Stem cells

# Pre-reading activities

*I. Answer these questions.*

1. Do you know what stem cells are?
2. Do you know how they function?
3. Can you explain how their use can influence human medicine in the future?

*II. Are you familiar with this vocabulary items? Try to give their English explanations.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **to treat** | **to refine** | **to retain** | **to harness** | **tissue** |
| **spinal chord** | **to maintain** | **rare** | **sufficient** | **fully fledged** |
| **to advocate** | **unwittingly** |  |  |  |

*III. Explain these phrases in English.*

1. stem cell
2. repair kit
3. tissue compromised by disease
4. pluripotent
5. immune system
6. safety concerns
7. to be cancerous

*Text:*

***Stem cells are thought to hold huge potential for treating a wide range of disease and disability*.**

Scientists around the world are working on techniques to refine stem cell therapy.

However, their use is mired in controversy.

**What are stem cells?**

Most adult cells in the body have a particular purpose which cannot be changed.

For instance, a liver cell is developed to perform specific functions, and cannot be transformed to suddenly take on the role of a heart cell.

Stem cells are different. They are still at an early stage of development, and retain the potential to turn into many different types of cell.

**Why are they so useful?**

When a stem cell divides, each new cell has the potential to either remain a stem cell or become another type of cell with a more specialised function.

Scientists believe it should be possible to harness this ability to turn stem cells into a super "repair kit" for the body.

Theoretically, it should be possible to use stem cells to generate healthy tissue to replace that either damaged by trauma, or compromised by disease.

Among the conditions which scientists believe may eventually be treated by stem cell therapy are Parkinson's disease, Alzheimer's disease, heart disease, stroke, arthritis, diabetes, burns and spinal cord damage.

Stem cells may also provide a useful way to test the effects of experimental drugs.

It is also hoped that studying stem cells will provide vital clues about how the tissues of the body develop, and how disease takes hold.

**Are there different types of stem cell?**

Yes. Scientists believe the most useful stem cells come from the tissue of embryos.

This is because they are pluripotent - they have the ability to become virtually any type of cell within the body.

Stem cells are also found within adult organs. They have not taken on a final role, and have the potential to become any of the major specialised cell types within that organ.

Their role is to maintain the organ in a healthy state by repairing any damage it suffers.

It is thought their potential to become other types of cell is more limited than that of embryonic stem cells. But there is evidence that they are still relatively "plastic".

**Can they be easily grown in the lab?**

Large numbers of embryonic stem cells can be relatively easily grown in culture.

However, adult stem cells are rare in mature tissues and science is still working on ways to grow them in the lab in sufficient numbers.

This is an important distinction, as large numbers of cells are needed for stem cell replacement therapies.

Adult stem cells do have one big advantage. It should theoretically be possible to take stem cells from a patient, grow them in culture, and then transplant them back into the patient without fear that they would be attacked by the body's immune system.

**Is the use of stem cells controversial?**

Very. Campaigners are vehemently opposed to the use embryonic stem cells.

These cells are typically taken from lab-created embryos that are just four or five days old, and are little more than a microscopic ball of cells. However, opponents argue that all embryos, whether created in the lab or not, have the potential to go on to become a fully fledged human, and as such it is morally wrong to experiment on them.

They strongly advocate the use of stem cells from adult tissue.

**Are there safety concerns?**

Yes. Some researchers fear that it is possible that stem cell therapy could unwittingly pass viruses and other disease causing agents to people who receive cell transplants. There is particular concern that stem cells are currently cultivated using nutrients taken from animal sources, and that these could harbour diseases which could be passed on to humans. Some research has also raised the possibility that stem cells may turn cancerous.

http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/4562235.stm

# Reading activity

*I. Decide whether these statements are true or false.*

1. Stem cell therapy is useful though controversial.
2. Stem cells in the body have a specific, unchangeable purpose.
3. Stem cells can be used to repair any non-functional tissue in the body.
4. Scientists think the only useful stem cells come from embryos.
5. Adult body is completely stem cells free.
6. Stem cells can be relatively easily grown in the lab.
7. A patient’s own stem cells grown in the lab will never be rejected by the body’s immune system.
8. Some people do not agree with the stem cell therapy.
9. Stem cell therapy can cause that animal diseases can be transferred to people.
10. They may cause cancer.

# Post-reading activity

*Discuss this problem:*

The text reads that stem cell therapy is a point of controversy, and certain groups of people strongly reject it. Try to think which groups of people or individuals can oppose this breakthrough method and state what reasons for rejection they may have.

*For further information, watch these videos.*

<http://search.bbc.co.uk/cgi-bin/search/results.pl?q=stem+cells&edition=i>

<http://www.youtube.com/watch?v=sUb3dsrR8AA&mode=related&search=>**Skin transformed into stem cells**

# Pre-reading activities

*I. Answer these questions.*

1. Explain what stem cell is, where it can be found, and its unique characteristics is.
2. Explain what controversy it has for some people.

*II. Are you familiar with this vocabulary items? Try to give their English explanations.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **mimic** | **plentiful** | **funding** | **coincide** | **clumps of cells** |
| **to supercede** | **although** | **significant** | **to remove** | **current** |
| **to ensure** | **invaluable** | **entire** | **inconceivable** | **to tease out** |

*III. Give the passive participles to these verbs.*

1. become 4. prove 7. lead
2. mean 5. remove 8. welcome
3. grow 6. control 9. reject

*Text:*

***Human skin cells have been reprogrammed by two groups of scientists to mimic embryonic stem cells with the potential to become any tissue in the body.***

The breakthrough promises a plentiful new source of cells for use in research into new treatments for many diseases. Crucially, it could mean that such research is no longer dependent on using cells from human embryos, which has proved highly controversial. The US and Japanese studies feature in the journals Science and Cell.

**The induced cells do all the things embryonic stem cells do - its going to completely change the field**
*Professor James Thomson
University of Wisconsin-Madison*

Until now only cells taken from embryos were thought to have an unlimited capacity to become any of the 220 types of cell in the human body - a so-called pluripotent state.

But campaigners have objected to their use on the grounds that it is unethical to destroy embryos in the name of science. In the US only limited use of embryonic stem cells is allowed by scientists receiving public funding.

The Japanese team used a chemical cocktail containing just four gene-controlling proteins to transform adult human fibroblasts - skin cells that are easy to obtain and grow in culture - into a pluripotent state.

**For once we have better science coinciding with better ethics**
*Josephine Quintavalle
Comment on Reproductive Ethics*

The cells created were similar, but not identical, to embryonic stem cells, and the researchers used them to produce brain and heart tissue. After 12 days in the laboratory clumps of cells grown to mimic heart muscle tissue started beating. The US team, from the University of Wisconsin-Madison, achieved the same effect by using a slightly different combination of chemicals. They have created eight new stem cell lines for potential use in research.

**Cloning superceded**

Using skin cells should mean that treatments could be personalised for individual patients, minimising the risk of rejection.

**Although it is early days for this technique it may well prove to be every bit as significant as the first derivation of human embryonic stem cells nine years ago**.
*Dr Lyle Armstrong
University of Newcastle Upon Tyne*

Not only does the new technique remove the need to create embryos in the lab, it is also more simple, and more precisely controlled than current cloning technology.

Professor Ian Wilmut, of the University of Edinburgh, who led the team which created Dolly the sheep in 1996, has said it represents a significant advance. However, the researchers have warned more work is needed to refine the process, and ensure its safety.

At present both techniques rely on viruses to introduce new material into the cells, which carries a potential risk of contamination.

Researcher Professor James Thomson said: "The induced cells do all the things embryonic stem cells do. "It's going to completely change the field."

Dr Shinya Yamanaka, of Kyoto University, a member of the Japanese research team, said: "These cells should be extremely useful in understanding disease mechanisms and screening effective and safe drugs."

**Positive reaction**

Professor Azim Surani, of the University of Cambridge, said the research should allow scientists to create a large range of human stem cell types, which could prove invaluable in studying disease. He said: "It is relatively easy to grow an entire plant from a small cutting, something that seems inconceivable in humans.

"Yet this study brings us tantalisingly close to using skin cells to grow many different types of human tissues.

Dr Lyle Armstrong, of the International Centre For Life at the University of Newcastle Upon Tyne, called the studies a "major development".

Professor Robin Lovell-Badge, of the Medical Research Council's National Institute For Medical Research, said the work was exciting, but work was required to end the reliance on viruses, and to tease out why two different techniques produced similar results.

Josephine Quintavalle, of Comment on Reproductive Ethics, said: "News that embryonic stem cells can be created successfully from human cells without cloning, without using human embryos or human eggs, or without getting involved in the creation of animal-human embryos, is most warmly welcomed.

"We congratulate these world-class scientists who have had the courage to state their change of tack so cogently.

"For once we have better science coinciding with better ethics."

**TECHNIQUES FOR MAKING 'STEM CELLS'**

Therapeutic cloning produces stem cells which can develop into different types of body cell, making them ideal for research into treatment of disease.

But this technology involves the creation and destruction of embryos, which is ethically controversial. The stem cells created also run the risk of being rejected by the body.

The new technology, nuclear reprogramming, creates stem-like cells from the patient's own cells, avoiding both these problems.

**TECHNIQUES FOR MAKING 'STEM CELLS'**

http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7101834.stm

# Reading activities

*I. Answer these questions.*

1. What is the main idea of the text?
2. What was unacceptable for some people about the stem cells taken from the embryonic stem cells?
3. Are the stem cells taken from human skin identical to embryonic ones?
4. How intensive is the risk of rejection of skin stem cells?
5. What are the advantages of the new technology?
6. Is there any potential risk of contamination?

*II. What do these figures represent in the article?*

1. 220
2. 2
3. 12
4. 1996
5. 9

*III. In the text find the examples of direct speech and transform hem into indirect ones following the rules for that.*

# Post-reading activity

### I. Writing

Put down a 10-sentence summary of the article.

*II. For further information watch also this video.*

<http://www.youtube.com/watch?v=XoggT8quHYs&mode=related&search=>