stem cells

new horizons in medicine

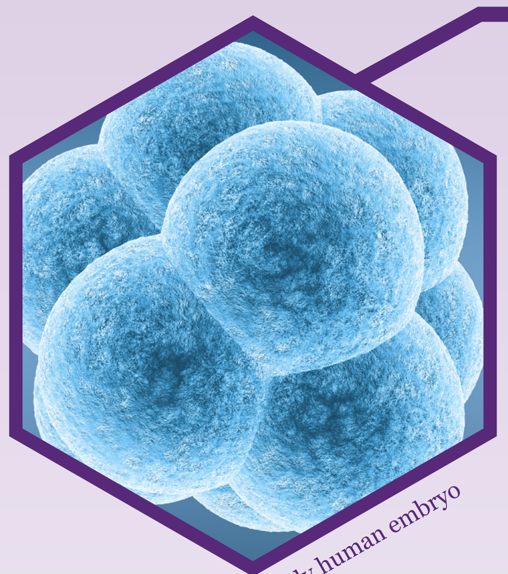
abpi

Bringing medicines to *life*

In the late 1990s, American scientists developed a method of culturing embryonic stem cells – cells with the potential to develop into any of the specialised tissues the body needs. This raised hopes of a major medical breakthrough – the ability to replace diseased or worn out body parts with new, healthy tissue. So far progress has been relatively slow, but although there are many technical and ethical issues to be resolved, these new techniques still have the potential to revolutionise medicine.

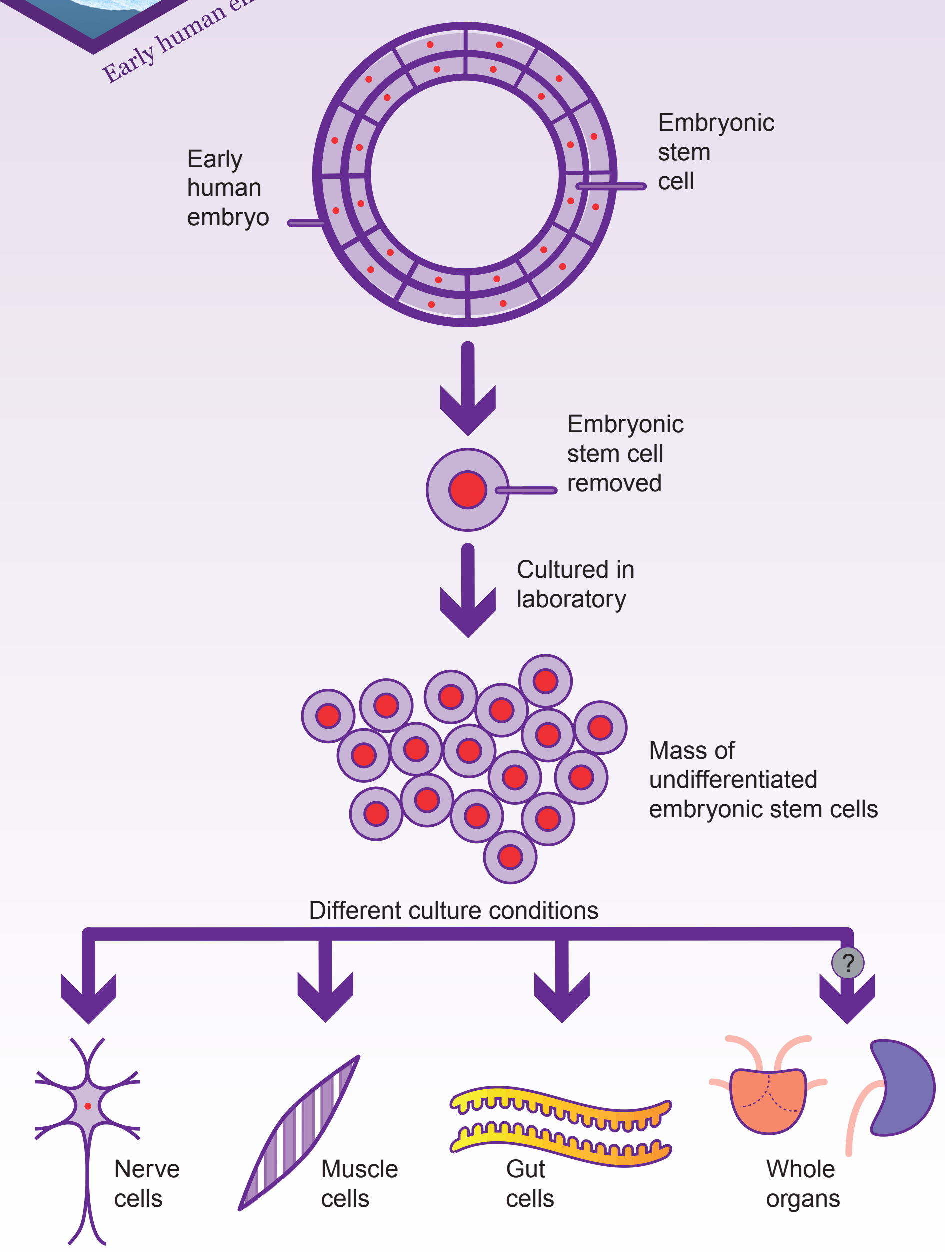
Stem cells

Embryonic stem cells

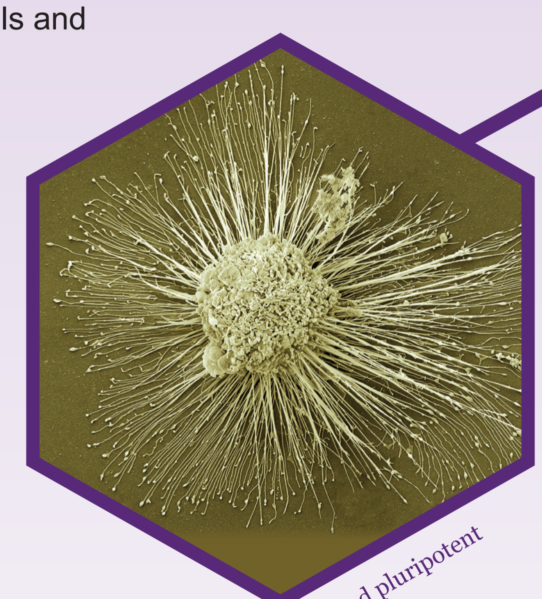


Early human embryo

The early human embryo contains many stem cells which can be harvested and cultured in the laboratory to produce huge numbers of undifferentiated cells. By changing the culture conditions, scientists have persuaded some of the stem cells to differentiate into new tissues including cartilage, bone and nerves. They hope to produce whole organs for transplantation in the future. In small trials to assess the safety of a procedure, embryonic stem cells also helped restore sight in patients with age related macular degeneration. More trials and different treatments are in the pipeline.



Induced pluripotent stem cells (iPSCs)



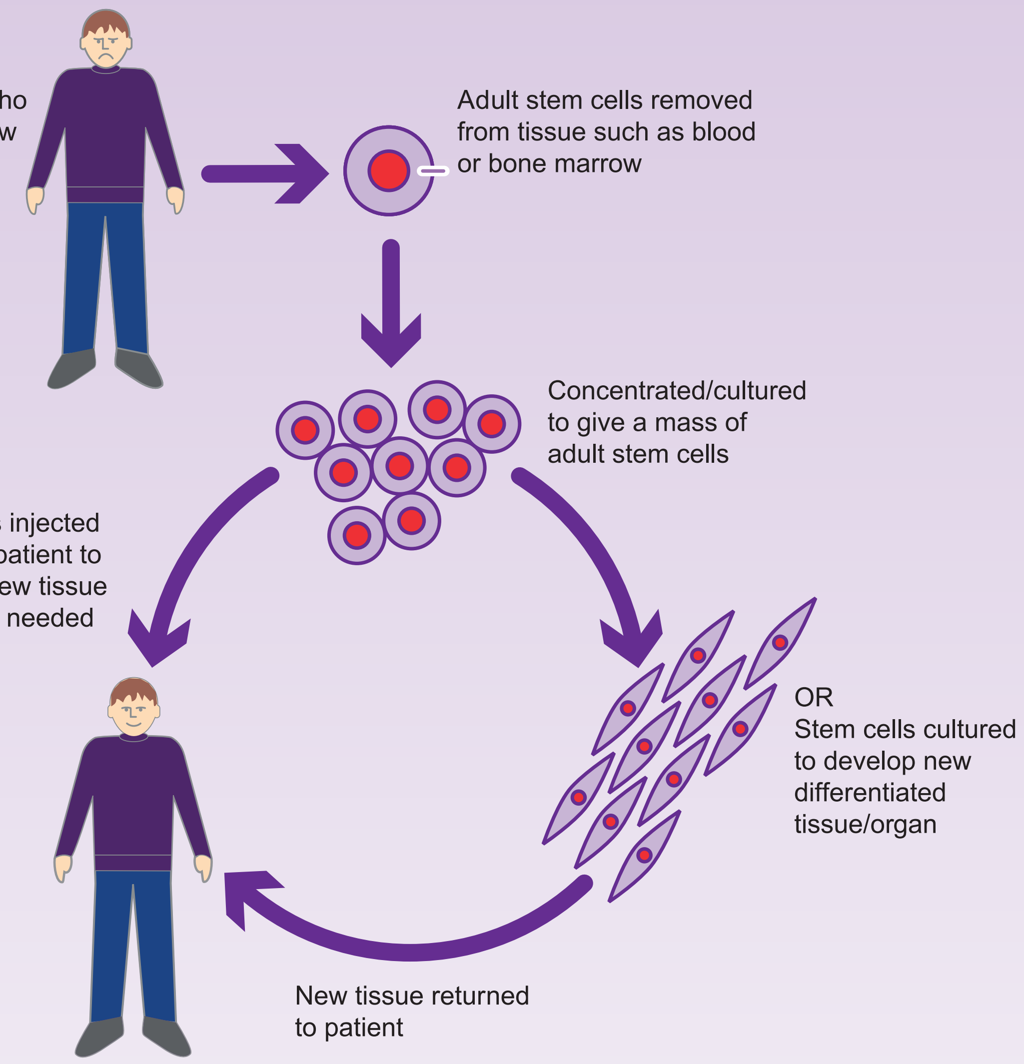
Induced pluripotent stem cell

In 2006, Japanese scientists made an amazing breakthrough. They persuaded differentiated adult mouse cells to become pluripotent again and act like embryonic stem cells. Since then, human iPSCs have also been developed. The potential for these cells in regenerative medicine, making new tissues and organs, is enormous. Because iPSCs may be produced from cells of the individual who needs them, they can overcome any problems of rejection. They avoid the ethical issues of using cells harvested from embryos. They can be used to model the molecular basis of different diseases in individual cells. Scientists can also use iPSCs as exciting new tools in the process of discovering new drugs.

Adult stem cells

Bone marrow biopsy

Adults have stem cells in their bodies – but not very many of them. What's more, they can be difficult to extract and to use, and most can only form a limited range of different cell types – they are only multipotent. However, they have been used successfully in bone marrow transplants for a long time, saving thousands of lives every year. Scientists are doing some promising work using adult stem cells to repair damaged heart muscles and to reverse Parkinson's disease. Adult stem cells have been used very successfully to repair damaged tendons in horses, and now there are trials of a similar technique in people. Interest in biotechnology involving adult stem cells is growing steadily.



Therapeutic stem cell cloning

In this technique, DNA is taken from the cells of a person and used to produce embryonic stem cells, which may then be differentiated into new tissues or organs. The hope is that this technology will help people who are seriously ill with problems ranging from diabetes and Parkinson's disease to heart attacks and spinal injuries. The technique still needs a lot of development, but its medical potential is enormous.

more information: **www.abpischools.org.uk**

The Association of the British Pharmaceutical Industry, a company limited by guarantee registered in England & Wales (number 09826787), t +44 (0)20 7930 3477 abpischools@abpi.org.uk January 2017 RMI-0064-1116