

There are three basic types or forms of stem cells:-

- Embryonic stem cells
- Adult stem cells
- Pluripotent stem cells.

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Embryonic Stem Cells

[Look up this term's definition](#) Embryonic stem cells, as their name suggests, are derived from embryos. Most embryonic stem cells are derived from embryos that develop from eggs that have been fertilized [Look up this term's definition](#) in an [Look up this term's definition](#) in vitro fertilization clinic and then donated for research purposes with informed consent of the donors. They are not derived from eggs fertilized in a woman's body.

Although the potential of embryonic stem cells is enormous, many ethical and political issues accompany their use. Mention the term "stem cells" to family and friends, though, and you are likely to get a variety of responses and opinions. Why is this? Probably because much of the early research on these cells originated from human embryos, and there are many ethical and legal debates about the procurement and usage of these cells.

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However, scientists are now utilizing stem cells of different origins; opening up the research and treatment options for humans and pets. Differing from embryonic stem cells, adult stem cells are procured from a variety of tissues, including skin, fat (adipose) and bone marrow, among other tissues. Adult stem cells are less controversial because the samples are easily obtained and the "host" is not destroyed, as with an embryo

Adult Stem Cell

An adult stem cell - which is present in us in all ages, is derived from an embryonic stem cell which we obviously all have at birth. Adult stem cells are found throughout the body after embryonic development.

The use of adult stem cells in research and therapy is not as controversial as embryonic stem cells, because the production of adult stem cells does not require the destruction of an embryo.

One of the difference between embryonic and adult stem cells is that adult stem cells are already partially differentiated - meaning that once you obtain them and expand them, it is a lot easier to turn them into the specific type of tissues being targetted.

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Adult mesenchymal (stromal) stem cells (MSC) offer a potentially very large therapeutic potential in the field of regenerative medicine. In [cell biology](http://en.wikipedia.org/wiki/Cell_biology), stromal cells are [connective tissue](http://en.wikipedia.org/wiki/Connective_tissue) cells of an [organ](http://en.wikipedia.org/wiki/Organ_(biology))

found in the loose connective tissue. These are most often associated with the [uterine](http://en.wikipedia.org/wiki/Uterus "Uterus") [mucosa](http://en.wikipedia.org/wiki/Mucosa "Mucosa") ([endometrium](http://en.wikipedia.org/wiki/Endometrium "Endometrium")), [prostate](http://en.wikipedia.org/wiki/Prostate "Prostate"), [bone marrow](http://en.wikipedia.org/wiki/Bone_marrow "Bone marrow") precursor cells, and the [ovary](http://en.wikipedia.org/wiki/Ovary "Ovary") as well as the [hematopoietic system](http://en.wikipedia.org/wiki/Hematopoietic_system "Hematopoietic system") and elsewhere. These are the cells that make up the support structure of biological tissues and support the [parenchymal cells](http://en.wikipedia.org/wiki/Parenchymal_cells "Parenchymal cells").

Originally identified as a source of osteoprogenitor cells, MSCs differentiate into adipocytes, chondrocytes, osteoblasts, and myoblasts in vitro ([Hauner et al., 1987](http://www.ncbi.nlm.nih.gov/pubmed/3546356) ; [Grigoradis et al., 1988](http://www.ncbi.nlm.nih.gov/pubmed/3384856) ; [Wakitani et al., 1995](http://www.ncbi.nlm.nih.gov/pubmed/7477065) ; [Ferrari et al., 1998](http://www.ncbi.nlm.nih.gov/pubmed/9488650) ; [Johnstone et al., 1998](http://www.ncbi.nlm.nih.gov/pubmed/9457080) ; [Pittenger et al., 1999](http://www.ncbi.nlm.nih.gov/pubmed/10102814)) and undergo differentiation in vivo ([Benayahu et al., 1989](http://www.ncbi.nlm.nih.gov/pubmed/2544612) ; [Bruder et al., 1998a](http://www.ncbi.nlm.nih.gov/pubmed/9621889)), making these stem cells promising candidates for mesodermal defect repair and disease management.

The initial concentration of researchers was on MSCs from the bone marrow. However, the clinical use of MSCs from the bone marrow has presented problems, including low cell number upon harvest, pain, morbidity. This has led many researchers to investigate alternate sources for MSCs. Adipose tissue contains a large number of stromal stem cells. Because it is easy to obtain in large quantities, adipose tissue has been found to be an ideal source of uncultured stromal stem cells. Adipose tissue, like bone marrow, is derived from the mesenchyme and contains a supportive stroma that is easily isolated. Being abundant, accessible, and replenishable, adipose tissue is an attractive source for adult stem cells that can be isolated from the adipose tissue by collagenase digestion and differential centrifugation.

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[Fibroblasts](http://en.wikipedia.org/wiki/Fibroblasts "Fibroblasts"), [immune cells](http://en.wikipedia.org/wiki/Immune_cells "Immune cells"), [pericytes](http://en.wikipedia.org/wiki/Pericytes "Pericytes"), [endothelial cells](http://en.wikipedia.org/wiki/Endothelial_cells "Endothelial cells"), and [inflammatory cells](http://en.wikipedia.org/wiki/Inflammation#Cellular_component "Inflammation") are the most common types of stromal cells.

Stromal cells near the bottom of the

[epidermis](http://en.wikipedia.org/wiki/Epidermis_%28skin%29 "Epidermis (skin)") (the very top layer of the skin) release

[growth factors](http://en.wikipedia.org/wiki/Growth_factors "Growth factors") that

promote [cell division](http://en.wikipedia.org/wiki/Cell_division "Cell division"). This keeps the epidermis regenerating from the bottom while the top layer of cells on the epidermis are constantly being "sloughed" off of the body.

Induced Pluripotent Cells

[Induced pluripotent stem cells \(iPSCs\)](#) are adult cells that have been genetically reprogrammed to an embryonic stem cell-like state by being forced to express genes and factors important for maintaining the defining properties of embryonic stem cells.

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