



## Lesson Overview

11.3 Regulating  
the Cell Cycle

# Controls on Cell Division

The controls on cell growth and division can be turned on and off

The cell cycle is controlled by regulatory proteins both inside and outside the cell.

## The Discovery of Cyclins

**Cyclins** are a family of proteins that regulate the timing of the cell cycle in eukaryotic cells.

# Regulatory Proteins

**Internal regulators** - proteins that respond to events inside a cell.

**External regulators** - proteins that respond to events outside the cell.  
- speed up or slow down the cell cycle.

**Growth factors** - external regulators that stimulate the growth and division of cells.

-important during embryonic development and healing.

# Apoptosis

**Apoptosis** - programmed cell death.

- influences development by shaping the structure of tissues and organs in plants and animals.

**Cancer** is a disorder in which body cells lose the ability to control cell growth.

Cancer cells divide uncontrollably to form a mass of cells called a **tumor**.

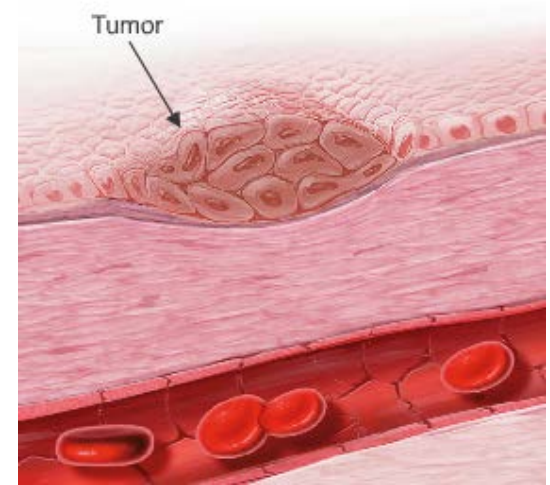
# Lesson Overview     Regulating the Cell Cycle

A **benign** tumor is noncancerous. It does not spread.

A **malignant** tumor is cancerous. It spreads to other body parts.

The spread of cancer cells is called **metastasis**.

Cancer cells absorb nutrients needed by other cells, block nerve connections, and prevent organs from functioning.



# What Causes Cancer?

- defects in genes that regulate cell growth and division.  
example: p53 gene
- **Carcinogens** – cancer causing substances
  - damage DNA causing gene defects
  - examples: smoking tobacco, radiation, viruses, chemicals

## Treatments for Cancer

- surgical removal.
- targeted radiation.
- Chemotherapy = chemical poisons.