

Introducing stem cells

Stem cells in the news

Objective: Understand what a stem cell is

Stem cells in the news

Our bodies are made of millions of cells that work together to help you think, talk, laugh, run around and stay healthy. Stem cells are one of the most amazing types of cell in your body because they can (1) make copies of themselves and (2) make other types of cells like skin cells, nerve cells or blood cells.

1. Read the article.

SCOTLAND on SUNDAY

AUGUST 2, 2009
www.scotlandonsunday.com

Award-winning researcher's stem cell study offers hope for Parkinson's cure

Lyndsay Moss
Health Correspondent

A GROUND-BREAKING stem cell study being carried out in Scotland could finally lead to a cure for Parkinson's disease.

A researcher at Edinburgh University has been awarded £380,000 to create a special type of stem cell from patients with Parkinson's and their relatives.

It is hoped that cell lines created from just three families will help researchers around the world test new treatments for the disease.

And eventually the research could lead to patients receiving transplants of their own specially-treated cells to cure the condition.

Dr Tilo Kunath has been awarded a senior research fellowship by the Parkinson's Disease Society to push forward with his stem cell work.

In patients with Parkinson's, nerve cells in a particular part of the brain involved in coordinating movement die, leading to symptoms like tremors and problems walking.

In a UK first, Kunath and colleagues will create induced pluripotent stem cells (iPS cells) from people with Parkinson's to help understand why nerve cells die.

IPS cells are created by taking adult cells, such as from the skin, and reprogramming them in the lab to become cells which behave like embryonic stem cells – with the ability to transform into any type of cell, including nerve cells.

Glossary:

- cell line: cells that all originate from the same cell; they are grown and kept in the lab.
- condition: disease
- tremors: shaking
- reprogramming: change

© The Scotsman Publications Ltd.

In the UK around 120,000 people have Parkinson's disease. Most patients get the disease when they are over 50, but sometimes young people also get it.

2. What happens to patients with Parkinson's? Give two symptoms.

i. _____

ii. _____

3. Why does this happen?

4. Read the text before question 1 again. What's so special about stem cells?

Stem cells are special because they can (1) _____
and (2) _____

Dr Tilo Kunath is going to use patients' cells to make stem cells.

5. What can he do with these stem cells to understand the disease better?

6. Scientists hope that in the future stem cells can be used to help the patients. How?

- i. _____

- ii. _____

Extension

In 2006, scientists discovered a new technique. They can now take a cell from a body, for example a skin cell, and turn it into a cell that behaves like stem cells from an embryo.

7. What are these special types of stem cells called?

8. Scientists are very excited about this new technique. Why do you think that is?

Introducing stem cells

Points of view

Teachers' notes

Objective

Discuss the moral and ethical issues connected with stem cell research.

Required student knowledge

This activity assumes that students know:

- That a stem cell is a cell that can: 1) make copies of itself; 2) make other types of cell
- That there are different kinds of stem cell: embryonic and adult stem cells
- That an embryo is an early stage in the development of a baby when it is still in the womb
- That IVF is a kind of fertility treatment in which embryos are made in the laboratory and then implanted into the mother's womb

Activity suggestion

Activity	Time needed
1. Introduction Use a teacher-guided class discussion to remind students what a stem cell is and recap on the two types of stem cell – adult and embryonic. Discuss the process of IVF (in vitro fertilization) to ensure all students understand that: 1) IVF is a kind of fertility treatment; 2) It involves making embryos in the lab using egg and sperm from the parents, then implanting an embryo in the mother's womb. Several embryos are made in the process but not all are used.	10 mins
2. Should we use embryos in research? Students work in groups. They are given four characters to look at – Janice, Grant, Liz and Father O'Reilly. They discuss the views of these characters and complete Part A of the policy worksheet provided in this resource.	15-20 mins
3. Summary Teacher-guided discussion: Groups feed back to the whole class on their policies and explain their opinions.	15-20 mins
Total time:	40-50 mins

Extension

Ask students to discuss the two additional characters – Tomaini and Amanda – then complete Part B of the policy worksheet.

Differentiation

Easier: Start students thinking about the issue by asking them to build a simple timeline of embryonic development and discuss when they think life begins. An embryo development timeline is available as a card sort activity at www.sciberbrain.org. After discussing the timeline, introduce two of the characters who hold opposing views, e.g. Grant Cameron and Father O'Reilly. Ask students to explain what the characters think and why.

Harder: Use the version of the policy worksheet designed for 16+ year olds to introduce more aspects of the debate. Alternatively, introduce the diabetes scenario from the 16+ version of this resource. Ask students to decide what they think about it, or what the characters on the cards might think.

Homework activity

Give students a recent news article about stem cells. Discuss the science in class, then ask students to write a letter to the newspaper editor about the story, from the viewpoint of one of the characters.

For news stories, you might wish to visit <http://www.eurostemcell.org/news> or a major newspaper website.

Credits and acknowledgements

Stem cells: Points of view was developed by EuroStemCell (www.eurostemcell.org) and the MRC Centre for Regenerative Medicine in Edinburgh, UK (www.crm.ed.ac.uk).

The resource is partially based on "PlayDecide". Any opinions, views and findings expressed in this resource are those of the authors and do not necessarily reflect the views of PlayDecide. PlayDecide is available at: <http://www.playdecide.org>

This work is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/3.0/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

Further information

For further information, please contact EuroStemCell using the contact form at www.eurostemcell.org/contact

Janice Fortune Doctor



About Janice

Janice is a doctor. She sees a lot of patients who have damaged their spines in accidents. Many of them cannot walk. Janice can help patients if they are in pain or need a wheelchair, but she cannot make them walk again.

Janice and stem cells

Recently, some of Janice's patients have travelled abroad and paid thousands of pounds for experimental stem cell treatment. Janice knows that scientists still have a lot to learn about stem cells. She is worried that patients are paying for treatments that don't work, or might even make the patients worse.

What Janice thinks

Janice is not worried about using embryos in research if it might one day help her patients. She thinks we should stop arguing about embryos in research. It is more important to make sure patients get good advice and understand what could go wrong with experimental treatments. After all, isn't a patient's life worth more than a ball of cells?

Father O'Reilly Catholic priest



About Father O'Reilly

Father O'Reilly is a Catholic priest. His religion has taught him that human life is sacred – it is a very special thing. He believes we must always protect life.

Father O'Reilly and stem cells

Father O'Reilly reads the newspaper every day. He knows there is a lot of suffering in the world and thinks we should help people as much as we can. He also reads about stem cells in the news. He often does not like what he reads about stem cell research.

What Father O'Reilly thinks

Father O'Reilly thinks research on embryos should not be allowed at all. He believes that when a sperm fertilizes an egg, a life is created. Right from that moment, we must protect the new life. He thinks using embryos in research is wrong because the embryos are destroyed. In his opinion, nothing can ever make it right to end a life, even if we are trying to cure diseases.

Grant Cameron Scientist



About Grant Cameron !

Grant is a scientist. He is in charge of one of the top research teams working on embryonic stem cells. He also reads a lot about research other scientists are doing on adult stem cells.

Grant and stem cells

Grant is working hard to understand more about embryonic stem cells. What makes them produce other kinds of cells? Is there a way to control them so we can use them to treat disease? The embryos used in his research are at a very early stage of development. They are about 4 or 5 days old. Each embryo is a ball of around 50-100 cells.

What Grant thinks

Grant disagrees with people who say embryonic stem cell research is wrong. He thinks it would be wrong to stop research on embryos when it could help cure many terrible diseases. Adult stem cells are important too, but embryonic stem cells can make every kind of cell in the body. How can it be right to protect a ball of cells instead of trying to help millions of people with diseases like cancer, heart disease or diabetes?

Liz Hopeful IVF patient



About Liz Hopeful !

Liz Hopeful has been married for 5 years. She has a baby daughter called Lara. Liz couldn't get pregnant at first, so she and her husband had IVF treatment. In the treatment, doctors took eggs from Liz and sperm from her husband then mixed them in the lab. Some of the eggs were fertilized by the sperm and formed embryos. The doctors put one of the embryos into Liz's womb. It grew into a baby and Lara was born.

Liz and stem cells

Liz and her husband still have 6 embryos left from their IVF treatment. All of them have names. At the IVF clinic, Liz and her husband were asked if they would like to donate some of their embryos to stem cell research. Liz's husband would like to donate their embryos. If they are not used for research, the embryos will be frozen and stored for a few years, and then thrown away.

What Liz thinks

Liz is horrified by the idea that her embryos could be experimented on. She thinks of them almost like babies that haven't had a chance to grow up. She can't understand how anyone could give their embryos to scientists for any kind of experiment.

Amanda Prentice Scientist



About Amanda Prentice !

Amanda is a young stem cell scientist. She is studying adult stem cells.

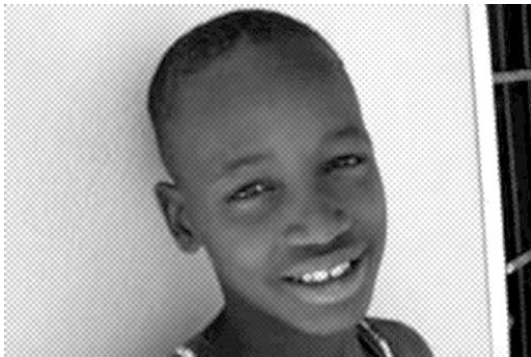
Amanda and stem cells

Amanda got interested in stem cells when she heard how they can be used to save lives. For example, skin stem cells are used to grow new skin for people who have been very badly burned. Doctors take stem cells from a tiny unburned part of the patient's body and use them to grow new skin in the laboratory. The patients would die without this skin, but it is not perfect: it has no hair or sweat glands. Amanda wants to solve this problem.

What Amanda thinks

Amanda thinks adult stem cells will be very useful for treating many patients. She knows that other scientists are investigating ways to treat many different diseases and injuries with adult stem cells. Amanda thinks everyone talks about embryonic stem cells too much. Adult stem cells are just as important.

Tomaini Minde Boy from Tanzania



About Tomaini Minde !

Tomaini is 12 years old. He lives in Tanzania, a very poor country. People he knows are dying from diseases like malaria and tuberculosis (TB). Tomaini knows that richer countries have medicines to treat these diseases. Everyone says there is not enough money to buy medicine for people in Tanzania.

Tomaini and stem cells

Tomaini's teacher told him about expensive stem cell research. The teacher said the research might find a cure for diseases like diabetes or heart disease. If researchers could cure these diseases, they might even save some money. Patients would not need to take expensive medicine all their lives or spend a lot of time in hospitals.

What Tomaini thinks

Tomaini does not understand why people are spending a lot of money on research. They might help people and save money one day, but that is in the future. He thinks it is more important to save lives now. Why are they putting so much money into this research? They could save people's lives straight away by buying medicines for people in poor countries like Tanzania.

Objective: Discuss the moral and ethical issues connected with stem cell research.
(Scottish curriculum: S1-3, Biological Systems SCN 4-13c)

Stem cell research: What's the right policy?

Read about Grant Cameron, Janice Fortune, Liz Hopeful and Father O'Reilly. What do they think about stem cell research? Why?

Decide which policy each character would support. Write their names in the boxes below.

Policy	People who agree with this policy
Policy 1 Embryos should NOT be used for research.	
Policy 2 Research on embryos SHOULD be allowed.	

Part A: What do YOU think?

Discuss your own opinions in your group.

Our group thinks the right policy is...

We think this because...

Part B: More things to think about

Read about Tomaini Minde and Amanda Prentice. Discuss their opinions in your group. Do their arguments affect your policy? Things to think about:

- Why could research on embryos be useful?
- What is the most important thing to spend money on?

Our group policy is...

Choose one of the options below and finish the sentence to make your own group policy.

1. No embryos should ever be used because...
2. Embryos should only be used if...
3. All embryonic stem cell research is okay because...

Introducing stem cells

What's missing?

Objective: Understand what a stem cell is

What are stem cells?

Use these words to fill in the gaps:

differentiation

skin

self-renewal

specialized

egg

Cells are the building blocks of all living things. Your body is made up of 210 different kinds of cells – blood cells, **a.** cells, muscle cells, nerve cells and many more. Stem cells are one of the most amazing types of cell in your body. You can't survive without them. In fact, you would never have developed from a fertilized **b.** into a baby if it weren't for stem cells. Stem cells are special because they can do two things:

1. Make copies of themselves. We call this process **self-renewal**.

2. Make other types of cells that do particular jobs in the body, e.g. skin cells, nerve cells or blood cells. We call this process **differentiation**. The new cells are known as 'differentiated', or **c.** cells. That's because they can only do the particular job they were made for – they are specialists at their jobs.

Stem cell



d.

(= copying)



Identical stem cells

Stem cell



e.

(= specializing)



Specialized cells

Objective: Explain the roles of stem cells in the body, both in growth and repair.

Why do we need stem cells?

Use the words below to fill in the gaps. One of them belongs in the diagram.

fertilization

stem cells

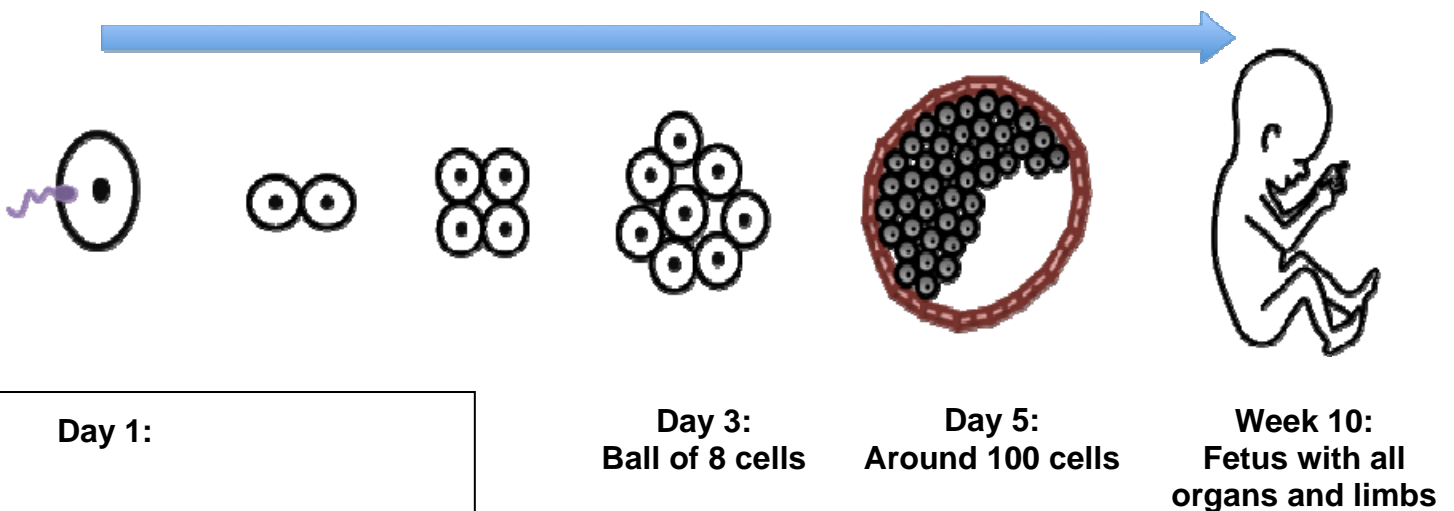
blood

divide

damaged

We need stem cells all our lives. They replace cells in our bodies that die, get **a.** or are used up. For example, right now, inside your bone marrow, stem cells are busy making the 100, 000, 000, 000 (1 billion) new blood cells you need every single day! At the same time, they are making copies of themselves. This makes sure you never run out of stem cells. You will need your stem cells to make more new **b.** cells tomorrow, after all.

Even before you were born, you already needed stem cells to develop from a fertilized egg into a baby. A fertilized egg divides to make two cells, then those cells **c.** so there are four cells, and so on. After about 5 days, an embryo with about 100 cells has developed. It contains **d.** that can make all the different kinds of cell that go on to form the tissues and organs of your body.



Introducing stem cells

Word search

Objective: Understand what a stem cell is

Stem Cells Word Search

Different types of cells

Your body is made up of 210 different **types** of **specialized** cells. For example skin cells, blood cells and nerve cells. In your body these cells die every day because of wear and tear or injury. For example, red blood cells only live for about 100 days so your body needs to make new ones every day to replace the ones that die. Your body uses stem cells to make the new red blood cells.

Stem cells

Everybody has stem cells: a **human embryo**, a **baby** and you too. Stem cells are amazing because they can (1) make copies of themselves and (2) make other types of cells like skin cells, nerve cells or blood cells.

Scientists study stem cells to **understand** the development of cells and to study **diseases** such as cancer. In the future they want to use stem cells to **develop new drugs** and to find **treatments** for diseases including multiple sclerosis, heart disease and diabetes.

Look for the following words

specialized	types	human	embryo	copies	understand
diseases	develop	new drugs	treatments	baby	stem cells

T	I	I	S	G	U	R	D	W	E	N	T	K	F
V	Y	T	A	C	O	P	I	E	S	E	S	B	Q
W	C	Q	G	Y	C	B	C	S	M	P	T	A	Q
J	H	H	B	T	V	L	L	B	E	M	R	B	J
E	G	U	J	W	G	L	R	C	Q	N	E	Y	N
K	X	M	N	U	E	Y	I	J	V	A	A	W	C
I	T	A	L	C	O	A	I	Q	P	X	T	R	Z
Z	L	N	M	B	L	Y	G	O	K	R	M	H	I
L	T	E	U	I	N	T	L	B	J	V	E	Y	N
E	T	E	Z	W	O	E	Y	V	R	G	N	W	I
S	H	E	M	W	V	X	E	P	E	G	T	R	C
G	D	J	Y	E	N	B	O	K	E	L	S	G	R
X	M	F	D	L	D	I	S	E	A	S	E	S	W
T	V	D	N	A	T	S	R	E	D	N	U	A	R