Regulation Section 3

Controls

Key Idea: Cell growth and division depend on protein signals and other environmental signals.

Controls

- Cell division is highly controlled.
- Signals from surrounding cells or even from other organs can also regulate cell growth and division.

Checkpoints

Key Idea: Feedback signals at checkpoints in the cell cycle can delay or trigger the next phase of the cell cycle.

Checkpoints

- Three main checkpoints: G_1, G_2, and mitosis
- G_1 - the cell checks its surroundings
- G_2 - the cell checks for any mistakes in the copied DNA. Enzymes correct the mistakes.
- Metaphase stage of mitosis - the cell checks that the chromosomes are properly attached to the spindle fibers.

At each checkpoint...

- G_1 - If conditions are not favorable, the cell goes into a resting period.
- G_2 - This checkpoint ensures that the DNA of the daughter cells will be identical to the DNA of the original cell.
- Mitosis - This checkpoint ensures that the genetic material is distributed equally between the daughter cells.

Cancer

Key Idea: Uncontrolled cell growth and division can result in masses of cells that invade and destroy healthy tissues.

Cancer is a group of severe and sometimes fatal diseases that are caused by uncontrolled cell growth.

A tumor is a mass formed by a defective cell that divides and produces more defective cells.

Loss of Control

- Damage to a cell's DNA can cause the cell to respond improperly or to stop responding leaving the cell cycle uncontrolled.

Development

- A benign tumor does not spread to other parts of the body and can often be removed by surgery.
- A malignant tumor invades and destroys nearby healthy tissues and organs.
- Metastasis is a process where malignant tumors, or cancers, can break loose from their tissue or origin and grow throughout the body.

Treatment

- Chemotherapy or "chemo" for short are drugs that kill the fast-growing cancer cells.
- Some cancers can be treated by surgery to remove the affected organ.
- In radiation therapy, high-energy rays are focused on an area in order to destroy cancerous cells.

Prevention

- The best way to prevent cancer is to avoid things that can cause cancer.
- Examples:
  - Ultraviolet radiation i sunlight
  - Chemicals in cigarette smoke