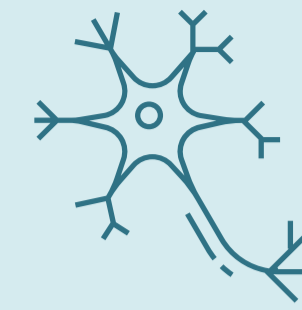
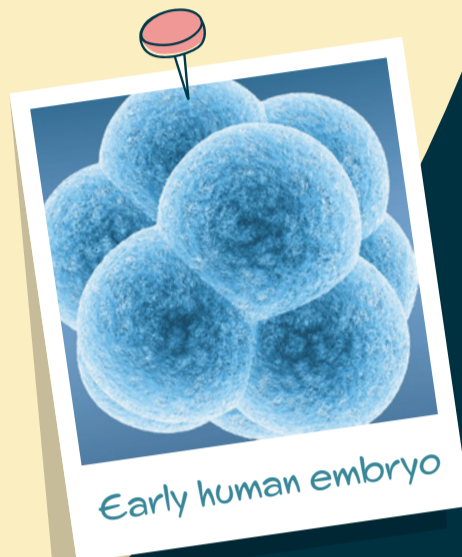


Stem cells

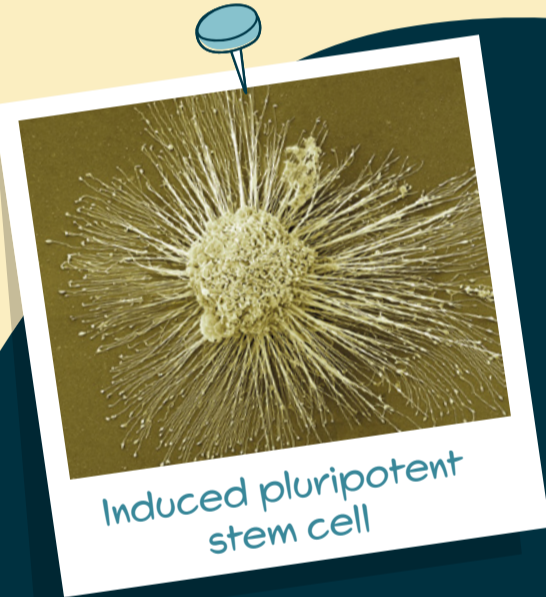


In the late 1990s, American scientists developed a method of culturing embryonic stem cells – cells with the potential to develop into any of the specialised tissues the body needs. This raised hopes of a major medical breakthrough – the ability to replace diseased or worn out body parts with new, healthy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



Embryonic stem cells

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.

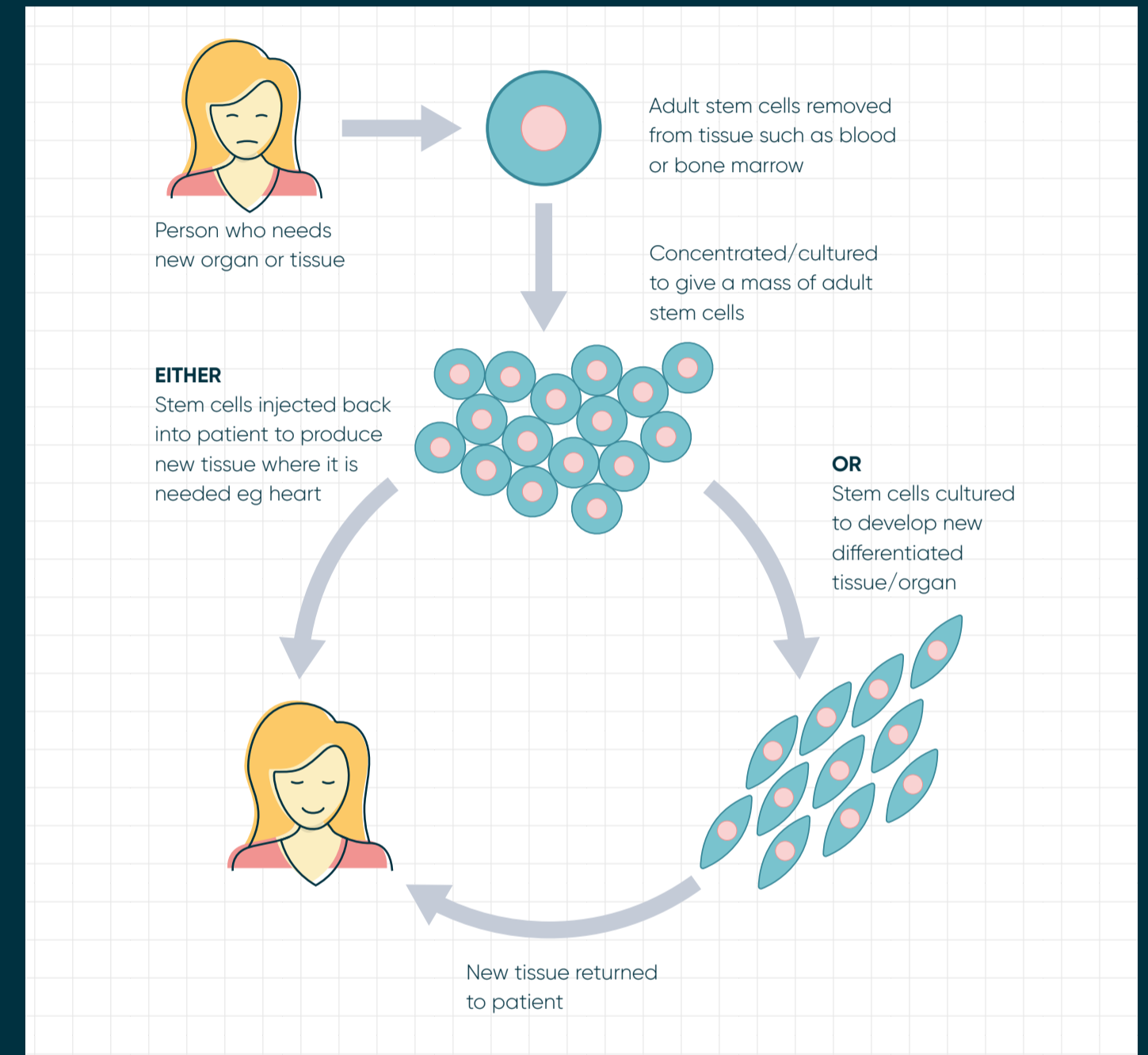
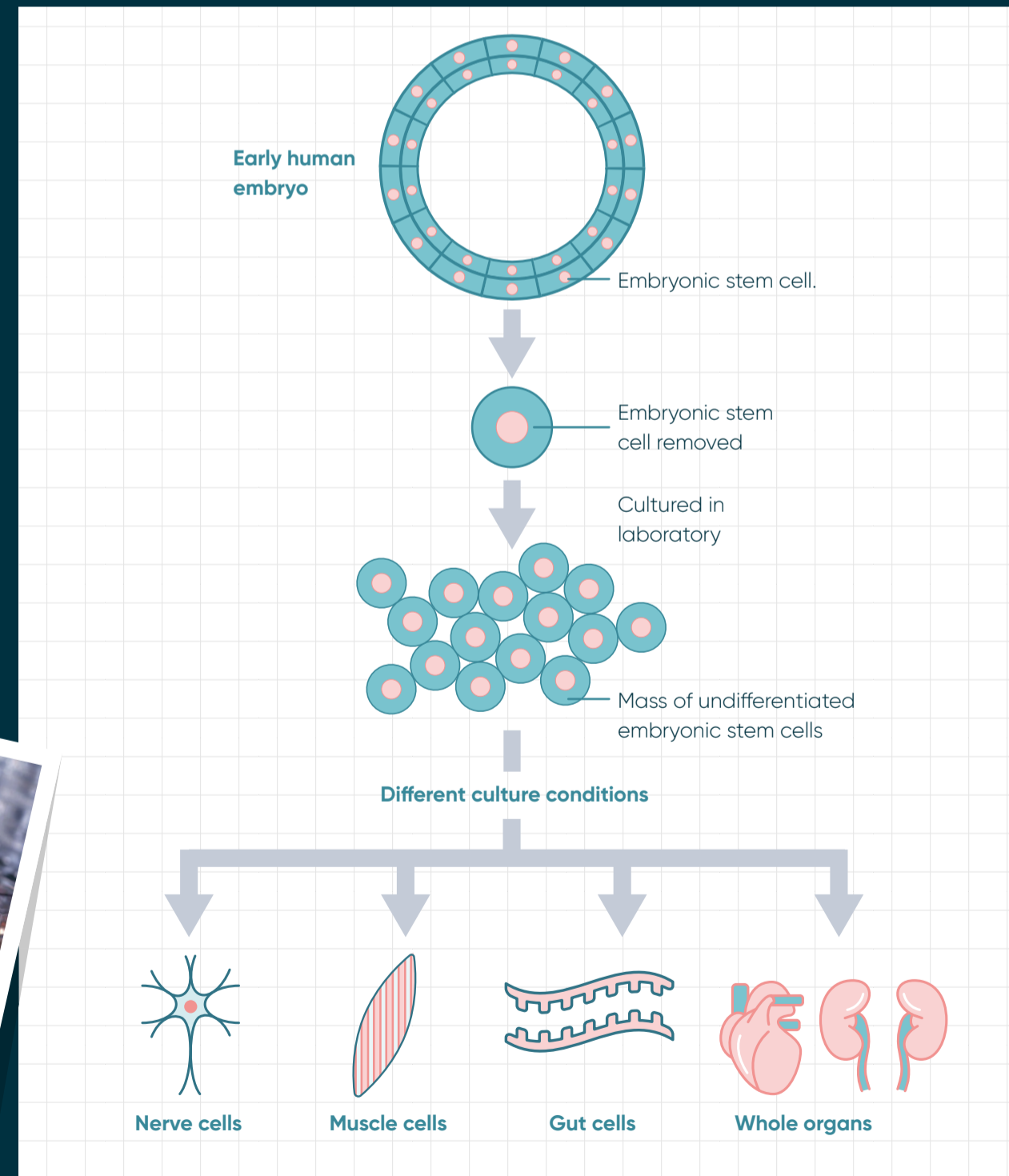


Induced pluripotent stem cells (iPSCs)

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.

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, such as with diabetes, Parkinson's disease, through heart attacks or spinal injuries. The technique continues to be developed as its medical potential is enormous.



Adult stem cells

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 have been working on 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 there have been trials of a similar technique in people. Interest in biotechnology involving adult stem cells is growing steadily.



Use QR code to find out more about stem cells on the ABPI Schools website

