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What is Stem Cell Research?

Stem cell research represents an entirely new approach to healing a large array of diseases, injuries and birth defects. The discovery of stem cells, and their use in medical therapies, is considered by many scientists to be the most promising field in biomedical research today. This revolutionary science is thought to have the potential to cure a large number is diseases, injuries and birth defects, including cancer, diabetes, heat disease, Alzheimer's, Parkinson's, spinal cord injury, osteoporosis, ALS, multiple sclerosis, liver and kidney disease and many more.

The principle behind stem cell treatments is relatively simple—replacing diseased, injured or dead cells with healthy, living ones that will take over the functions of those that have been lost. These healthy cells become a permanent part of the body, dividing and reproducing themselves, replacing sick tissues and restoring lost functions. Stem cells are the versatile "parent" cells that have the ability to develop into more specialized cell types. They can be used to grow specific cell types in the lab, and these cells can then be transplanted into a sick patient who needs them.

There are several different kinds of stem cells. The "master" stem cells, which can give rise to every cell type of the human body, are **embryonic stem cells**. These cells are derived from very early-stage embryos, during the first few days of cellular division. Also called pluripotent stem cells, these versatile cells exist only during a very brief window of time in the early embryo. After about seven days of cellular division, the cells will have begun to specialize, meaning that they are no longer pluripotent.

Another type of stem cells, which are found throughout the fully developed body, are **adult stem cells**. These cells are considered to be **multipotent**, meaning that they are more specialized than embryonic stem cells, and can give rise to a limited number of other cell types. An example of an adult stem cell is the stem cells found in bone marrow. These cells can give rise to all the blood and immune cells, but so far they have not been proven to produce brain, kidney or liver cells. Adult stem cells have been identified in several organs, but scientists are not sure whether all of the body's organs produce their own stem cells.

Another recently discovered source of stem cells is **umbilical cord blood**. The stem cells found in a baby's umbilical cord blood are not embryonic stem cells—they are multipotent, and are considered to be adult stem cells. It is not yet known how many or what kind of cells can be derived from this source, but scientists believe that they will come to have some applications in the treatment of disease

Without the ability to genetically match stem cells to the patient's DNA, stem cell transplants face the same danger as organ transplants—rejection. **Therapeutic cloning**, also called somatic cell nuclear transfer or simply **nuclear transfer**, is a technique for creating embryonic stem cells that are genetically matched to a patient. The technique entails fusing a cell taken from the patient with an egg cell. Within 5 – 7 days, pluripotent stem cells will arise. These stem cells are immediately separated and put into lab dishes, where they can divide indefinitely and produce any cell type that the patient needs. Separating the stem cells from the inner cell mass of the egg, or embryo, ends any possibility that the embryo could grow into a baby.