

Control of blood glucose concentration

4.5.3.2 · Homeostasis and response · revision notes

How the pancreas uses insulin to keep blood glucose within narrow limits, and the causes and treatments of Type 1 and Type 2 diabetes. Expect graph questions on glucose levels after a meal and 'compare Type 1 and Type 2 diabetes' questions.

Key facts

- The pancreas monitors and controls blood glucose
- Type 1: pancreas makes too little insulin → insulin injections
- Obesity is a risk factor for Type 2 diabetes
- Glucose too high → insulin → glucose moves into cells → stored as glycogen in liver and muscle cells
- Type 2: cells no longer respond to insulin → carbohydrate-controlled diet and exercise
- Glucose = the sugar; glycogen = the store

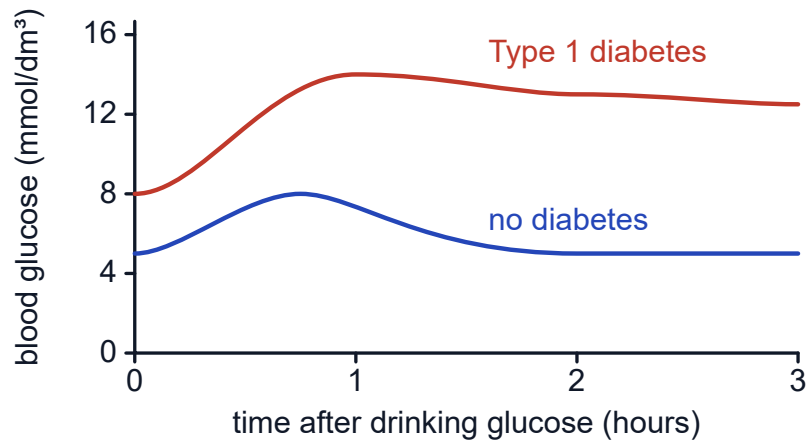
Notes

Insulin

- Blood glucose concentration is **monitored and controlled by the pancreas**.
- If blood glucose is **too high** (e.g. after a meal), the pancreas releases the hormone **insulin** into the blood.
- Insulin causes glucose to **move from the blood into the cells**.
- In **liver and muscle cells**, excess glucose is converted into **glycogen** for storage. Blood glucose falls back to normal.

Diabetes

- **Type 1 diabetes:** the pancreas fails to produce enough insulin, so blood glucose is uncontrolled and can rise to dangerously high levels. It is normally treated with **insulin injections**.
- **Type 2 diabetes:** the body cells **no longer respond** to the insulin produced by the pancreas. Common treatments are a **carbohydrate-controlled diet** and an **exercise regime**.



Without enough insulin, blood glucose rises higher and stays high.

- **Obesity** is a risk factor for Type 2 diabetes.
- People with Type 1 diabetes test their blood glucose so they can match the insulin dose to what they eat and how active they are.

How to answer each type of question

Describe how blood glucose returns to normal after a meal

3 marks

Grade 5

1. The pancreas detects the high glucose level and releases insulin.
2. Insulin makes glucose move from the blood into cells.
3. Liver and muscle cells convert excess glucose to glycogen.

Example. After a meal, a person's blood glucose concentration increases.
Describe how the body brings the blood glucose concentration back to normal.

Model answer. The pancreas detects the high blood glucose concentration and releases insulin (1). Insulin causes glucose to move from the blood into cells (1). In liver and muscle cells, excess glucose is converted to glycogen for storage (1).

Compare Type 1 and Type 2 diabetes

2 to 4 marks

Grade 5

1. Give the cause of each type, linked with 'whereas'.
2. Give the treatment of each type, linked with 'whereas'.

Example. Compare the causes and treatments of Type 1 and Type 2 diabetes.

Model answer. In Type 1 the pancreas does not produce enough insulin (1), whereas in Type 2 the body cells no longer respond to insulin (1). Type 1 is treated with insulin injections (1), whereas Type 2 is usually treated with a carbohydrate-controlled diet and exercise (1).

Don't lose marks

- ✗ Saying insulin turns glucose into glycogen in the blood. Insulin makes glucose move into cells; the conversion happens in liver and muscle cells.
- ✗ Saying people with Type 2 diabetes make no insulin. They do make it; their cells no longer respond to it.
- ✗ Dividing by the final value instead of the starting value in percentage change calculations.
- ✗ Describing a graph without quoting any values from it.

More tips

Memory tricks

- Insulin puts glucose IN to cells.
- Type 1: the pancreas is the problem. Type 2: the cells are the problem.

Exam technique

- When describing graphs, quote values with units and times, e.g. 'rises to a peak of 8 mmol/dm³ at 30 minutes'.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3

Name the organ that controls blood glucose

The pancreas monitors and controls blood glucose concentration.

Grade 4

Describe how insulin lowers blood glucose

Insulin makes glucose move from the blood into cells; liver and muscle cells store it as glycogen.

Grade 5

Compare the causes of Type 1 and 2

Type 1: the pancreas does not make enough insulin. Type 2: body cells stop responding to insulin.

Grade 5

Describe treatments for each type of diabetes

Type 1: insulin injections. Type 2: a carbohydrate-controlled diet and an exercise regime.

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