



Fact Sheet

Stem Cells and Biomedical Research in California

California has recently made history with the passage of Proposition 71. Proposition 71 authorized \$3 billion in bonds (an average of \$295 million for the next three years) to fund stem cell research at California universities, pharmaceutical companies, hospitals, and other research institutions throughout the state. Proposition 71 also created a state agency called the California Institute for Regenerative Medicine that will oversee all of the research.

Why is stem cell research important?

Stem cell research holds great possibilities for improving human and animal health. Researchers believe stem cells can replace diseased cells, potentially reversing symptoms in ill patients. Many treatments and cures for major diseases such as cancer, Parkinson's, Alzheimer's, HIV/AIDS, and many others. Stem cell research is vital to the future of biomedical research. Stem cells are unspecialized cells that renew themselves and for long periods through cell division. Another way that stem cells vary from regular cells is that under certain conditions, they can be induced to become cells with specific functions such as the beating cell of the heart muscle or the insulin-producing cells of the pancreas.

Research using stem cells has produced significant results. For example, a recent study done at the Reeve-Irvine Research institute, involved a mouse suffering from a spinal cord injury. In this study, the mouse could only move by dragging its feet behind its body and was unable to lift its tail. This is similar to a human suffering from a spinal cord injury. The researcher then injected the mouse with human embryonic stem cells and as a result, the mouse was able to lift its tail high, and could carry its own weight and move around, although a bit clumsily.

Stem cell research hasn't only produced results in animal models. Significant progress has been made in the treatment of individuals suffering from diabetes and other ailments as well. In a recent experiment, pancreatic cells grown from stem cells were implanted into an individual suffering from diabetes. The pancreatic cells began producing insulin. In another example, stem cells in a donor's bone marrow are used to replace the blood cells of the patients suffering from leukemia and other cancers. In addition, experiments are being done where grafts of new skin cells are taken to treat victims of serious burn injuries and stem cells are also being used to grow new corneas for the visually impaired.

What is the specific role of a stem cell?

Stem cells serve as a repair system for the body and can divide repeatedly to replenish other cells for as long as a human or an animal is alive. When a stem cell divides, each new cell has the potential to either remain a stem cell or become another type of cell with a specialized function, such as a muscle cell, a red blood cell, or a brain cell. There are three classes of stem cells.

Where do stem cells come from?

Over 20 years ago, scientists found a way to derive stem cells from mice. After many additional years of study of mouse stem cells, in the late 1990's scientists discovered how to isolate the stem cells found in human embryos and then grow the cells in laboratories.

The first class of stem cells is called totipotent, meaning that its potential is total; it gives rise to all the different types of cells in the body. The second class of stem cells can give rise to a small number of

different cell types are generally called multipotent. The third class of stem cells are called pluripotent stem cells that can give rise to any type of cell in the body except those needed to develop a fetus.

What is the difference between embryonic stem cells and adult stem cells?

Both embryonic and adult stem cells have the potential to develop into many different cell types in the body. However, they differ in the number and type of cells they can become. Embryonic stem cells can become all cell types, while adult stem cells are limited to the number and type of cells they can become within a tissue or organ.

Embryonic stem cells are cells that come from embryos. These cells develop from an egg that has been fertilized. Embryonic stem cells are developed in a laboratory via in-vitro fertilization and are then donated for research. They are not developed from eggs that have already been fertilized in a female's body.

Adult stem cells are cells that have not changed from their original cell type. They can be found among other cells that have already changed into another cell type within a tissue or organ. Adult stem cells can then develop into other specialized cell types of the tissue or organ. The main role of adult stem cells is to serve as a repair tool for the tissue or organ where they are found.

What is Therapeutic Cloning of Stem Cells?

Therapeutic cloning or Somatic Cell Nuclear Transfer (SCNT) is specific method of producing cells for research and testing. The nucleus of an unfertilized egg is replaced with material from the nucleus of a somatic cell, (i.e. a skin, heart, or nerve cell). When the cell begins to divide, stem cells are taken and used for research.

This type of cloning offers hope for advances in many areas of medical research. Its main objective is to produce cells and tissues for therapy that have the same DNA as the recipient, and will not be rejected by the recipient's body. Human cloning of this type differs substantially from "cloning of a human" or reproductive cloning. In this type of cloning, only cells are cloned whereas in human reproductive cloning, the intent is to create a human baby.

How will California, in particular, benefit from this Proposition?

There will be a substantial increase in funding for stem cell research that could not otherwise, be funded by federal research grants. Also, the benefits to the economy are manifold. One major benefit is that this funding is specifically designated to California, which in return could draw many of the world's leading scientists to research institutions in the state. Other jobs will also be created as a result of this Proposition, attracting many individuals to the state and resulting other economic growth.

The Independent Citizens Oversight Commission will govern the California Institute for Regenerative Medicine. The Commission will be comprised of 29 individuals from California universities, pharmaceutical companies, hospitals, and other research institutions. These individuals will be responsible for managing all final decisions on research standards and awards. They will receive advice from various working groups that have been set up under the initiative.

**Please note: Some of the above information was obtained from the National Institutes of Health, the Stem Cell Research Foundation, and the Wisconsin Association for Biomedical Research & Education (WABRE) Bioscience Wisconsin 2004.*

TO SUPPORT THE ADVANCEMENT OF HUMAN AND ANIMAL HEALTH BY PROMOTING AND PROTECTING BIOMEDICAL RESEARCH AND TEACHING.