OCR (A) Biology A-level

5.1.4 - Hormonal communication

Flashcards

What is endocrine communication?

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Specialised glands secrete hormones into bloodstream.

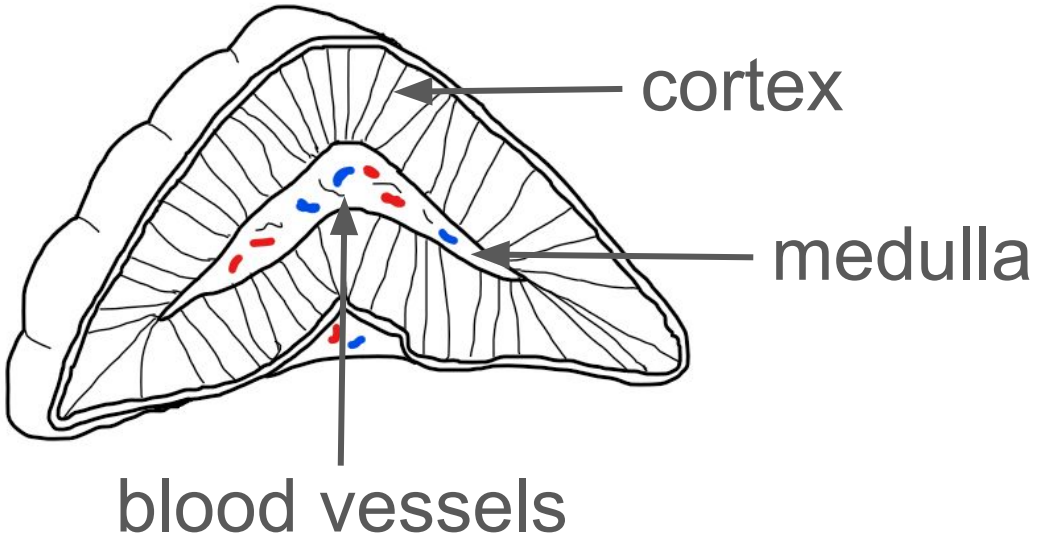
Circulatory system carries hormone to target cell/ tissue.

Lipid-soluble steroid hormones diffuse into cell & bind to complementary receptor in cytoplasm. Peptide hormones bind to complementary receptor on cell-surface membrane.

Describe the structure of the adrenal glands.

Describe the structure of the adrenal glands.

Located above kidneys.



What hormone does the medulla secrete?

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Adrenaline in response to danger, stress or excitement as part of the fight or flight response.

Which hormones does the cortex secrete?

Which hormones does the cortex secrete?

- **Mineralocorticoids** e.g. aldosterone, which targets kidney & gut to control concentration of Na^+ & K^+ ions in blood.
- **Glucocorticoids** e.g. cortisol & corticosterone, which stimulate an increase in blood glucose concentration.

Describe the histology of the pancreas.

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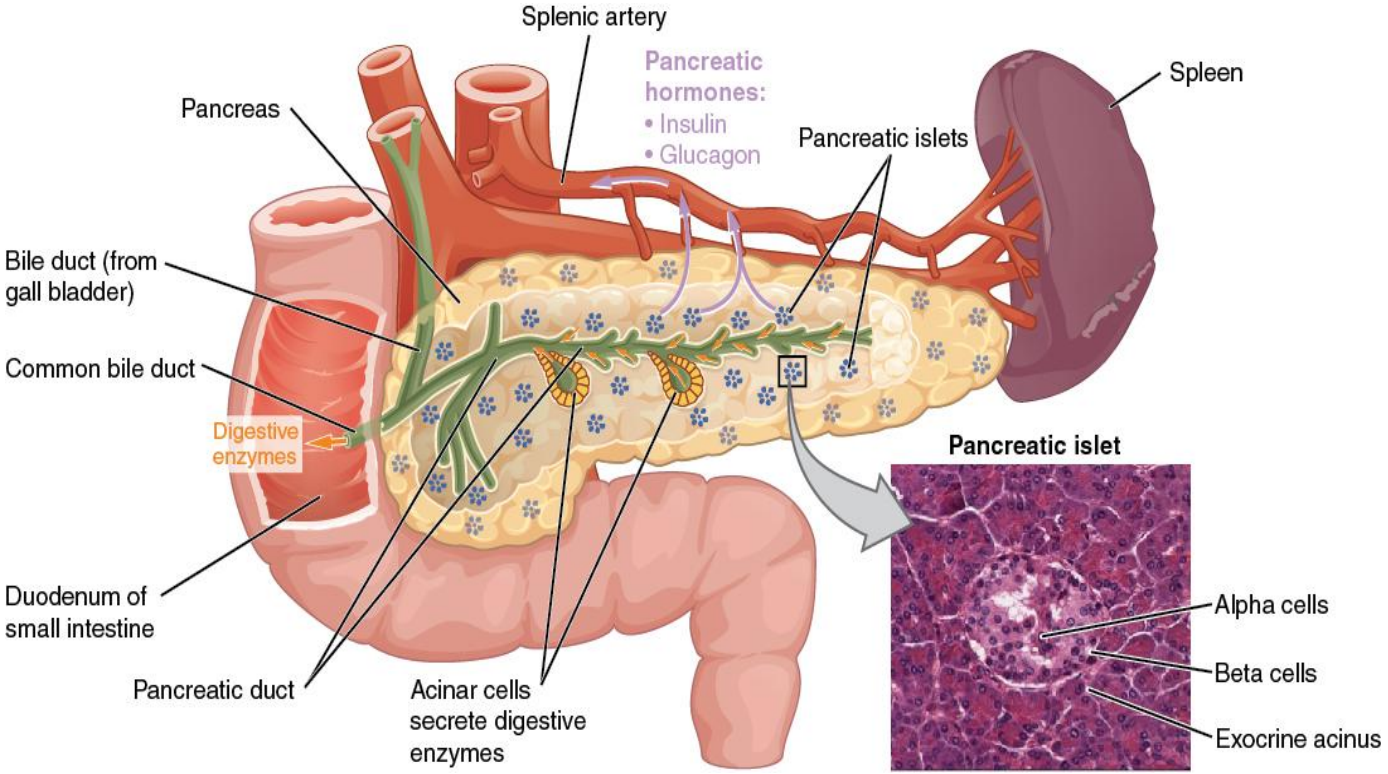

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Why is it important that blood glucose concentration remains stable?

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- Maintain constant **blood water potential**: prevent osmotic lysis/ crenation of cells.
- Maintain constant **concentration of respiratory substrate**: organism maintains constant level of activity regardless of environmental conditions.

Define negative feedback.

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Self-regulatory mechanisms return internal environment to optimum when there is a fluctuation.

Different mechanisms are responsible for dealing with an increase/ decrease in normal level for greater control.

Define glycogenesis, glycogenolysis and gluconeogenesis.

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Glycogenesis: liver converts glucose into the storage polymer glycogen.

Glycogenolysis: liver hydrolyses glycogen into glucose which can diffuse into blood.

Gluconeogenesis: liver converts glycerol & amino acids into glucose.

Outline the role of glucagon when blood glucose concentration decreases.

Outline the role of glucagon when blood glucose concentration decreases.

1. ***α* cells** in **Islets of Langerhans** in **pancreas** detect decrease & secrete **glucagon** into bloodstream.
2. Glucagon binds to surface receptors on **liver** cells & activates enzymes for **glycogenolysis** & **gluconeogenesis**.
3. Glucose diffuses from liver into bloodstream.
4. α cells detect that blood glucose concentration has returned to optimum & stop producing glucagon. (negative feedback).

Use the secondary messenger model to explain how glucagon works.

Use the secondary messenger model to explain how glucagon works.

1. Hormone-receptor complex forms.
2. Conformational change to receptor activates G-protein.
3. Activates **adenylate cyclase**, which converts ATP to **cyclic AMP** (cAMP).
4. cAMP activates **protein kinase A** pathway.
5. Results in **glycogenolysis**.

Outline what happens when blood glucose concentration increases.

Outline what happens when blood glucose concentration increases.

1. **β cells** in **Islets of Langerhans** in **pancreas** detect increase & secrete **insulin** into bloodstream.
2. Insulin binds to surface receptors on target cells to:

a. increase cellular glucose uptake.

b. activate enzymes for **glycogenesis** (liver & muscles).

c. stimulate adipose tissue to synthesise fat.

Describe how insulin leads to a decrease in blood glucose concentration.

Describe how insulin leads to a decrease in blood glucose concentration.

- Increases permeability of cells to glucose.
- Increases glucose concentration gradient.
- Triggers inhibition of enzymes for glycogenolysis.

How is insulin secretion controlled?

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1. β cells have K^+ & Ca^{2+} ion channels to maintain p.d. -70mV.
2. As glucose concentration increases, glucose enters β cells via facilitated diffusion.
3. Respiration of glucose produces ATP. ATP-gated K^+ ion channels close, so K^+ ions no longer diffuse out of cell.
4. P.d. in cell becomes more positive = depolarisation. Ca^{2+} ion channels open. Ca^{2+} triggers exocytosis of insulin.

Describe the exocrine function of the pancreas.

Describe the exocrine function of the pancreas.

Secretes digestive enzymes e.g. amylase, trypsin & lipase to the duodenum via the pancreatic tract.

Explain the causes of Type 1 diabetes mellitus and how it can be controlled.

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Body cannot produce insulin e.g. due to autoimmune response which attacks β cells of Islets of Langerhans

Treat by injecting insulin from animal source or genetically modified bacteria. Possible future treatment: use stem cells to produce new β cells.

Explain the causes of Type 2 diabetes mellitus and how it can be controlled.

Explain the causes of Type 2 diabetes mellitus and how it can be controlled.

- Glycoprotein receptors are damaged or become less responsive to insulin.
- Strong positive correlation with poor diet / obesity.
- Treat by controlling diet and exercise regime.