



Cancer

5.3 Cell Regulation

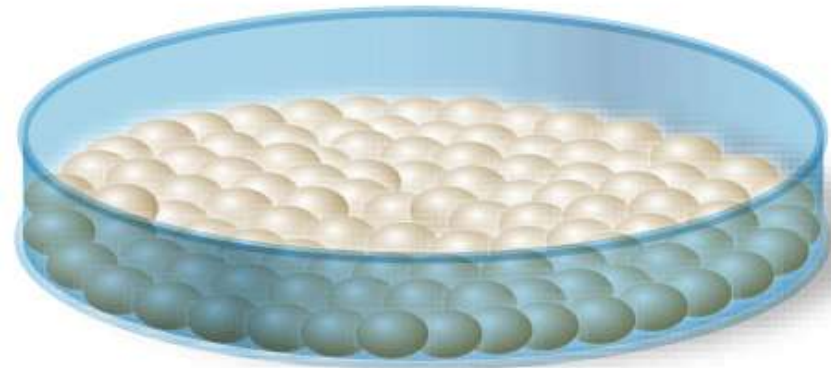
EQ:

What happens when the cells do not follow the normal cell cycle?

[Cancer and Diagnosis
Clip....](#)

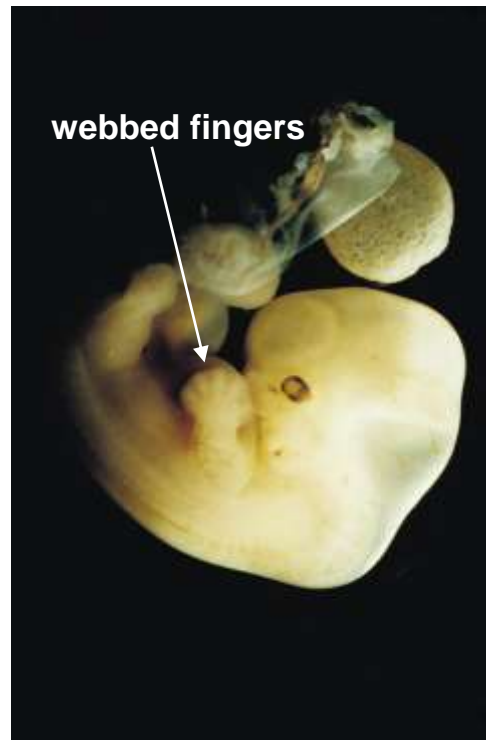
Internal and external factors regulate cell division.

- External factors include physical and chemical signals.
- **Growth factors** are proteins that stimulate cell division.
 - Most mammal cells form a single layer in a culture dish and stop dividing once they touch other cells.



- **Apoptosis** is programmed cell death.

- a normal feature of healthy organisms
- caused by a cell's production of self-destructive enzymes
- occurs in development of infants



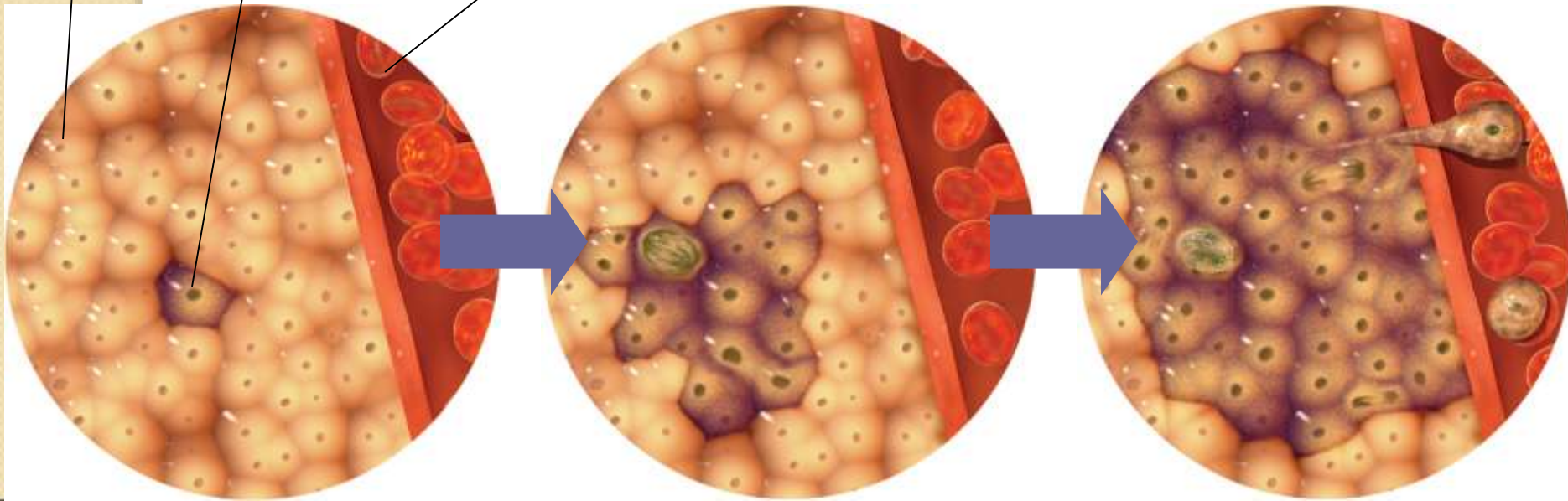
Cell division is **uncontrolled** in cancer.

- Cancer cells form disorganized clumps called **tumors**.
- **Benign** tumors remain clustered and can be removed.
- **Malignant** tumors metastasize, or break away, and can form more tumors.

normal cell

cancer cell

bloodstream



Loss of Normal Growth Control

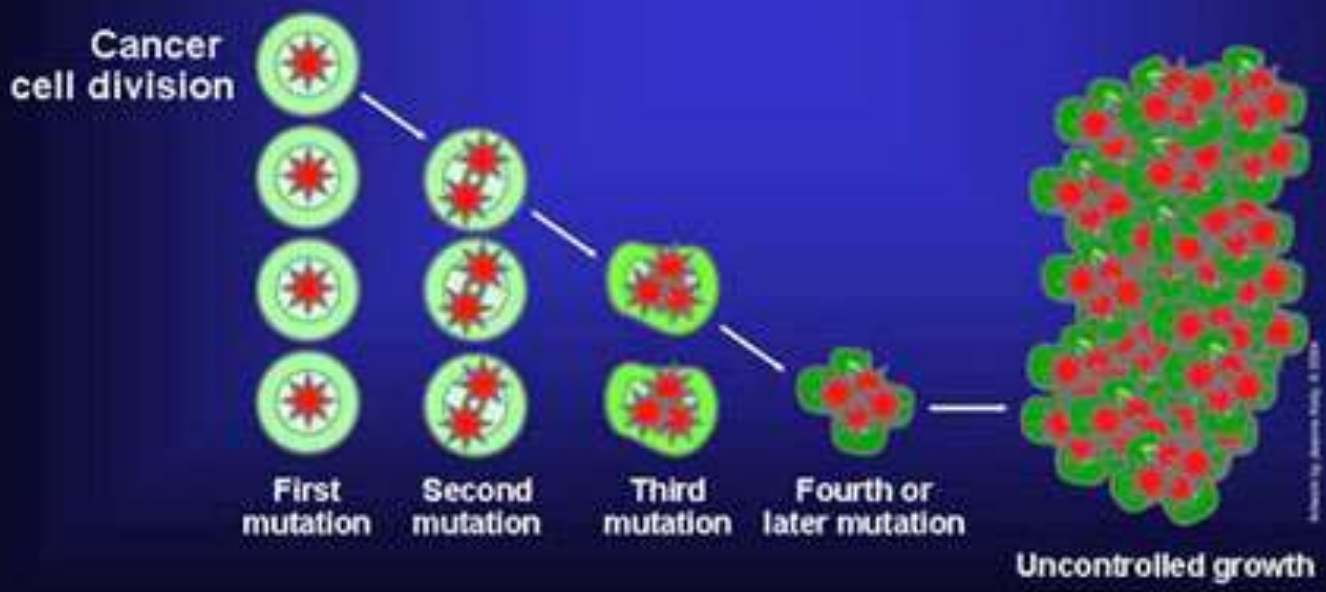
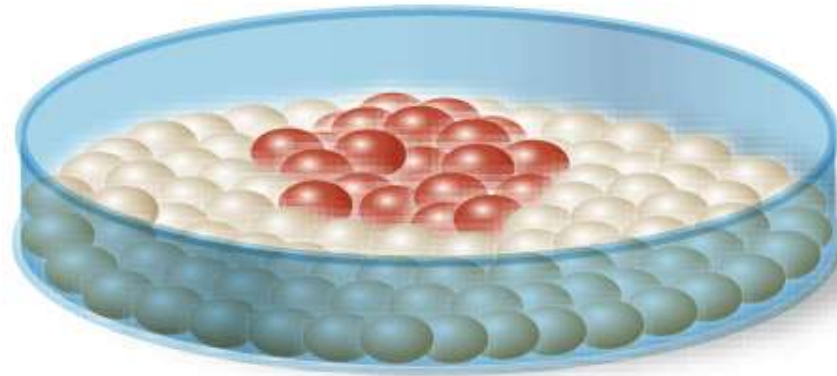


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- Cancer cells do not carry out necessary functions.
- Cancer cells come from normal cells with damage to genes involved in cell-cycle regulation.

Cancerous cell growth



- **Carcinogens** are substances known to promote cancer.
- Standard cancer treatments typically kill both **cancerous and healthy cells**.



Types of Cancer

- **Carcinoma** - cancer that begins in the skin or in tissues that line or cover internal organs.
- **Sarcoma** - cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue.
- **Leukemia** - cancer that starts in blood-forming tissue such as the bone marrow and causes large numbers of abnormal blood cells to be produced and enter the blood.
- **Lymphoma and myeloma** - cancers that begin in the cells of the immune system.
- **Central nervous system cancers** - cancers that begin in the tissues of the brain and spinal cord.
- Diagnosing cancer clip...

2009 Statistics

New cases: 1,479,350 (does not include nonmelanoma skin cancers)
Deaths: 562,340



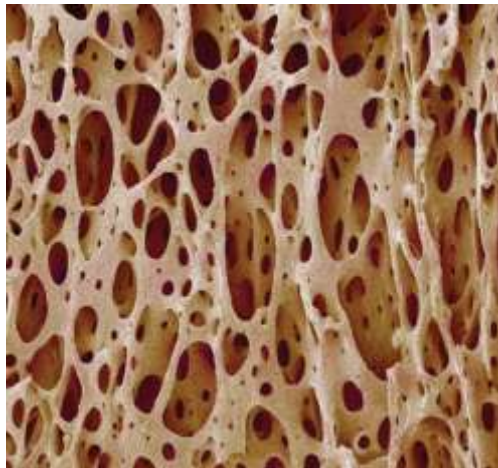
Stem Cells

Specialized cells perform specific functions.

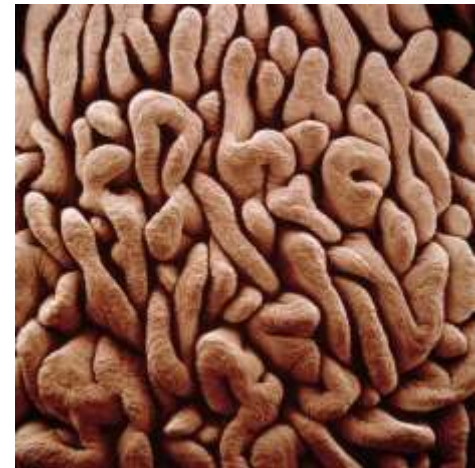
- Cells develop into their mature forms through the process of **cell differentiation**.
- Cells differ because different **combinations of genes** are expressed.
- A cell's **location** in an embryo helps determine how it will differentiate.



Outer: skin cells



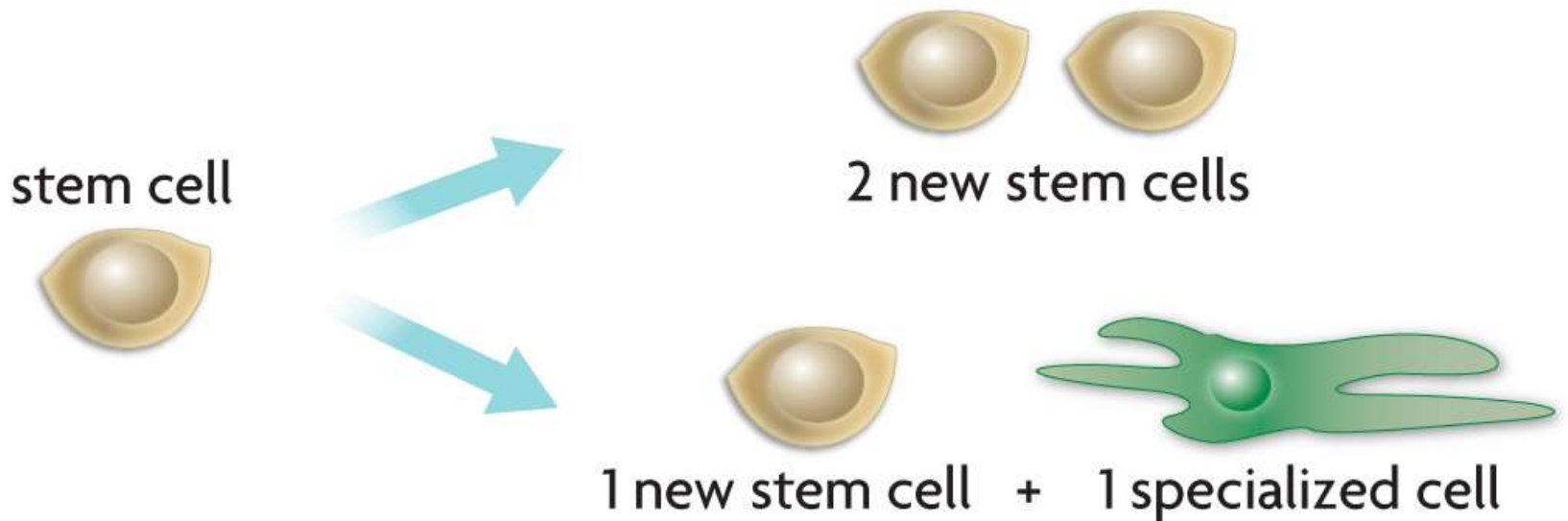
Middle: bone cells




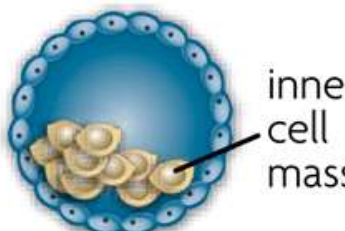

Inner: intestines

Stem cells are unique body cells.

- Stem cells have the ability to
 - divide and renew themselves
 - remain undifferentiated in form
 - develop into a variety of specialized cell types

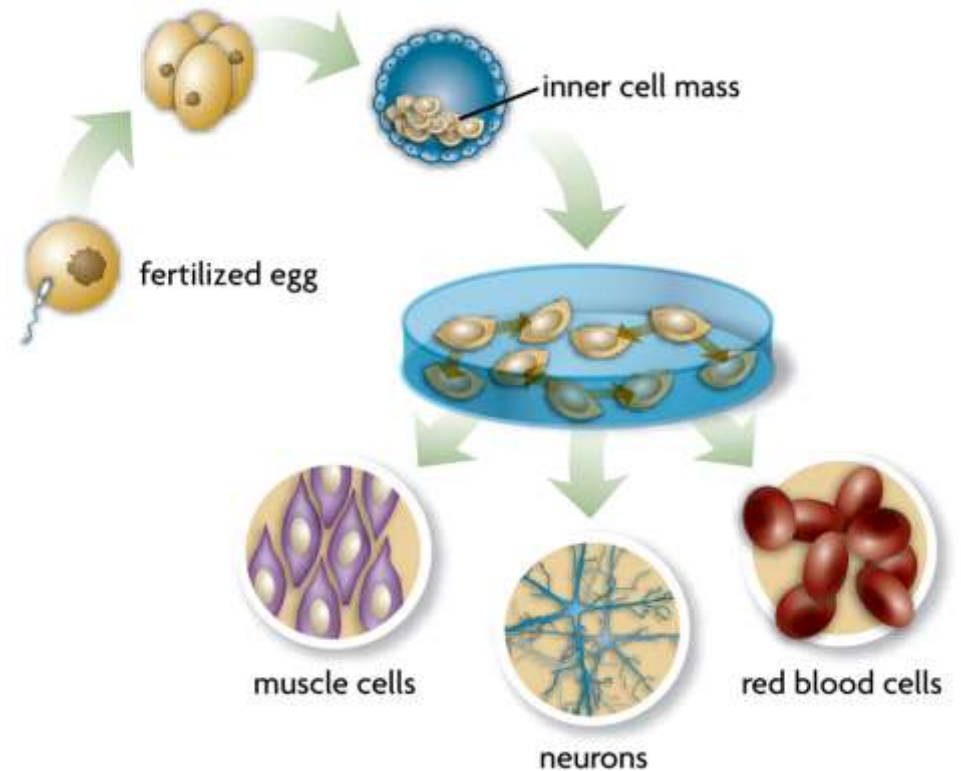


- Stem cells are classified into three types.
 - **totipotent**, growing into any other cell type
 - **pluripotent**, growing into any cell type except a totipotent cell
 - **multipotent**, growing into cells of a closely related cell family

| Class | totipotent | pluripotent | multipotent |
|------------------|--|--|---|
| Type of cell | fertilized egg  | embryonic stem cell  | adult stem cell (example from blood)  |
| Can give rise to | all cells | almost any cell | closely related cells |
| Example | new organism | neurons, skin, muscle, kidney, cartilage, bone, liver, pancreas | red blood cells, platelets, white blood cells |

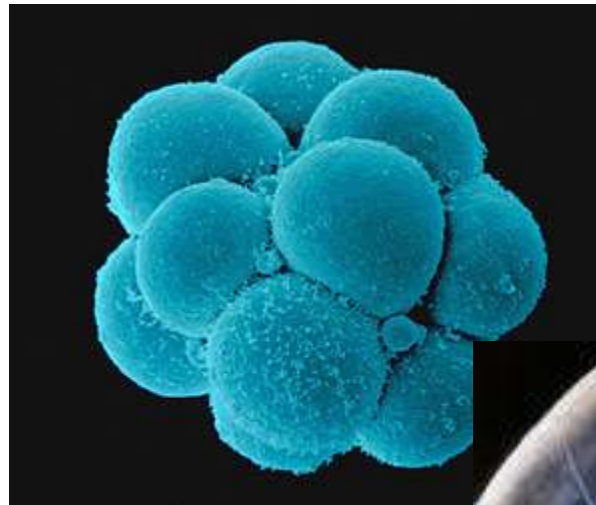
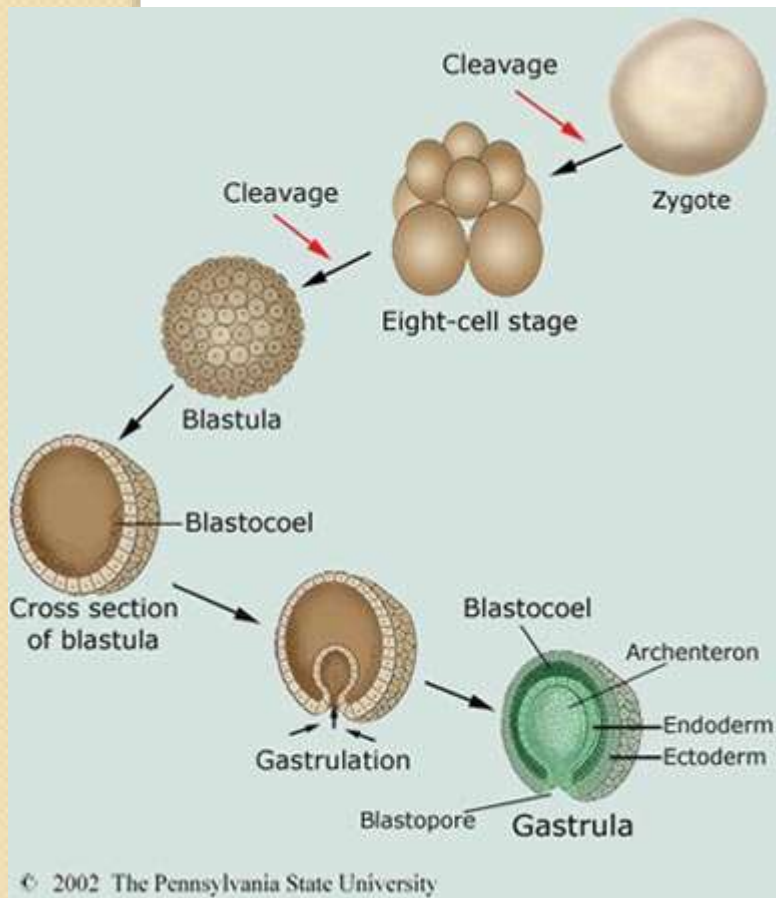
- Stem cells come from adults and embryos.

- Adult stem cells can be hard to isolate and grow.
- The use of adult stem cells may prevent **transplant rejection**.




First, an egg is fertilized by a sperm cell in a petri dish. The egg divides, forming an inner cell mass. These cells are then removed and grown with nutrients. Scientists try to control how the cells specialize by adding or removing certain molecules.

- The use of embryonic stem cells raises ethical issues
- Embryonic stem cells are pluripotent and can be grown indefinitely in culture.
- Taken from a few days old up to 8 week old fetus



8 Week Fetus
Pictures

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- The use of stem cells offers many currently realized and potential benefits.
 - Stem cells are used to treat leukemia and lymphoma.
 - Stem cells may cure disease or replace damaged organs.
 - Stem cells may revolutionize the drug development process.
 - The use of stem cells, especially embryonic, raises ethical dilemmas concerning how far science should go in an effort to help people.

In the News:

- 10/27/09 –limited funding to cell lines derived from embryos before August 2001.
 - Federal law prohibits the use of U.S. government funds for research that creates embryos for research or destroys them. That law, the Dickey-Wicker Amendment, has been interpreted to allow federal support for research on embryonic cell lines created with private funds.
- Dickey-Wicker Amendment
- Adult Stem Cell Treatment Case
- Stem Cell Legislation
- Can embryonic stem cells cure diseases?