



Questions about Embryonic Stem Cells

Where do ES cells come from?

- Embryonic stem cells (ES cells) come from leftover in vitro fertilization (IVF) embryos created in a laboratory dish for the purpose of treating infertility. Those embryos not implanted can be donated for research, otherwise they are discarded or frozen. ES cells come from these very early-stage embryos (about 6 days after fertilization). These embryos, called blastocysts at this stage, contain about 50 cells and have not yet developed into tissues.
- ES cells do not come from aborted fetuses.
- One blastocyst may produce a number of cell lines that can be kept in culture for years. That is, the cells are capable of replicating themselves in laboratory conditions in what is called a cell line. Many studies can be done on this cell line, so blastocysts are not destroyed every time new studies are performed.

How are ES cells different from other stem cells?

- ES cells are pluripotent, meaning they can become all 220 mature cell types in the human body. Adult stem cells can be obtained from tissues in the body and are also early-stage cells, but they can only become the specialized cell types present in the tissue from which they were obtained, so they are called multipotent.
- ES cells can self-renew and divide indefinitely providing potentially unlimited amounts of cells, but adult stem cells have a limited ability to divide in culture due to senescence (aging process).
- Recently, mature cells have been genetically reprogrammed to become pluripotent. Called induced pluripotent stem cells, (iPS cells), they appear to be similar to ES cells. However, new research has shown that they may age sooner than ES cells. Also, parts of the genetic information in these new cells may not undergo complete reprogramming, which could cause problems if used in patients.

What are ES cells used for?

- ES cells are powerful tools for research on early reproduction and development, causes of birth defects, and miscarriage. They also shed light on the origins of numerous diseases and disorders, such as Parkinson's, ALS, Huntington's, Alzheimer's, spinal muscular atrophy, multiple sclerosis, arthritis, musculoskeletal disease, skin disease, leukemia, lymphoma, hearing loss, vision loss, diabetes and heart disease.
- ES cells and their derivatives are being used to develop new drugs and test for drug toxicity.
- ES cells may be used to produce cells and tissues that can be transplanted into patients to treat a variety of diseases. In 2010, the Federal Food and Drug Administration approved the first two clinical trials involving ES cells, one for spinal cord injury and the other for juvenile macular degeneration.

Is there oversight for ES cell research?

- The U.S. National Academies of Science and the International Society for Stem Cell Research have provided guidelines for the ethical creation of ES cell lines and for proper research practices involving these lines. These guidelines are updated to address any new ethical issues that might arise.
- Research institutions, such as the University of Wisconsin-Madison, have special oversight committees that must review and approve all ES cell research on campus.
- Any research on ES cells using federal funds must be done using formally approved cell lines and must adhere to strict guidelines set forth by the National Institutes of Health.