5.4.3 Chemical Regulation

Chemical regulation is the process by which the body maintains proper levels of chemical substances such as glucose, oxygen, carbon dioxide, salts, and hormones. It is an important part of homeostasis and ensures that body cells function efficiently.

Definition of Chemical Regulation

Chemical regulation refers to the control and maintenance of chemical balance within the body. It involves coordination between organs, hormones, and enzymes to maintain stable internal conditions.

Importance of Chemical Regulation

The body requires balanced chemical conditions for normal metabolism and survival.

Maintains normal blood glucose levels. Controls oxygen and carbon dioxide levels. Regulates pH balance. Supports enzyme activity. Maintains healthy cells and tissues.

Regulation of Blood Glucose

Blood glucose level must remain stable because glucose is the main source of energy for body cells. The pancreas regulates blood sugar through hormones called insulin and glucagon.

Role of Insulin

Insulin is released when blood sugar level becomes high after eating.

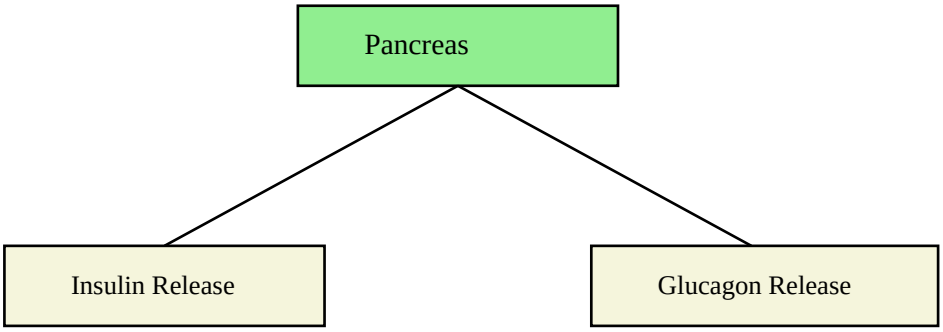
Stimulates body cells to absorb glucose. Converts excess glucose into glycogen in the liver. Lowers blood glucose level.

Role of Glucagon

Glucagon is released when blood glucose becomes low.

Converts glycogen into glucose. Releases glucose into the blood. Raises blood glucose level.

Diagram of Blood Glucose Regulation


Pancreas
Insulin Release
Glucagon Release

Regulation of Oxygen and Carbon Dioxide

The respiratory system helps maintain normal levels of oxygen and carbon dioxide in the blood.

Oxygen is needed for cellular respiration. Carbon dioxide is a waste product of respiration. Breathing rate changes according to body needs. The brain controls breathing through the respiratory center.

Regulation of pH

The body maintains blood pH around 7.4. Small changes in pH can affect enzymes and body processes.

The lungs remove carbon dioxide. The kidneys remove acids and bases. Buffer systems stabilize blood pH.

Hormonal Regulation

Hormones are chemical messengers produced by endocrine glands. They help regulate growth, metabolism, reproduction, and many other activities.

Hormone	Gland	Function
Insulin	Pancreas	Lowers blood glucose
Thyroxine	Thyroid	Regulates metabolism
Adrenaline	Adrenal gland	Prepares body for stress
Growth hormone	Pituitary gland	Controls growth

Disorders Related to Chemical Regulation

Failure in chemical regulation may lead to diseases and disorders.

Diabetes mellitus: Caused by insufficient insulin. **Acidosis:** Excess acidity in the blood. **Alkalosis:** Excess alkalinity in the blood. **Hormonal imbalance:** Too much or too little hormone production.

Important Notes

- Chemical regulation maintains stable internal chemical conditions.
- Insulin lowers blood glucose level.
- Glucagon increases blood glucose level.
- The lungs and kidneys regulate blood pH.
- Hormones are important chemical regulators.

Summary

Chemical regulation is essential for maintaining homeostasis in the body. The body carefully controls blood glucose, oxygen, carbon dioxide, and pH levels. Hormones, the respiratory system, and the kidneys work together to maintain stable conditions necessary for healthy body functioning.

Review Questions and Answers

1. What is chemical regulation?

Chemical regulation is the maintenance of stable chemical conditions in the body.

2. Which hormone lowers blood glucose level?

Insulin lowers blood glucose level.

3. What is the function of glucagon?

Glucagon increases blood glucose level.

4. Which organs help regulate blood pH?

The lungs and kidneys help regulate pH.

5. Why is oxygen important?

Oxygen is needed for cellular respiration.

6. Mention one disorder related to chemical regulation.

Diabetes mellitus.

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