Regenerative and Cellular Sciences

An Interactive Workshop - Adult Stem Cells: The Science

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An Interactive Workshop

ADULT STEM CELLS: THE SCIENCE

ADVANTAGES

Adult stem cells already have **established clinical applications** (eg: leukaemia treatment is an example of ASC use).

There is **no immuno-response or rejection** for autologous stem cell treatments because the stem cells come from the patient.

There exists **immune-privileged sites** (eg: the brain) where the transplant of adult stem cells from other people are not rejected by the patient's immune system.

Some evidence that adult stem cells do not give rise to teratomas when injected into animal and human models because they do not differentiate into other (non-compatible) cells.

WHAT ARE ADULT STEM CELLS?

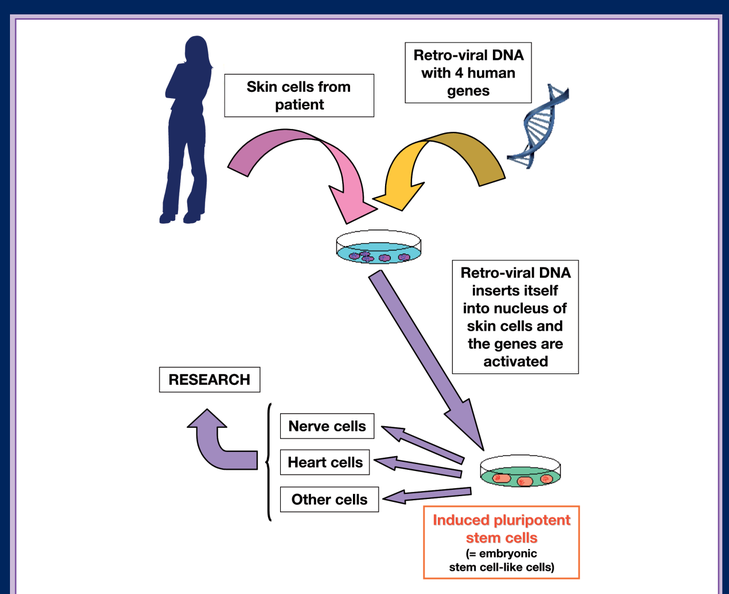
Adult stem cells are found in a number of the body's tissues and organs. These cells help maintain and repair the tissues. Among the tissues thought to contain adult stem cells are the brain, bone marrow, skin, skeletal muscle, and blood. Adult stem cells are **multipotent**, which means that they can produce a certain type of cells, particular to a given tissue. For example, blood stem cells can become all types of blood cells, including platelets, red blood cells, and white blood cells, and neural stem cells can become the nerve cells and supporting cells of the brain and spinal cord. It remains unclear how many types and sources of adult stem cells exist.

INCREASED PLASTICITY

Evidence suggests that even after a cell is terminally differentiated, its nucleus contains the information necessary to become any cell in the body (ie: it retains 'developmental plasticity' and could possibly be encouraged to behave like embryonic stem cells and develop into a number of different cell types).

In 2007, researchers demonstrated that it is possible to make adult stem cells behave like embryonic stem cells by inserting 4 specific genes into them. This is considered exciting but there are many uncertainties and such practices are nowhere near ready for clinical practice.

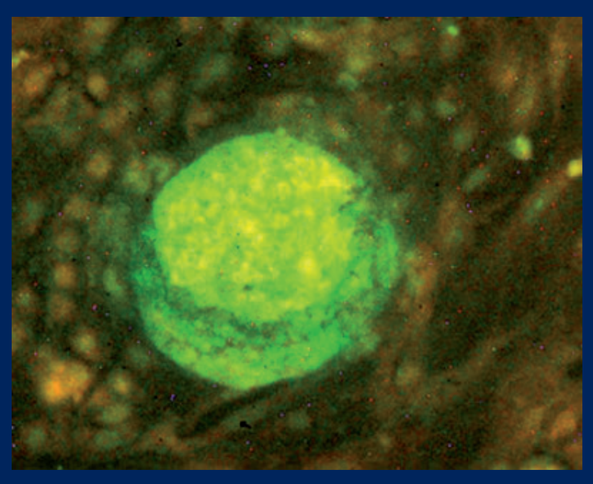
Researchers are studying ways to reprogramme adult stem cells so they have the same plasticity as embryonic stem cells. Experiments have demonstrated that bone marrow derived cells can give rise to a variety of cell types, not just blood, and may be able to repair cartilage or bone, but these are early outcomes and much more research is needed.



Creating induced pluripotent stem cells from adult cells

Creating induced pluripotent stem cells from adult cells.
Source: Talking Stem Cells.

Reprogramming Stem Cells.
Source: S. Harmon



Reprogramming Stem Cells.
Source: N. Strelchenko'

DISADVANTAGES

Established adult stem cell applications (eg: bone marrow transplants for leukaemia) are painful, sometimes simply do not work, and suffers from insufficient donors.

Even autologous adult stem cell transplants can cause problems (eg: muscle stem cells extracted from the thigh and injected into the heart can cause rhythm problems).

The apparent lower plasticity of adult stem cells may limit their clinical application because they can be used for fewer types of tissue.

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