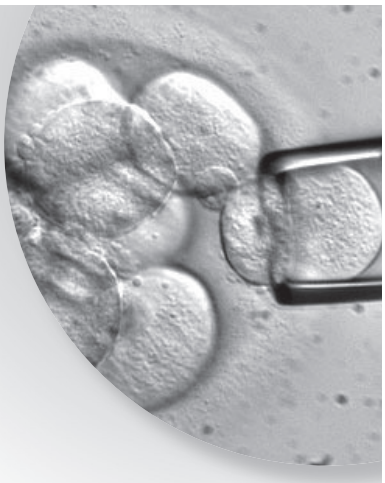
Let's Talk



Stem Cells

Pupil Background Information

Most types of cells (muscle, blood, bone) have particular functions. Stem cells are different because they can:

1) Make other cell types, and;
2) Make copies of themselves so they don't run out.

Current stem cell therapies

Stem cells are used to treat thousands of patients with blood cancers such as leukaemia, using blood stem cells in bone marrow taken from the patient themselves, or from a donor. Other examples include; the use of skin stems cells for skin grafts and the treatment of Parkinson's disease using stem cells to replace nerve cells which have been destroyed.

Types of stem cells

There are different types of stem cells:

- **Tissue stem cells** are taken from a specific tissue and can only develop into that cell type (multipotent). These cells are naturally used by the body to replace damaged or diseased cells. Only a few tissues have these stem cells, such as gut, skin and blood.
- **Embryonic stem cells** - these are grown in the laboratory from cells found in the early embryo and can make nearly all the cell types in our body. These are the most useful type of stem cells - this ability to develop into almost any kind of cell is known as pluripotent. Embryonic stem cells are usually taken from embryos left over from in vitro fertilisation (IVF) treatments for infertility, where egg and sperm are combined in a test tube and the embryo implanted back into the woman.
- **Induced pluripotent stem cells (iPSCs)** - these are specialised cells that have been reprogrammed to have the pluripotent ability found in embryonic stem cells. They offer great hope for the future and do not have the ethical concerns associated with embryonic stem cells.

The future

Stem cells are an important biological resource for the advancement of human medicine, because they can be grown in large quantities yet still produce all the cell types produced in the body. Stem cells can help in:

- Offering new therapies such as repair of spinal injuries, wound healing and cartilage repair.
- Testing millions of new drugs in a 'human environment'.
- Testing the function of large numbers of genes generated from the Human Genome Project.
- Reducing the need for animal testing of new drugs and therapies.
- Offering new cell therapies to correct genetic disorders.
- Studying disease onset and progression.

All embryonic stem cell research in the UK is regulated by the Human Fertilisation and Embryology Act (1990). Only research to find cures for serious diseases or fertility research is permitted, and embryos can only be used up to 14 days after fertilisation. Embryos must be donated by fully informed donors giving their consent or created by non-reproductive stem cell cloning.

In 2003 the UK Stem cell bank was set up to provide researchers with ethically sourced cells grown under the highest quality control standards. These cells will reduce the need to create new lines from embryos and will allow essential repetition of experiments.

More detailed information can be found at:

- http://www.eurostemcell.org/
- http://www.bbsrc.ac.uk/stemcellsresource/
- http://www.wellcome.ac.uk/Education-resources/Education-and-learning/Big-Picture/All-issues/The-Cell/WTDV030778.htm
- http://www.crm.ed.ac.uk/research