

Progenitor X

Middle School - Regenerative Medicine

TERM 2013

LOCATION G+L+S

PROGRAM VideoGames and Learning

Overview of Lesson This fun game will help students learn about the main characters of cellular differentiation; embryonic stem cells, adult stem cells, and induced pluripotent stem cells (iPS cells). Students will take turns playing the role of detective in which they must interview the three mystery cells, roles also played by students, in order to reveal their distinct identities.

Time Needed This lesson is intended for 2-3 class periods: 1-2 days of independent research and group work to complete a cell characteristic chart and 1 day of game play. However, depending on the content already covered, the lesson may be adopted to just game play.

Materials Needed Plain sheets of paper
Notepad
Pencils
Notecards
Room divider
Chairs
Research article(s)
Computers

Content of Lesson Part I: Stem cell research and characteristic chart completion

Students should investigate the different types of stem cells and their roles in cellular differentiation using the various multi-media and print resources made available to them by the instructor.

Have each student create a 4 x 6 chart on a plain piece of paper. Complete the first row with the titles: **Embryonic**, **Adult**, and **iPS cells**. Cross-section this by completing the first column with certain characteristics of each cell type. In the example below, the characteristics; **Definition**, **Specialization**, **Location**, **Age**, **Implications**, and **Future** were used.

Have the students work independently on their charts then meet in pairs or small groups to discuss and compile their findings. Students should be motivated to complete their charts to the best of their ability, since they will be a valuable resource during the game play that follows.

Example of Cell Characteristic Chart

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	Embryonic	Adult	iPSCs
Definition	Ex: Derived from embryos that develop from eggs that have been fertilized in vitro and then donated for research purposes with informed consent of the donors...	Ex: An undifferentiated cell, found in a tissue or organ whose primary role is to maintain and repair the tissue in which they are found...	Ex: Adult cells that have been genetically reprogrammed to act like an embryonic stem cell...
Specialization	Ex: Pluripotent, (meaning having many possibilities) Can become all cell types in the body...	Ex: Can differentiate to different cell types, but is restricted to the tissue of its origin...	Ex: Pluripotent (meaning having many possibilities): Can become all cell types in the body.
Location	Ex: Found in: embryos, in vitro fertilization clinic, laboratories, culture dishes...	Ex: Found among differentiated cells in a tissue or organ, mature tissues, bone marrow, liver, etc...	Ex: Easy to find. Cultured from many cell types...
Age	Ex: In 1981, the first in vitro stem cell line was developed from mice...	Ex: In 1968, the first bone marrow transplant was performed to successfully treat two siblings with severe combined immunodeficiency...	Ex: In 2006, it's discovered that specialized cells could be converted back into stem cells...
Implications (Regenerative Medicine)	Ex: possibility of transplant rejection because not derived from original host.	Ex: Less likely to be rejected after transplantation by immune system...	Ex: Unlikely to be rejected because derived from original host...
Future	Ex: possibly fading out with the increased use of iPSCs...	Ex: Being discovered in more and more places. If the differentiation of adult stem cells can be controlled in the laboratory, these cells may become the basis of transplantation-based therapies...	Ex: Potential tool that could allow doctors to make stem cells from people with rare genetic diseases...

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Part II: Game play

Select one student to play the role of **Detective**. The detective will be responsible for correctly identifying the three mystery cells through various interrogation questions.

When the game begins, ask the detective to exit the room and assign three more students the following roles:

Mystery Cell 1 (Embryonic)

Mystery Cell 2 (Adult)

Mystery Cell 3 (iPS cell)

Have the Mystery Cells take a seat in front of the room facing the class. The identities of the cells should be known by their actors, the teacher, and the rest of the class, and will only remain a mystery to the Detective. In this case, labeled notecards to act as name tags for the Mystery Cells and a room divider to separate the Detective from the cells may come in handy. (If this is unclear, picture the 1960's show *The Dating Game* for an example of the room setup.)

When the room is ready, ask the Detective to return to the room. The Detective may interview Cell 1, 2, and 3 individually using a list of prompted questions, and the Mystery Cells will answer as best they can. All players and the audience should reference their charts and take notes if necessary. After a few questions, the Detective must make an informed guess of the cell identities. The game is over when the Detective has successfully identified the three Mystery Cells.

Vocabulary/Concepts	adult stem cells culture cellular differentiation embryonic stem cells induced pluripotent stem cell (iPSC) in vitro pluripotent regenerative medicine
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Learning Objectives Students will be able to read scientific information from print and/or multimedia texts.

Students will be able to decipher what information from their research is relevant and summarize their findings in a chart.

Students will be able to correctly identify embryonic, adult, and iPS stem cells through their knowledge gained in research and through deductive reasoning.

Students will be able to show their understanding of the three types of cells of regenerative medicine, their relationships with the human body, and their similarities and differences by correctly identifying the Mystery Cells

Educational Standards

- (MS-LS1-3.)** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- (MS-LS4-5.)** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- (MS-LS1-1.)** Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- (RST.6-8.10)** By the end of grade 8, read and comprehend science/technological texts in the grades 6-8 text complexity band independently and proficiently.