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Introduction

The Real-Life Science series is designed to engage students with topics of high interest that involve places, phenomena, technology and concepts that they may encounter in their everyday lives. The topics were chosen by professionals in science education, and the activities have been developed to address a number of science concepts. Each book in the series has a correlations chart that shows core science concepts that are addressed by each lesson, as well as other standards that are addressed, but are not the main focus of the lesson.

Using “real-life” examples is a technique that supports theory that quality instruction can and should include material that does more than just require students to memorise and repeat basic facts.

This series supports the following teaching approaches:

Teachers of science plan an inquiry-based science program for their students.

- Select science content and adapt and design curricula to meet the interests, knowledge, understanding, abilities and experiences of students.

Teachers of science guide and facilitate learning.

- Focus and support inquiries while interacting with students.
- Orchestrate discourse among students about scientific ideas.

Teachers of science develop communities of science learners that reflect the intellectual rigour of scientific inquiry and the attitudes and social values conducive to science learning.

- Structure and facilitate ongoing formal and informal discussion based on a shared understanding of rules of scientific discourse.
- Model and emphasise the skills, attitudes and values of scientific inquiry.

Each book in the Real-Life Science series features lessons you can use in your classroom today. Use these engaging lessons to help your students explore the intriguing ways that science is at work all around them.

25. What Are Stem Cells?

Topics

cell development, DNA, stem cells

Goal

To clarify the nature of stem cells, both what they are and how they are used

Context

Debate over the use of stem cells is in the news on a daily basis, both in Australia and abroad. The ethical questions surrounding the collection and use of stem cells make this topic something students should know about.

Teaching Notes

After reading the Explanation, discuss and, as necessary, do the following:

- Help students distinguish between embryonic stem cells and adult stem cells.
- Discuss and identify where embryonic and adult stem cells are found.
- Clarify the definition of differentiate.

Extension Activity

Have students find recent stories in the news that pertain to stem-cell use or research. As a class, compile a list of all the ways stem cells are used to treat diseases and a list of restrictions placed on stem-cell research.

Answer Key

1. a
2. c
3. d
4. b
5. Stem cells have the ability to keep dividing without differentiating and can differentiate into any of the body's 220 different types of cells.
6. Adult stem cells repair and/or replace damaged cells.
7. Scientists are interested in using stem cells to replace damaged cells or even grow entire organs.
8. In order to use embryonic stem cells, the embryo must be destroyed. Some people are concerned that scientists could clone embryos only to use them for their cells.

25. What Are Stem Cells?

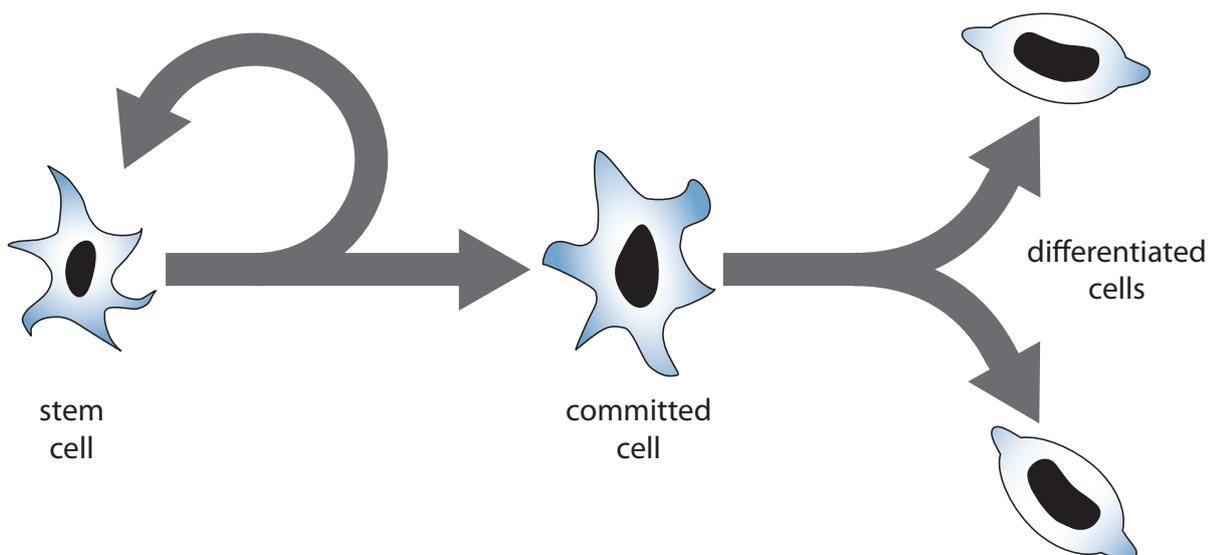
Explanation

You have probably heard stem cells discussed on the news. But what are they, and why are they the subject of such debate? Stem cells are cells that have two important characteristics. They have the ability to keep dividing without differentiating. They also have the ability to differentiate into any of the body's 220 different types of cells.

You probably know that the beginning of a new organism starts when an egg is fertilised by a sperm. Immediately, the fertilised egg splits into two identical cells, which split into four cells, which split again, and so on. Each split produces an identical cell. After about five days, there are about 50 to 150 cells in a ball called a blastocyst. The cells inside this ball are the stem cells, called embryonic stem cells. These stem cells can differentiate into any type of body cell. The term differentiate means to go from unspecialised to specialised.

A second type of stem cell is the adult stem cell. Adult stem cells are undifferentiated cells that are found throughout the body. These cells repair and/or replace damaged cells. Adult stem cells may have limited differentiation abilities.

Researchers are interested in stem cells because of their ability to become any type of body cell. Scientists' goals are to grow stem cells that can be differentiated, and then use them to replace damaged cells or even grow entire organs. Using embryonic stem cells is controversial because in order to use the cells, the embryo has to be destroyed. People have different views about when life begins. Some are concerned that scientists could clone embryos only to use them for their cells. There is no doubt that the debate about stem-cell research will be around for a while.



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STUDENT PAGE**25. What Are Stem Cells?**

Match the description on the left with the letter of the correct term on the right. Write the letter on the line.

- | | |
|---|-------------------------|
| _____ 1. These stem cells are found throughout the body. | a. adult stem cells |
| _____ 2. This means to go from unspecialised to specialised. | b. embryonic stem cells |
| _____ 3. Embryonic stem cells are found here. | c. differentiate |
| _____ 4. These stem cells can differentiate into any of the 220 different types of cells. | d. blastocyst |

Answer the following questions.

5. What are the two characteristics of stem cells?

6. What is the role of adult stem cells?

7. How are scientists interested in using stem cells?

8. What are two reasons the use of embryonic stem cells is debated?