

[Family Research Council, www.frc.org, 2005]

For additional information see also:

Benefits of Stem Cells to Human Patients
Adult Stem Cells v. Embryonic Stem Cells
<http://www.stemcellresearch.org/facts/treatments.htm>

References for these Adult Stem Cell Treatments:
<http://www.stemcellresearch.org/facts/asc-refs.pdf>

Stem Cell News and Resources
<http://www.lifesite.net/features/stemcellembryo/index.html>

The Current Status of Adult and Embryonic Stem Cell Research, by John B. Shea, MD, FRCP
<http://www.lifesite.net/features/stemcellembryo/statusapril2002.html>

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Pamphlet 499

Stem Cell Primer: The Basics

Physicians for Life

What is a Stem Cell?

A stem cell is essentially a “blank” cell, capable of becoming another more differentiated cell type in the body, such as a skin cell, a muscle cell, or a nerve cell.

Why are Stem Cells Important?

Stem cells can be used to replace or heal damaged tissues and cells in the body.

What are the 2 Broad Classes of Stem Cells?

Two basic types of stem cells are **embryonic type** and **adult type** (adult type includes all types that do not destroy a human embryo).

Embryonic (Embryo-Destructive) Type

Embryonic Stem Cells

Embryonic Germ Cells

Adult Type

Umbilical Cord Stem Cells

Placental Stem Cells

Adult Stem Cells (from blood, bone marrow, all body tissue, hair follicles, deciduous (baby) teeth, etc)

Where do Embryonic Type Stem Cells Come From?

EMBRYOS – Embryonic stem cells are obtained by harvesting living human embryos which are generally 5-7 days old. The removal of embryonic stem cells historically results in the destruction of the human embryo.

FETUSES – Another kind of stem cell, called an embryonic germ cell, can be obtained from either miscarriages or aborted human fetuses. [“Fetus” is a Latin word for “offspring” or “young one”.]

Where do Adult Type Stem Cells Come From?

UMBILICAL CORD BLOOD, PLACENTAS, AMNIOTIC FLUID, WHARTON'S JELLY – Adult type stem cells can be derived from various pregnancy related tissues.

ADULT TISSUES – In adults, stem cells are present within various tissues and organ systems. These include the bone marrow, liver, epidermis, retina, skeletal muscle, intestine, brain, dental pulp, hair follicles, olfactory mucosa (nose), and elsewhere. Even fat obtained from liposuction has been shown to contain significant numbers of adult type stem cells.

CADAVERS – Neural stem cells have been removed from specific areas in post-mortem human brains as late as 20 hours following death.

How Do Embryonic and Adult Stem Cells Compare?

EMBRYONIC STEM CELL ADVANTAGES

- 1 Flexible – appear to have the potential to make any cell
- 2 Immortal – one embryonic stem cell line can potentially provide an endless supply of cells with defined characteristics
- 3 Availability – embryos from in vitro fertilization centers

EMBRYONIC STEM CELL DISADVANTAGES

- 1 Difficult to differentiate uniformly and homogeneously into a target tissue.
- 2 Immunogenic – embryonic stem cells from a random embryo donor are likely to be rejected after transplantation.
- 3 Tumorigenic – Capable of forming tumors or promoting tumor formation.
- 4 Destruction of developing human life.

ADULT STEM CELL ADVANTAGES

- 1 Special adult type stem cells from bone marrow and from umbilical cords (from the blood and from Wharton’s Jelly) have been isolated recently which appear to be as flexible as the embryonic type.
- 2 Already somewhat specialized – inducement may be simpler.

3 Not immunogenic – recipients who receive the products of their own stem cells will not experience immune rejection.

4 Relative ease of procurement – wome adult stem cells are easy to harvest (skin, muscle, marrow, fat, hair follicles), while others may be more difficult to obtain (brain stem cells). Umbilical and placental stem cells are likely to be readily available.

5 Non-tumorigenic – tend not to form tumors.

6 No harm done to the donor.

ADULT STEM CELL DISADVANTAGES

1. Limited quantity – can sometimes be difficult to obtain in large numbers (waning problem)
2. Finite – may not live as long as embryonic stem cells in culture (waning problem)
3. Less flexible (with the exception of #1 above advantages) – may be more difficult to reprogram to form other tissue types. [more recent research is finding that several types of adult stem cells are now considered “pluripotent” and even “totipotent”, making them very similar to embryonic stem cells.]

Thus, these 3 Adult Stem Cell "Disadvantages" are being overcome with time and research.