

# Stem Cell Therapy: What Is It, What Can It Do?

By Julie Cargill, R.N., A.N.P., G.N.P., retired

You've heard about stem cells in the news, and perhaps you've wondered if they might help you or a loved one with a serious disease. I have a friend who had stem cell knee injections this past summer, and is fairly happy with the results. I wondered what exactly what are stem cells, and how are they being used to treat such conditions. I do remember that they were the subject of vigorous debate in the past. It seems after I reviewed several sources, that stem cells and derived products offer great promise for new medical treatments.

In this article I discuss types of stem cells, current and possible future uses, ethical issues, and the state of research and practice. Here are some answers to frequently asked questions about stem cells.

## **Stem Cells—what are they?**

Stem cells are often termed the body's "master cells", because they are the body's raw materials — they can generate new cells with programmed specialized functions. Under the right conditions in the body or a laboratory, stem cells divide to form more cells called daughter cells. These daughter cells either become new stem cells or specialized cells with a specific function, such as blood cells, brain cells, heart muscle cells or bone cells. No other cell in the body has the natural ability to generate new cell types.

## **How could this be useful to me?**

Researchers and the medical profession hope stem cell studies can us help to:

- Increase understanding of how diseases occur. By watching stem cells mature into cells in various organs and tissue, researchers may better understand how certain diseases and conditions develop.
- Generate healthy cells to replace diseased cells (regenerative medicine). Stem cells are guided into becoming specific cells that can be used to regenerate and repair diseased or damaged tissues. People who might benefit from stem cell therapies include those with spinal cord injuries, type 1 diabetes, HIV, Parkinson's disease, amyotrophic lateral sclerosis, Alzheimer's disease, heart disease, stroke, burns, cancer and osteoarthritis.
- Further development and use in research for drug safety and quality.
- Develop alternatives to current medical approaches which have suboptimal results. E.g., current therapy for common disorders such as osteoarthritis includes pain control with medications including opioids, which does not correct the pathology. However, stem cell therapy may work to decrease inflammation, promote regeneration of healthy tissue,

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modulate the immune system, reduce scar tissue, and eliminate the need for medications such as opioids.

## What is the source of stem cells?

There are several sources of stem cells: embryonic, adult and perinatal.

- Embryonic stem cells come from very early-stage embryos. They can divide into more stem cells or can become another type of cell. This versatility allows embryonic stem cells to be used to regenerate or repair diseased tissue and even organs. Embryonic cells are used from embryos which will not be sustained.
- Adult stem cells are found in small numbers in some adult tissues such as bone marrow or fat. Compared with embryonic stem cells, adult stem cells are more limited in their ability to change into other types of cells, although new evidence suggests they may also be able to create various types of cells including bone or heart muscle cells, similar to embryonic cells.
- Perinatal stem cells exist in amniotic fluid as well as umbilical cord blood. Researchers identified stem cells in amniotic fluid drawn from pregnant women to test for abnormalities. Umbilical cord stem cells are harvested right at birth, with consent from the parent.

## Why is there a controversy about using embryonic stem cells?

Embryonic stem cells are obtained from early-stage embryos — a group of cells that forms when a woman's egg is fertilized with sperm in an in vitro fertilization clinic (the proverbial "test tube"). Since these embryonic stem cells are extracted from human embryos, issues have been raised about the ethics of embryonic stem cell research on the medical ethics and religious basis.

The National Institutes of Health created guidelines for human stem cell research in 2009 which define embryonic stem cells and how they may be used in research, and include recommendations for the donation of embryonic stem cells. Most therapy centers now use alternatives to embryonic stem cells.

## What is stem cell therapy (regenerative medicine) and how does it work?

Stem cell therapy, also known as regenerative medicine, promotes the repair response of diseased, dysfunctional or injured tissue using stem cells. It is the next version of organ transplantation, using stem cells instead of donor organs. Donor organs are limited in supply, and many candidates cannot wait the extended time required. Since researchers grow stem cells in a lab which are manipulated to specialize into specific types of cells, these can then potentially become the required heart muscle, cartilage, blood or nerve cells and be implanted

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into a person. Researchers have already shown that adult bone marrow cells can be guided to becoming heart-like cells and repair heart tissue.

## **What is therapeutic cloning, and what benefits might it offer?**

This is performed by removing the cell nucleus from an unfertilized egg, and injecting with a donor's cell nucleus to form a line of stem cells that is genetically identical to the donor's cells — in essence, a clone. Theoretically, these cells are less likely to be rejected once transplanted back into the donor. Again, these are methods being studied carefully in research.

## **Have stem cells already been used to treat diseases?**

Yes, absolutely. There are several stem cell/regenerative medicine centers in Arizona. You can search for them online. These centers usually offer adult stem cell or perinatal sources for treatments.

## **Precautions in considering stem cell therapy:**

- Become aware of potential side contra-indications for certain stem cell therapies. You will be screened for existing conditions which may be a problem.
- Make sure the therapy you are considering is FDA approved or under an Investigational Application from the FDA
- Be aware of safety risks such as possible cell contamination, and other possible complications. The agency you consult with should inform you completely about these risks.
- Cost: one Regenerative Medicine clinic in Scottsdale quoted typical therapy courses ranging from \$5,800 to \$15,000, depending on components of the therapy. Most insurances do not reimburse for this cost. Treatment centers may offer payment plans.

## References:

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