

## Useful resources

We have put together a list of classroom activities, reference materials and web-based tools that you might find useful when teaching stem cells. They are listed alphabetically and we've provided a short description of each. This is not an exhaustive list, but we hope it gives you plenty of good starting points when you are searching for information or teaching resources.

## Contents

	<b>Page</b>
<b>1. Our resources</b>	<b>1</b>
<b>2. Resources from other sources:</b>	
a. Classroom activities and materials on the web	2
b. Online activities and animations	3
c. Images	3
d. Films	4
e. Reference material for teachers	5

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## Our resources

EuroStemCell has collaborated with the MRC Centre for Regenerative Medicine in Edinburgh, Scotland to put together this list of resources. Of course, we also offer our own materials:

### EuroStemCell

EuroStemCell is a partnership of stem cell researchers from across Europe. It aims to provide information and resources for both schools and the adult public. It includes:

- Classroom activities with versions suitable for different age groups, including: fill-the-gaps exercises, a word search, activities on stem cells in the media and the ethics of stem cell research, a quick quiz, an introductory PowerPoint for teachers to use. Many of these activities were developed in collaboration with the MRC CRM (see below) and are also available on their website. More activities will be added later in 2010.
- Short films introducing the science and ethics of stem cells, suitable for 16+ year olds.
- FAQs, news articles and a glossary. Suitable for more able 16+ students or adults.

Visit [www.eurostemcell.org](http://www.eurostemcell.org)

### MRC Centre for Regenerative Medicine, University of Edinburgh

The MRC Centre for Regenerative Medicine brings together leading researchers to improve our understanding of basic stem cell biology and work towards new treatments for major diseases such as cancer, heart disease, diabetes, degenerative diseases and liver failure.

The centre is actively involved in public engagement and its website provides a variety of easy-to-use classroom activities suitable for different age groups. These include quizzes, games, science in the media activities and discussion-based work. Many of these activities were developed in collaboration with EuroStemCell and are also available on the EuroStemCell website (see above).

Visit [www.crm.ed.ac.uk/outreach](http://www.crm.ed.ac.uk/outreach)



Links to third party websites are for your convenience only. Such websites are operated and controlled by third parties and their inclusion does not imply any endorsement or approval of the materials on such websites.

## Classroom activities and materials on the web

### S1-S3 students

#### From Stem Cell to Any Cell

[www.sciencenewsforkids.org/articles/20051019/TZWorksheet.asp](http://www.sciencenewsforkids.org/articles/20051019/TZWorksheet.asp)

Worksheet based on engaging students with science in the news. Activity requires that students have access to the internet to research answers to the questions.

#### SciberBrain.org

[www.sciberbrain.org/](http://www.sciberbrain.org/)

A collection of dialogue/discussion activities for teachers to download and use in the classroom, plus two online Flash-based presentations and quizzes for students (one on science, one on ethics).

### S4+ students

#### The Debate over Embryonic and Adult Stem Cell Use

[www.pbs.org/newshour/extra/teachers/lessonplans/science/adult\\_stemcell.html](http://www.pbs.org/newshour/extra/teachers/lessonplans/science/adult_stemcell.html)

Set of activities that aims to introduce the principles of stem cell science as well as give students an understanding of scientific process. Structured to fill two to three 50-minute lessons.

#### Play Decide

[www.playdecide.eu](http://www.playdecide.eu)

A downloadable discussion game that supports students to debate the ethical issues around stem cell research. Extensive and would take more than one lesson, but aspects of the content and format could be adapted for use in a lesson.

#### SciZmic Stem Cell Debate

[www.scizmic.net/](http://www.scizmic.net/)

Debate kit made up of pdf downloads containing tasks and factsheets, plus flow charts explaining embryonic stem cell research and cloning. Note that the kit is now a few years old so some of the content on legal issues is out of date.

#### Stem Cell Curriculum, Northwest Association for Biomedical Research, USA

[www.nwabr.org/education/stemcellrequest.html](http://www.nwabr.org/education/stemcellrequest.html)

Series of downloadable lesson plans on stem cells, covering both science and ethics. Very extensive; lessons quite long and complex. Supported by PowerPoints.

#### Stem Cell Research: The Young People of Scotland Decide

[www.rse.org.uk/schools/learning\\_resources/stem\\_cells/index.html](http://www.rse.org.uk/schools/learning_resources/stem_cells/index.html)

Structure for a group discussion activity, supported by a series of videos showing talks from experts on the science and ethics of stem cell research. Includes additional videos of students giving their views.

#### Stem Cells Science, Ethics and Politics

[www.garlandscience.com/textbooks/cbl/stemcell/activities/activities\\_home.html](http://www.garlandscience.com/textbooks/cbl/stemcell/activities/activities_home.html)

Activity plans with downloadable resources and teacher notes. Advanced level activities and quite long.

#### Stem Cell Snakes and Ladders

[www.embl.de/training/scienceforschools/teacher\\_training/teachingbase/stem\\_cell/index.html](http://www.embl.de/training/scienceforschools/teacher_training/teachingbase/stem_cell/index.html)

Downloadable board, cards and instructions for a snakes and ladders game intended to reinforce basic principles of stem cell science.

#### Triple Science Quick Guides

[www.schoolscience.co.uk/search.cfm?FaArea1=customWidgets.contentItem\\_show\\_1&cit\\_id=4448&&subject\\_id=](http://www.schoolscience.co.uk/search.cfm?FaArea1=customWidgets.contentItem_show_1&cit_id=4448&&subject_id=)

Two-page pdf that introduces stem cells and reasons for doing stem cell research.

## Online activities and animations

### S1-S3

#### SciberBrain.org

[www.sciberbrain.org/](http://www.sciberbrain.org/)

Two Flash presentations and quizzes (one on science, one on ethics) that work in combination with a collection of dialogue/discussion activities for teachers to download and use in the classroom.

#### Learn Genetics

[learn.genetics.utah.edu/content/tech/stemcells/](http://learn.genetics.utah.edu/content/tech/stemcells/)

Series of short animations introducing: the concepts of self-renewal and differentiation; some specialized cell types; types of stem cell. Includes a quiz to test what you have learned and an animate game in which students 'try out cloning' ([learn.genetics.utah.edu/content/tech/cloning/clickandclone/](http://learn.genetics.utah.edu/content/tech/cloning/clickandclone/)). Suitable for higher ability students.

### S4+

#### Biology Animation Library

[www.dnalc.org/resources/animations/stemcells.html](http://www.dnalc.org/resources/animations/stemcells.html)

Cold Spring Harbor Laboratory's Dolan DNA Learning Centre Animations on how embryonic stem cells are made, cloning and other topics. Some can be watched online or downloaded, others only watched online. Also has library of online animations on DNA replication, transcription etc on same site.

#### Learn Genetics

[learn.genetics.utah.edu/content/tech/stemcells/](http://learn.genetics.utah.edu/content/tech/stemcells/)

Series of short animations introducing key concepts relating to stem cells. Includes a quiz and an animated game in which students 'try out cloning' ([learn.genetics.utah.edu/content/tech/cloning/clickandclone/](http://learn.genetics.utah.edu/content/tech/cloning/clickandclone/)). Some students may feel a little patronized by the use of a character called 'Stem Cell Guy' and some of the drag and drop interactives.

#### University of Michigan

[www.umich.edu/stemcell/tutorial/](http://www.umich.edu/stemcell/tutorial/)

Online tutorials on the basics of stem cells and their uses.

## Images

Below is a list of websites offering images that can be freely accessed online and include material relevant to stem cell research. Note that you may be required to ask permission before using some of the images. Please check the relevant website for details.

- California Institute for Regenerative Medicine's photostream: [www.flickr.com/photos/cirm/page2](http://www.flickr.com/photos/cirm/page2)
- Cells Alive! [www.cellsalive.com/gallery.htm](http://www.cellsalive.com/gallery.htm)
- Cellpics: <http://cellpics.cimr.cam.ac.uk>
- Cell Pictures: [www.rkm.com.au/CELL](http://www.rkm.com.au/CELL)
- Free Images: [www.freeimages.co.uk](http://www.freeimages.co.uk)
- PD Andrews: [www.pdandrews.org](http://www.pdandrews.org)
- Public Domain Stock Photos: [www.logodesignweb.com/stockphoto/index.htm](http://www.logodesignweb.com/stockphoto/index.htm)
- Science Photo Library: [www.sciencephoto.com](http://www.sciencephoto.com)
- Science and Technology Facilities Council: [www.scitech.ac.uk/imagelibrary](http://www.scitech.ac.uk/imagelibrary)
- Wellcome Images: <http://images.wellcome.ac.uk>
- Wikimedia Commons: [commons.wikimedia.org/wiki/Main\\_Page](http://commons.wikimedia.org/wiki/Main_Page)

## Films

### Big Screen Science - Stem Cell Controversy (15 minutes)

[www.teachers.tv/video/3189](http://www.teachers.tv/video/3189)

Film made by pupils in collaboration with a professional film-maker and distributed by Teachers' TV. Craig McMillan, a wheelchair user, investigates the moral and ethical dilemmas of stem cell therapy and questions whether it will ultimately affect his own disability. Can be watched online or downloaded for free. You can also order a DVD (£15). You can also download a Word document containing subtitles for the film.

### From Fertilization to Blastocyst (2 mins)

[stemcells.nih.gov/info/cellmovie.htm](http://stemcells.nih.gov/info/cellmovie.htm)

This time-lapse film shows a human embryo from the time of fertilization, when it is a single cell, until it reaches the blastocyst stage. Can be watched online or downloaded. Requires QuickTime to view. No commentary included.

### ISSCR Movies and Images (1 or 2 mins each)

[www.isscr.org/public/index.htm](http://www.isscr.org/public/index.htm)

A few images (3 or 4) of cells and a selection of very short movies (a few minutes each) with titles: beating heart, transplanted fish, walking rat, rat adult neural cells, self-renewal, early embryos, scientists talk. Can be downloaded, formats vary (mpg, avi, wmv, QuickTime).

### Making Sense of Stem Cells (8 chapters, 2 to 5 mins each)

[www.isscr.org/public/index.htm](http://www.isscr.org/public/index.htm)

Leaders of the International Society for Stem Cell Research explain the basics of stem cell research. Aimed at adults. Can be watched online in Windows Media Player or downloaded for viewing in QuickTime.

### Stem Cells: Building and Maintaining the Body (4 chapters of 2 mins each)

[www.cdb.riken.go.jp/en/05\\_development/0505\\_stemcells04.html](http://www.cdb.riken.go.jp/en/05_development/0505_stemcells04.html)

Series of short animations with audio commentary introducing some key concepts in stem cell research. May be visually helpful for students but commentary is aimed at adults and will be too difficult for students. Can be downloaded and played offline.

### Stem Cell Channel (various clips)

[www.stemcellchannel.com.au](http://www.stemcellchannel.com.au)

Australian website that holds a whole host of short clips (a few minutes each) on stem cells, their use and ethical issues. Clips vary in level of difficulty. Website includes links to factsheets for schools, careers-related clips and an 'ask a scientist' form for submitting questions. Clips can be watched online, but not downloaded.

### Stem Cells on Science Now (15 mins)

[www.pbs.org/wgbh/nova/sciencenow/3209/04.html](http://www.pbs.org/wgbh/nova/sciencenow/3209/04.html)

Follows a teenager with diabetes and looks at how stem cells may help, and what the ethical issues around stem cell research are. Language is quite difficult so this is suitable for higher ability S4+ students. Supported by teacher notes/lesson ideas, but can only be watched online.

### Stem Cells: Myths, Truths and Possibilities (10 mins)

[www.isscr.org/public/index.htm](http://www.isscr.org/public/index.htm)

Introduction to types of stem cells. Suitable as an introduction for teachers, and possibly for more able S4+ students. Has to be watched online, cannot be downloaded. Not suitable for viewing on a large screen.

## Reference material for teachers

### **BIONET**

[www.bionetonline.org/English/Content/sc\\_cont1.htm#](http://www.bionetonline.org/English/Content/sc_cont1.htm#)

Website on various biological themes, with a stem cell section. Includes text, slides (in 9 languages), video and quiz material on what stem cells are, legal positions in different countries and ethics.

### **BioZone**

[www.biozone.co.nz/links.html](http://www.biozone.co.nz/links.html)

Website associated with the BioZone book. The book contains lots of worksheets used at Advanced / Higher Biology level. The website has links to information (not generally worksheets) on various topics, including stem cells.

### **Stem Cell Information, National Institutes of Health, USA**

[stemcells.nih.gov](http://stemcells.nih.gov)

Extensive but accessible information on stem cells that includes a glossary. Available as web pages and as a pdf.

### **Stemcellresources.org**

[www.stemcellresources.org](http://www.stemcellresources.org)

American website containing lesson plans, case studies and links to other useful resources for educators: background information for teachers, animations on stem cells, podcasts, webcasts and videos, maps of policy positions.

### **Understanding Cancer: Blood Stem Cell Transplants**

[www.cancer.gov/cancertopics/understandingcancer/StemCells/allpages](http://www.cancer.gov/cancertopics/understandingcancer/StemCells/allpages)

An example of an existing use of stem cells from the US National Institutes of Health. Includes a downloadable PowerPoint with lots of pictures and notes to explain each slide, but would need significant work to adapt for students.

### **Wellcome Trust: Human Embryology and Fertilization Act**

<http://www.wellcome.ac.uk/About-us/Policy/Spotlight-issues/Human-Fertilisation-and-Embryology-Act/index.htm>

Clearly explained information about stem cell basics and the UK Act governing the use of embryos in research. Includes 4 short videos (3-5 mins) of scientists talking about potential uses of stem cells, and an animation explaining how human admixed embryos are made.