

Overview

All about stem cells is a flexible resource for use with student groups aged 11-14 or 16+. It consists of four sets of activity cards covering the basics of stem cell science and its potential applications. The cards are provided in two versions for different age groups, and are supported by simple worksheets for those who need additional guidance.

This guide describes some ways you might use the materials, but feel free to create your own activities too. Share your suggestions and experiences by posting your comments at www.eurostemcell.org/resources. You can also contact us using the form at www.eurostemcell.org/contact.

Learning objectives

All students:

- Understand that **stem cells** can both **self-renew and differentiate**, unlike specialised cells
- Understand that there are **different types of stem cells**, and describe some **key features** of tissue and embryonic stem cells
- Consider the **potential applications** of stem cell research, including the use of cells in therapy, drug testing and disease modelling

More able students:

- Consider induced pluripotent stem cells as an example of DNA technology and discuss their **potential applications**

Required prior knowledge

These activities assume that students have a basic awareness of what cells, embryos, genes and DNA are. Students should be given a simple introduction to the concepts of stem cells and specialized cells beforehand, or at the start of the lesson.

Materials

Provided as PDF and Microsoft Word or PowerPoint downloads:

- Activity cards divided into four themes
- Question sheet (optional)
- Worksheets for less able students (optional)
- Poster templates (optional)

The PDFs are designed to be printed at A4 size and cut into A5 cards. Printing on both sides of the page produces cards with a photo on one side and related text on the other, plus some single-sided diagram cards. If printed single-sided, the photos can be easily matched with the relevant text using the card titles.

Four themes of cards:

1. What is a stem cell? – what stem cells can do; types of stem cell
2. Where do embryonic stem cells come from? – the blastocyst; cell culture; IVF
3. Why bother with stem cells? – applications now and in the future
4. Making stem cells – induced pluripotent stem cells (iPS cells); recommended for higher ability/older students only; students working on this theme may need more time and/or support

Related resources

Visit www.eurostemcell.org/resources for ethics and 'stem cells in the news' activities, quizzes, puzzles, slides and more.

Why not introduce the topic with one of our short films? www.eurostemcell.org/films

A glossary of stem cell terms is available at www.eurostemcell.org/glossary

Activity 1: Poster conference

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Students work in groups and use the resources to make posters on four different themes. They then go on a fact-finding mission to discover the answers to a set of questions by examining each other's posters.

Timing

1.5 to 2 lessons (80 to 110 mins)

Materials

Per group of 4/5 students:

- Activity cards from one theme
- 1 worksheet (optional); recommended for less able students
- 1 large blank sheet of card, ideally A1 size
- Coloured pens
- Method for sticking cards onto poster, e.g. Blue tak (<http://en.wikipedia.org/wiki/Blue-Tack>) or Velcro dots (<http://velcrodots.com/>)

For each student:

- 1 question sheet

Activity	Time
A. Introduction Option 1: Show the film, <i>A Stem Cell Story</i> , available at www.eurostemcell.org/films . You can order a DVD of this film on the website if you prefer. Running time = 15 mins. Option 2: Lead a discussion on key concepts: What is a stem cell and how are stem cells different from specialized cells? What types of stem cell are there? – Cover tissue and embryonic. How might stem cells be used? – Brainstorm ideas.	20 mins
B. Poster building Students work in small groups of 4 or 5. Give each group a pack of activity cards on one of the four themes, an A1 sheet of card, something to stick the cards onto their poster with and some coloured pens. Ask students to make a poster that answers the three key questions on the 'Your task' card in their pack. Less able students: Students complete the worksheet that matches the theme of their cards, and then use their finished worksheet as a template for their poster. Group members could also be assigned roles, e.g. group leader, timekeeper, fact finder, scribe, and artist. Further resources for posters: For other image and information sources, download our <i>Useful resources list</i> at www.eurostemcell.org/resources .	30–45 mins
C. The conference Scientific conferences often include a poster session. Scientists attending the conference put up posters about their research for others to view and discuss. Tell students they are going to carry out their own scientific poster session. Give each student a question sheet covering all the themes of the different posters. In their original groups, students must then work as a team to find the answers to all the questions as quickly as possible by viewing the posters made by other groups. Students could also nominate a spokesperson to remain by their own poster to talk their classmates through the concepts.	15–30 mins
D. Plenary Go through the answers to the questions as a class, correcting any misconceptions. You might wish to run this as a competition between student groups, with a reward for the most correct answers.	15 mins

Activity 2: Presenting science

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Students work in groups to prepare presentations to inform their classmates about a particular aspect of stem cell science.

Timing

1.5 to 2 lessons (95 to 120 mins)
OR may be extended to a longer project

Materials

Per group of 4/5 students:

- Activity cards from one theme
- 1 worksheet (optional); recommended for less able students
- Access to PowerPoint or poster-making materials (optional)

For each student:

- 1 question sheet

Activity	Time
<p>A. Introduction</p> <p>Option 1: Show the film, <i>A Stem Cell Story</i>, available at www.eurostemcell.org/films. You can order a DVD of this film on the website if you prefer. Running time = 15mins.</p> <p>Option 2: Lead a discussion on key concepts: What is a stem cell and how are stem cells different from specialized cells? What types of stem cell are there? – Cover tissue and embryonic. How might stem cells be used? – Brainstorm ideas.</p>	20 mins
<p>B. Prepare presentations</p> <p>Students work in small groups of 3 or 4. Give each group a pack of activity cards on one of the four themes. Students prepare a 5-minute presentation to explain the key points on the cards in their pack. They may hold up the cards during their presentation if they wish to show the pictures. Their presentation MUST answer the three key questions on the 'Your task' card in their pack. Every member of the group must deliver a part of the presentation.</p> <p>Less able students: Students complete the worksheet that matches the theme of their cards to help them find the key points. The completed worksheet provides the structure for their presentation.</p> <p>Further suggestions for presentations: This activity could be combined with the poster-building component of Activity 1. Students first create posters, then use these as visual aids for their presentations. If you have access to computers, groups could prepare PowerPoint slides instead. Some image and information sources are listed in our <i>Useful resources list</i> at www.eurostemcell.org/resources. Both these additional options require more time and could perhaps be part of a longer research project. Students could then be encouraged to set their own additional questions about their topic for their classmates.</p>	30–45 mins
<p>C. Talk stem cells</p> <p>Give each student a question sheet covering all the themes of the cards being used. The groups deliver their presentations and the rest of the class must listen out for the answers to the questions. If you wish to make this a competitive exercise, students could return to their original groups after the presentations to combine their individual answers and agree a set of team answers.</p>	30–40 mins
<p>D. Plenary</p> <p>Go through the answers to the questions as a class, correcting any misconceptions. You might wish to run this as a competition between student groups, with a reward for the most correct answers.</p>	15 mins

Pairs (30 mins)

A card matching game.

Materials

- Activity cards printed on one side only – select only the photo cards and their associated text; remove diagram cards
- Question sheets

Students work in groups of 3 or 4. Each group has a full set of photo cards from all themes being considered. The cards are placed face down on the table. Students take it in turns to turn over any 2 cards of their choice. When a student finds a match – a photo card and text card with the same title – they must read the text card out to the rest of their group. The group then uses this information to try to answer the relevant question(s) on the sheet. They may leave the matched cards face up and continue until all the cards are face up. They should then have discovered the answers to all the questions.

Experts (30–40 mins)

Students focus on a set of activity cards on one theme and become experts. They then share their expertise with their peers to complete a question sheet.

Materials

- Activity cards
- Worksheets
- Question sheets, or questions displayed on a whiteboard

Students work in groups of 4 if you are using all 4 themes of activity cards. If you wish to omit the more advance *Making stem cells* theme, then they should work in groups of 3. Each group is given the activity cards that belong to one theme. Every student has a copy of the worksheet associated with their theme. The groups read their cards and complete the worksheets. Students are then reorganised into new groups, containing an 'expert' from each theme. Using their worksheets to help them, each expert reports to the rest of their new group what they have learnt so far. Each group is then given a question sheet to complete, using their combined knowledge.

Poster puzzles (45 mins)

A quicker, simpler version of the poster-building exercise described in Activity 1. Use this as a recap exercise after students have already learnt about stem cells.

Materials

- EITHER A1 poster templates from the files available online
- OR A2 versions of the poster templates, plus activity cards scaled down to A6 (ie half their normal A5 size)
- Question sheets

Students work in groups to assemble the posters by sticking cards onto the templates and filling in the gaps. Do this as a timed exercise (15 mins) with teams racing against one another to keep the pace up. All students then receive a question sheet and search for the answers on each other's posters. Keep the pace fast (15 mins), it doesn't matter if not everyone finds all the answers but groups should work as teams to gather as much information as possible. Round up by running through the questions in quiz style, allocating points for the first team to raise their hand. Additional points can be allocated to other teams who can correct wrong answers or improve on vague ones.

Note: If the poster templates are laminated and students use flipchart pens to write on them, the writing can be wiped off and the templates re-used.

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Teacher reviewers

Louise Guy, Bathgate Academy, Scotland
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Louise Guy adapted the activity cards for 11-14 year olds. Both teachers contributed valuable comments during the development of this resource.

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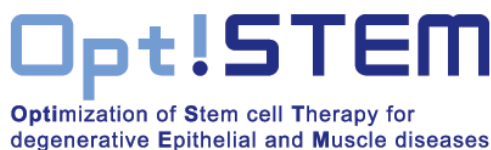
Diagrams

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Photographs

Wellcome Images provided many of the photographs used on the activity cards. Contact images@wellcome.ac.uk should you wish to use any of the images outside the context of this resource.

Other photographs were taken from freely available sources and their creators are acknowledged individually with the resource where required.



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