EuroStemCell

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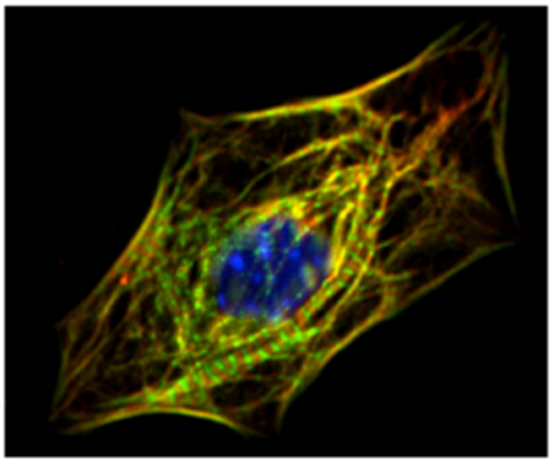
The Heart: our first organ

What do we know?

Heart attacks cause damage to the heart that is never fully repaired.

Contrary to previous thoughts, research shows that heart muscle cells (cardiomyocytes) are slowly made and replaced throughout our life. This process grows slower as we age and is much too slow to repair damage from a heart attack.

Researchers can make cardiomyocytes and pacemaker cells in the lab using embryonic stem cells and induced pluripotent stem cells (iPSCs). Although researchers are hopeful that stem cells may be used to repair heart damage, there are currently no proven stem cell treatments.



A cardiomyocyte (heart muscle cell) obtained from stem cells and identified using a 'bar code' of proteins found on the surface of the cells.

Photo: Stefan Jovinge, Lund University Stem Cell Centre.

What are researchers investigating?

It is not known how new cardiomyocytes are made. Some researchers have suggested that there are heart stem cells, but more data is needed to confirm this.

Scientists are also very interested in understanding how hearts in other animals regenerate. This could lead to discoveries that unlock the ability of the human heart to repair itself.

There is ongoing research to find ways to stimulate cells in the heart to multiply and repair damage to the heart naturally.

Studies are being conducted to make cardiomyocytes in the lab that are uniform, predictable and safe for use in transplants.

What are the challenges?

Medical treatments that affect the heart carry significant risks because the heart is critical for life.

Using pluripotent stem cells, such as iPSCs, to make cardiomyocytes for transplantation requires methods to certify that all the cells are truly cardiomyocytes. If pluripotent cells are accidentally transplanted they could cause cancerous tumours, generate unwanted types of cells or cause other complications.

If cardiomyocytes are correctly made for transplant, an additional complication is making sure that they beat at the same rate as the heart's original cardiomyocytes.

For more information visit: **www.eurostemcell.org/heart**