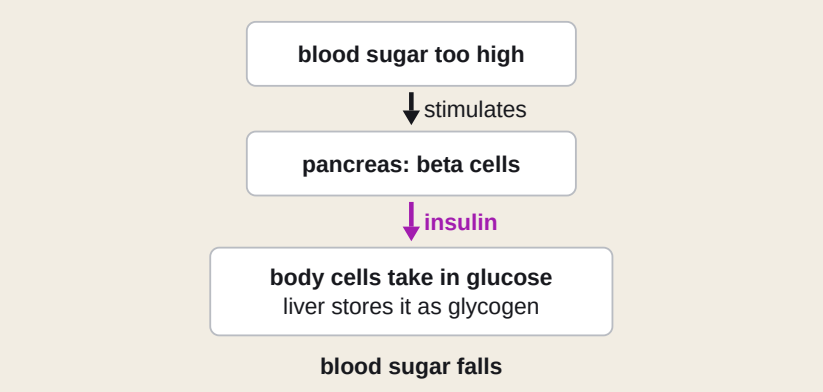
A13 · Blood sugar: insulin, glucagon and diabetes mellitus · Completed notes

Goals: State what insulin does and when it is released. State what glucagon does and when it is released. Read a graph of blood sugar after a meal. Explain the signs of diabetes mellitus. Compare type 1 and type 2 diabetes and their treatments.

These are the completed notes. The blanks are filled in and each question is worked.

Slide 1 of 5 · Insulin lowers blood sugar

In lesson A12, epinephrine and cortisol raised blood sugar during stress. Today you see the two hormones that control blood sugar all day long.



Key ideas

When blood sugar is too high, the **beta cells** of the pancreas release **insulin**.

Insulin makes body cells take in **glucose**.

The liver stores glucose as **glycogen**. Blood sugar falls.

Example

State the two things insulin does that lower blood sugar.

1. It makes body cells take in glucose.
2. It makes the liver store glucose as glycogen.

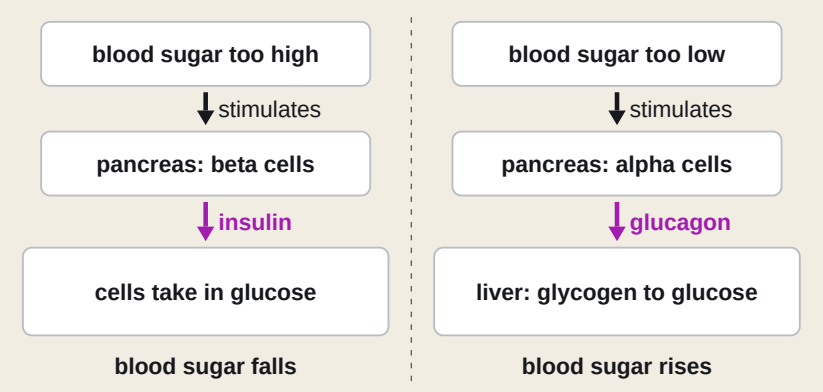
Try it

State when insulin is released, and name the cells that release it.

1. It is released when blood sugar is too high.
2. The beta cells of the pancreas release it.

Slide 2 of 5 · Glucagon raises blood sugar

On the last slide, insulin lowered blood sugar after a meal. Between meals, blood sugar starts to fall. A second hormone stops it from falling too far.



Key ideas

When blood sugar is too low, the **alpha cells** of the pancreas release **glucagon**.

Glucagon makes the liver change glycogen into **glucose**.

Insulin and glucagon are **antagonistic hormones**.

Example

You have not eaten for six hours. Name the hormone the pancreas is releasing. State what it does.

1. Blood sugar is low.
2. The pancreas releases glucagon.
3. The liver changes glycogen into glucose.

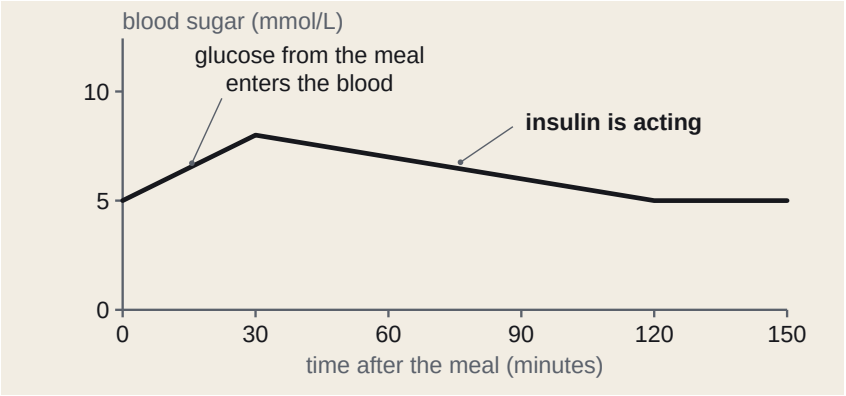
Try it

Explain why insulin and glucagon are antagonistic hormones.

1. Insulin lowers blood sugar.
2. Glucagon raises blood sugar.
3. They have opposite effects.

Slide 3 of 5 · Blood sugar after a meal

On the last two slides, insulin and glucagon kept blood sugar near normal. A graph shows this happening after one meal.



Key ideas

Before the meal, blood sugar is **5** mmol/L.

After the meal it rises to **8** mmol/L.

Insulin is released. Blood sugar falls back by **120** minutes.

Example

Read the graph. By how much does blood sugar rise after the meal?

1. It starts at 5 mmol/L and rises to 8 mmol/L.
2. 8 − 5 = 3.
3. It rises by 3 mmol/L.

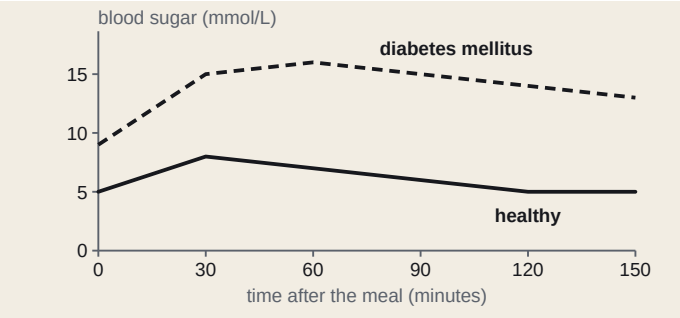
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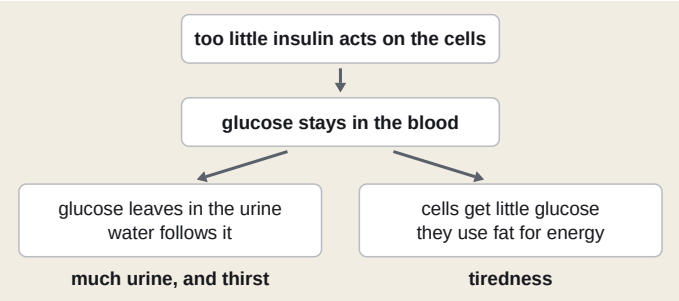
Read the graph. How long after the meal is blood sugar back to normal?

1. The line flattens at 5 mmol/L.
2. This is at 120 minutes.

Slide 4 of 5 · Diabetes mellitus

On the last slide, insulin brought blood sugar back to normal within two hours. In diabetes mellitus, that does not happen.





Key ideas

In **diabetes mellitus**, too little insulin acts on the cells.

Glucose stays in the blood. High blood sugar is called **hyperglycemia**.

Glucose appears in the **urine**, and water follows it.

The cells get little glucose, so the person feels **tired**.

Example

Explain why a person with untreated diabetes mellitus makes a lot of urine.

1. Glucose leaves in the urine.
2. Water follows the glucose by osmosis.

Try it

Explain why a person with untreated diabetes mellitus feels tired.

1. Glucose cannot move from the blood into the cells.
2. The cells get little glucose for energy.

Slide 5 of 5 · Type 1, type 2 and their treatments

On the last slide, diabetes mellitus meant too little insulin acting on the cells. There are two main ways this happens.

	Type 1	Type 2
Usually starts	in childhood	in adulthood
Cause	beta cells are destroyed	cells respond poorly to insulin
Insulin made	none	some
Treatment	insulin injections	diet, exercise, medicine by mouth

Key ideas

In **type 1 diabetes**, the beta cells are destroyed. No insulin is made.

Type 1 is treated with insulin by **injection**.

In **type 2 diabetes**, the body still makes insulin.

Type 2 is treated with diet, **exercise** and medicine taken by mouth.

Example

Explain why a person with type 1 diabetes must take insulin.

1. The beta cells are destroyed.
2. The body makes no insulin.

Try it

Explain how an islet cell transplant treats type 1 diabetes.

1. It gives the person new beta cells.
2. The new beta cells make insulin.