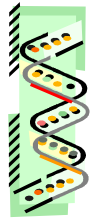


10.4 Cell Differentiation –POWERPOINT NOTES



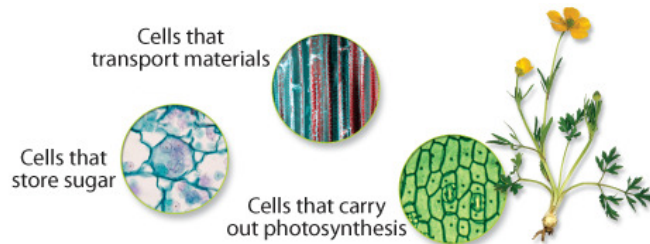
THINK ABOUT IT

The human body contains hundreds of different cell types, and every one of them develops from the single cell that starts the process. How do the cells get to be so different from each other?

From One Cell to Many

How do cells become specialized for different functions?

- During the development of an organism, cells _____ into many types of cells.
- All organisms start life as just _____ cell.
- Most multicellular organisms pass through an early stage of development called an _____, which gradually develops into an adult organism.
- During _____, an organism's cells become more differentiated and specialized for particular functions.
- For example a plant has specialized cells in its _____, _____, and _____.

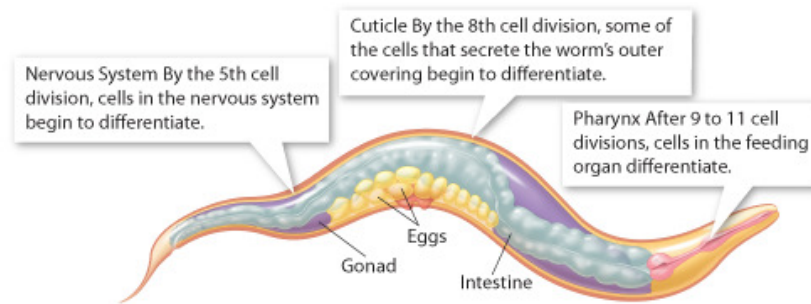


Defining Differentiation

- The process by which cells become _____ is known as _____.
- During development, cells differentiate into many different types and become specialized to _____.
- Differentiated cells carry out the _____ that multicellular organisms need to stay alive.

Mapping Differentiation

- In some organisms, a cell's _____ is determined at a specific point in development.
 - In the worm *C. elegans*, daughter cells from each cell division follow a specific path toward a role as a particular kind of cell.



Differentiation in Mammals

- Cell differentiation in mammals is controlled by a number of interacting factors in the _____.
- _____ cells generally reach a point at which their differentiation is complete and they can no longer become other types of cells.

Stem Cells and Development

What are stem cells?

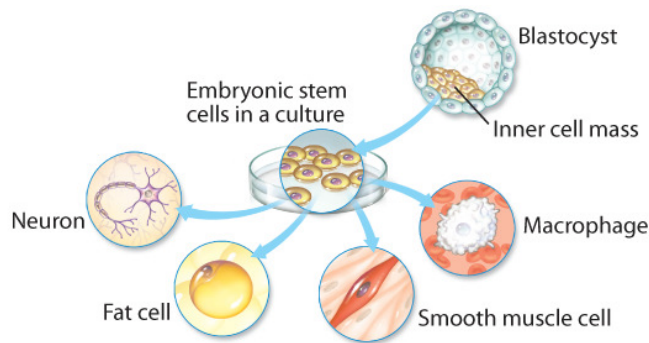
- The unspecialized cells from which differentiated cells develop are known as _____.
- One of the most important questions in biology is how all of the specialized, differentiated cell types in the body are formed _____.
- Biologists say that such a cell is _____, literally able to do everything, to form all the tissues of the body.
- Only the _____ and the cells produced by the first few cell divisions of embryonic development are truly totipotent.

Human Development

- After about four days of development, a human embryo forms into a _____, a hollow ball of cells with a cluster of cells inside known as the inner cell mass.
- The cells of the inner cell mass are said to be _____, which means that they are capable of developing into many, but not all, of the body's cell types.

Stem Cells

- **Stem cells** are _____ - cells from which _____ cells develop.
- There are two types of stem cells: _____ and _____ cells.



Embryonic Stem Cells

- _____ are found in the inner cells mass of the early embryo.
- Embryonic stem cells are pluripotent.
- Researchers have grown stem cells isolated from human embryos in culture. Their experiments confirmed that embryonic stem cells have the capacity to produce _____ in the human body.

Adult Stem Cells

- Adult organisms contain _____ of stem cells.
- Adult stem cells are _____. They can produce many types of differentiated cells.
- Adult stem cells of a given organ or tissue typically produce _____ of cells that are unique to _____.

Frontiers in Stem Cell Research

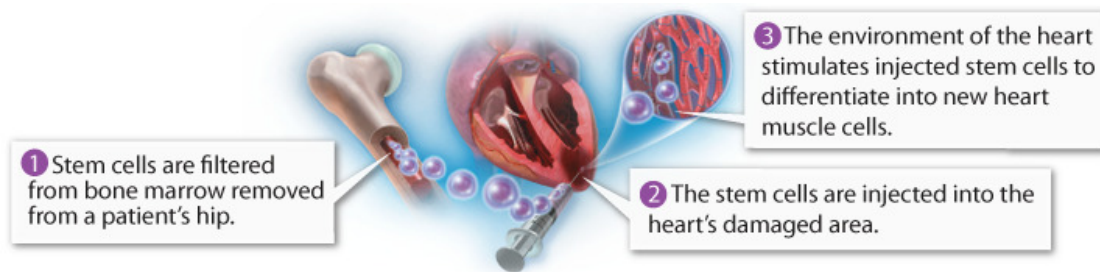
What are some possible benefits and issues associated with stem cell research?

- Stem cells offer the potential benefit of using undifferentiated cells to _____ or _____ badly damaged cells and tissues.
- Human embryonic stem cell research is controversial because the arguments for it and against it both involve _____ of life and death.

Potential Benefits

- Stem cell research may lead to new ways to repair the cellular damage that results from _____, _____, and _____ injuries.

One example is the approach to reversing heart attack damage illustrated below.



Ethical Issues

- Most techniques for _____, or gathering, embryonic stem cells cause _____ of the embryo.
- Government funding of embryonic stem cell research is an important _____.
- Groups seeking to protect embryos oppose such research as _____.
- Other groups support this research as essential to saving human lives and so view it as unethical to _____.