biocapsules, we can avoid rejection. These biocapsules may contain genetically engineered cells that are designed to produce therapeutic molecules like recombinant proteins.

These biocapsules are permeable to nutrient exchange and the molecules within are able to escape to the surrounding tissues or bloodstream. These capsules also protect the molecules within from antibodies and immune cells. Capsules containing insulin-producing cells from the pancreas may be implanted into a person with type I diabetes. They may have to be replaced every so many months, but is more convenient than everyday injections.

1. Palladino, Thieman. Introduction to Biotechnology, Pearson Education, Inc., CA. 2004
2. http://www.fi.edu/brain/index.htm
3. http://www.stonetavernfarm.com/barnyard.htm