

Definition

A hormone is a **chemical substance** produced by **endocrine glands** and **secreted directly into the blood** to be transported to **specific target organs** where it exerts its effects, after which it is **destroyed by the liver**.

Differences between endocrine & nervous

| Endocrine | Nervous |
|--------------------------------|---------------------------------|
| Involves hormones | Involves impulses |
| Transported in blood | Transported by neurones |
| Usually slow | Usually quick |
| Involuntary | Either voluntary or involuntary |
| Short-lived or long-lived | Short-lived |
| May affect more than one organ | Usually localised |

Adrenaline

| | |
|---|--|
| Stimulus: fear, anger, anxiety received by the hypothalamus | Secreted by adrenal medulla in the adrenal gland |
| Actions | Effects |
| Stimulates breakdown of glycogen to glucose in the liver | Increases blood glucose level |
| Increases heart rate and blood pressure | Transport oxygen and glucose to the muscles faster |
| Increases rate and depth of ventilation | Increases oxygen supply to the muscles |
| Dilates pupils of eye | Enhanced vision |
| Constricts arterioles in the skin and digestive system | Channel more blood to the skeletal muscles |
| Speeds up blood clotting | Reduces blood loss |

Insulin

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|---|--|
| Stimulus: blood glucose concentration increases above normal levels | Secreted by Islets of Langerhans in the pancreas |
| Actions | Effects |
| Increases permeability of cell membranes to glucose | Increases glucose uptake |
| Stimulates conversion of excess glucose into glycogen in liver and muscles | Decreases blood glucose concentration |

Glucagon

| | |
|---|--|
| Secreted when blood glucose concentration decreases below normal levels | Secreted by Islets of Langerhans in the pancreas |
| Actions | Effects |
| Stimulates the conversion of glycogen, fats and amino acids into glucose in the liver | Increases blood glucose concentration |

Effects of insulin on body

Lack of secretion:
Hyperglycemia
 Glucose cannot be stored and therefore lost in urine, causing **diabetes mellitus**.
 Muscles have no glycogen reserve, causing the person to feel weak and eventually lose weight.
 Body oxidises fats instead of glucose for energy, causing **poisonous substance ketones** to be produced, which at high concentrations can cause blood pH to drop.
 Over-secretion:
Hypoglycemia
 Results in insulin shock, leading to coma and possibly death.

Diabetes Mellitus

Type 1

Islets of Langerhans do not secrete sufficient insulin

Type 2

Cells of target organs are insensitive to insulin

Signs and symptoms

1. Presence of glucose in urine after meals
2. Persistently high blood glucose conc.
3. Slow healing of wounds as bacteria growth is encouraged with high blood glucose, causing inflammation of wounds
4. Increased urination/thirst
5. Rapid weight loss as there is low glycogen storage
6. Blurred vision leading to blindness

4: High blood glucose conc. causes a decrease in water potential. Water moves from surrounding tissue fluid into the blood, indicating that more water will enter the nephron during ultrafiltration, therefore causing increased volume of urine to be produced. There is thus loss of excessive amount of water, causing feelings of thirst

Treatments for diabetes

Inject insulin directly into blood

Ensure patients have a supply of sugary food as too much insulin can cause blood glucose to drop too low, leading to coma

Regulate carbohydrate content in diets, regular exercise