

# Cell Cycle Regulation

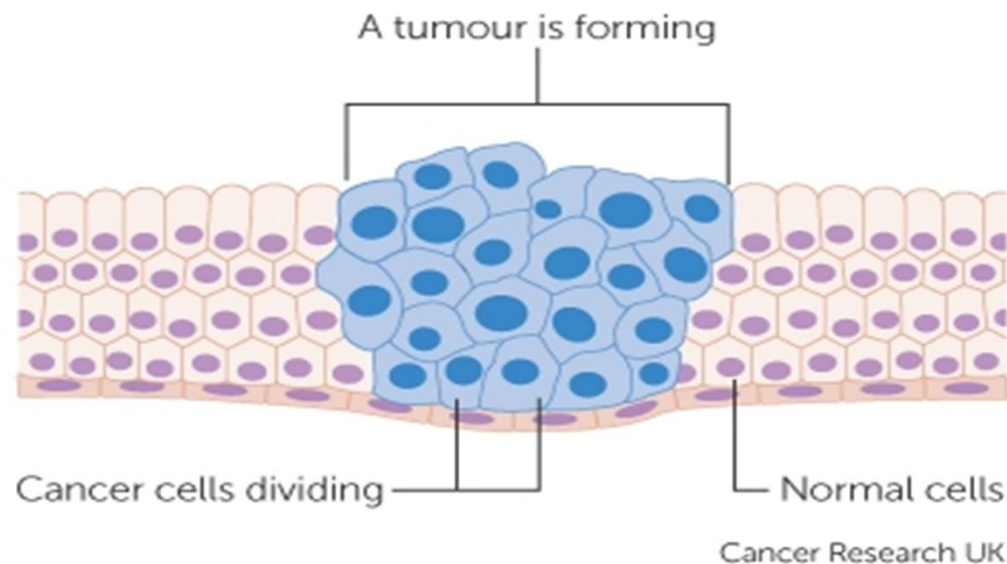
Section 9.3

# Normal Cell Cycle

- An organism depends on proper timing of cell division
- Proteins and enzymes help to signal stages in cell division
- Examples:
  - G1 of interphase – signal to start the cycle
  - S – signal for DNA replication
  - Mitosis – before prophase, signal to start nuclear division
  - Signal after cytokinesis – stops division and begins growth process again
- Checkpoint – monitor the cycle and stop it if something is wrong
  - End of G1 looks for DNA damage
  - Spindle failure stops before cytokinesis

# Abnormal Cell Cycle: Cancer

- Cancer – uncontrolled growth and division of cells
- Results of the failure to regulate the cell cycle
- Cancer cells kill an organism by crowding out normal cells and stopping their processes
- Spend less time in interphase than normal cells
  - As long as they get nutrients, they keep dividing very quickly



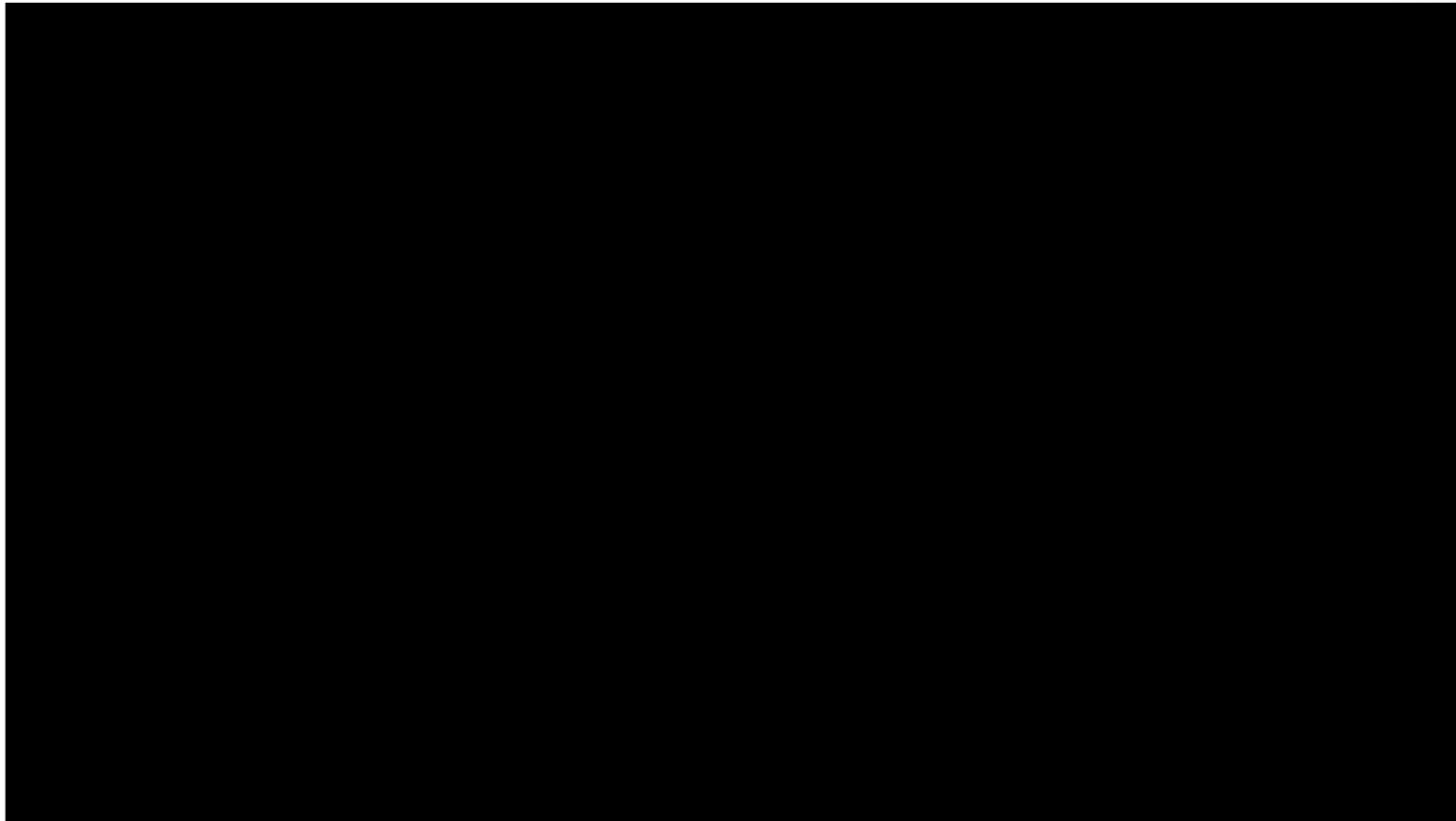
# Abnormal Cell Cycle: Cancer

- Cancer usually occurs in healthy, active organisms
- Mutations occur that affect the checkpoints in the cycle
- If they are not repaired properly, cancer can result
- Substances that cause cancer are called carcinogens
- Avoiding carcinogens can help to reduce your risk of cancer
- Examples:
  - Asbestos
  - Tobacco
  - Secondhand smoke
  - Ultraviolet radiation
  - Exposure to X rays
- More than one change to DNA has to result in order to get cancer
  - Over time the changes occur – why older people get cancer more often

# Apoptosis

- Programmed cell death
- Usually shrink and shrivel in a controlled process
- “death program” that can be activated in the cell
- Example:
  - Human hand and foot
  - During development, there is webbing between the fingers and toes
  - Apoptosis occurs and this is not present in a mature organism
- Can help to kill off cells that are destined for cancer and save an organism

# Apoptosis



# Stem Cells

## Embryonic Stem Cells

- Unspecialized cells
- After fertilization, a mass of cells results
- These are not specialized
- Capability of developing into various types of cells
- If not harvested, they will become specialized as the embryo grows
- Very controversial

## Adult Stem Cells

- Unspecialized cells
- Found in various body tissues
- Ever babies have “adult” stem cells
- Capability to develop into various types of cells
- Can help to treat and/or cure various diseases and conditions
- Not as controversial

# Stem Cells

