



## Stem cell FAQs

[What is a stem cell?](#)

[Why are stem cells important from a medical perspective?](#)

[How are stem cells being used today?](#)

[Where do scientists get stem cells?](#)

---

### What is a stem cell?

A stem cell is an immature cell that has the potential to become specialized into different types of cells throughout the body.

There are two basic types of stem cells: adult stem cells and embryonic stem cells. Embryonic stem cells are produced when a newly fertilized egg begins to divide. These stem cells can become any type of cell in the body.

Adult stem cells – somewhat of a misnomer because they can also be found in infants and children – are stem cells that reside in already developed tissue. These stem cells can act like a repair system, dividing regularly to provide new specialized cells to take the place of those that die or are lost. Tissues where adult stem cells have been found include the brain, blood, muscle, skin and bone. Research with adult stem cells has been limited due to the difficulty in growing and differentiating them under laboratory conditions.

### Why are stem cells important from a medical perspective?

For decades, researchers have been studying the biology of stem cells to figure out how development works and to find new ways of treating health problems. Because stem cells can give rise to any tissue found in the body, they provide nearly limitless potential for medical applications.

Current studies are researching how stem cells may be used to prevent or cure diseases and injuries such as Parkinson's disease, type 1 diabetes, heart disease, spinal cord injury, Duchene's muscular dystrophy, Alzheimer's disease, strokes, burns, osteoarthritis, rheumatoid arthritis, vision, and hearing loss. Stem cells could also be used someday to replace or repair tissue damaged by disease or injury.

### How are stem cells being used today?

Stem cell procedures currently provide life-saving treatments for patients with leukemia, lymphoma, other blood disorders, and some solid tumors. The three main technologies in use today are:

- *Adult stem cell transplant: bone marrow stem cells*  
Stem cell technology has been used for more than 20 years in bone marrow transplants, where the patient's bone marrow stem cells are replaced with those from a healthy, matching donor. If the transplant is successful, the stem cells will migrate into the patient's bone marrow and begin producing new, healthy leukocytes to replace the abnormal cells.
- *Adult stem cell transplant: peripheral blood stem cells (PBSCs)*  
While most blood stem cells reside in the bone marrow, a small number are present in the bloodstream. PBSCs can be obtained from drawn blood, making them easier to collect than bone marrow stem cells. However, PBSCs are sparse in the bloodstream, so collecting enough to perform a transplant can pose a challenge.
- *Umbilical cord blood stem cell transplant*  
Umbilical cords traditionally have been discarded as a by-product of the birth process. In recent years,

however, the stem-cell-rich blood found in the umbilical cord has proven **useful in treating the same types of health problems as those treated using bone marrow stem cells and PBSCs.**

### **Where do scientists get stem cells?**

This is the main area of debate that surrounds this technology. Adult stem cells can be removed from adult tissues with little harmful effect on the individual while embryonic stem cells are derived from multicellular embryos that have been cultured in the laboratory.

Numerous regulatory and ethical constraints exist for the use of embryos in research. There is also a limited number of human embryonic cell lines available for research that meet all criteria for federal funding, but many scientists remain skeptical over the quality of these cells.

Following is a list of current and potential sources of stem cells:

- Early embryos created by in vitro fertilization - either those which are not needed for infertility treatment (sometimes called spare embryos) or created specifically for research;
- Early embryos created by somatic (body) cell nuclear transfer (SCNT), a procedure that bypasses the normal fertilization process by taking the genetic material from a cell in an adult's body and fusing it with an empty egg cell. This is a form of therapeutic cloning, which would allow cells to be customized for each individual and thereby minimize the chances of tissue rejection;
- Germ cells or organs of an aborted fetus;
- Blood cells of the umbilical cord at the time of birth;
- Some adult tissues (such as bone marrow);
- Mature adult tissue cells reprogrammed to behave like stem cells