

The Science of Human Stem Cell Research

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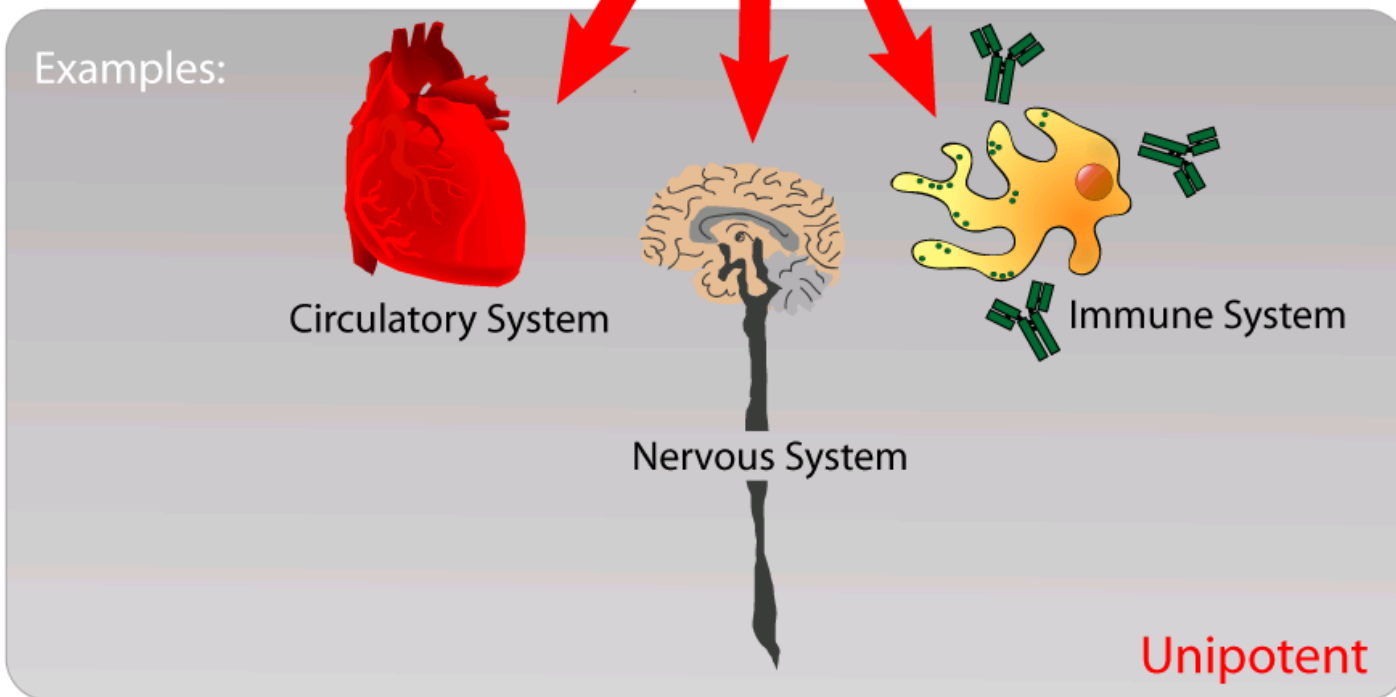
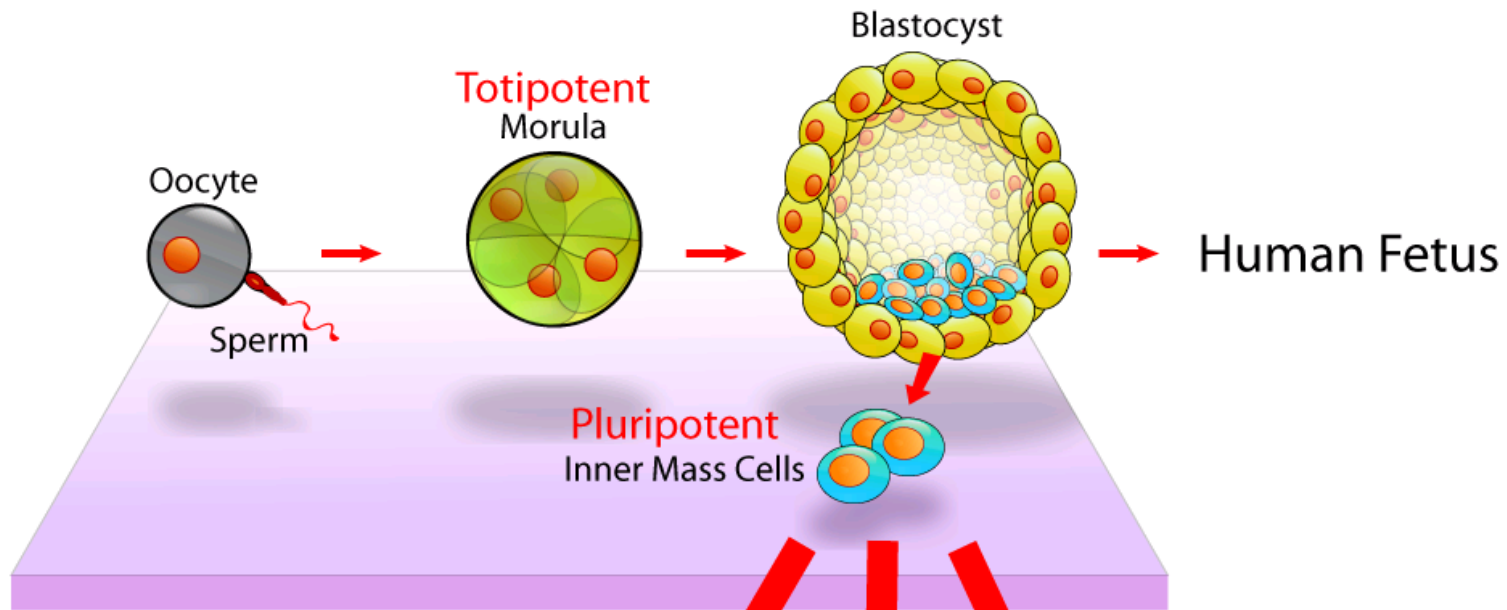
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What are stem cells?

- Stem cells are found in almost all multi-cellular organisms.
- Stem cells have two key properties:
 - The capacity for self-renewal; and
 - The capacity to differentiate into specialized cell types (potency).





Three types of human stem cells of interest to researchers.

- Embryonic stem cells.
 - Derived from inner cell mass of fertilized egg or somatic cell nuclear transfer
- Adult stem cells.
 - Isolated from various organs and tissues.
- Induced pluripotent stem cells (iPS).
 - Derived from adult somatic cells through genetic manipulation.



Embryonic stem cells.

Potency: Pluripotent.

Advantage: Potency.
Easily derived and cultured.
Therapeutic promise.

Disadvantage: Ethically problematic(?).
Concerns about “cloning.”
Limits on egg donation.
Not yet clinically proven(?).



Adult stem cells.

Potency: Mostly multipotent.

Advantage: Not ethically problematic.
Already proven clinically.

Disadvantage: Potency and self-renewal.
Not as easily isolated.
Ineffective for genetic disorders.



Induced pluripotent stem cells (iPS).

Potency: Pluripotent.

Advantage: Not ethically problematic(?).

Disadvantage: Genetic manipulation.
Not yet clinically proven(?).



Current and Potential Stem Cell Therapies.

Some proven and established stem cell-based therapies are already available:

1. Bone marrow transplants; and
2. Cord blood transplants.

These reintroduce hematopoietic (blood-producing) stem cells into cancer patients receiving high-dose chemo or radiation.



Current and Potential Stem Cell Therapies (2).

Other conditions that researchers hope to treat using stem cell therapies include:

1. Brain damage;
2. Spinal cord injuries;
3. ALS (Lou Gerhig's Disease).
4. Heart damage;
5. Blindness; and
6. Hematopoetic disorders.



Recommendations.

- Continue to loosen restrictions and increase federal funding for stem cell research.
- Fund all areas of stem cell research (embryonic, adult and iPS).
- Encourage scientifically-sound public discussion of the ethical, legal and political issues surrounding stem cells.

