Controlling Blood Sugar
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- Glucose
- Diabetes
- Researching diabetes
- Obesity
- Summary activities
Glucose as an energy source

**Glucose** is a type of sugar used by the body to provide energy.

Sometimes there is too much glucose in the blood, and sometimes there is not enough.

What affects the level of blood glucose?

- **eating** causes blood glucose levels to **rise**
- **vigorous exercise** causes blood glucose levels to **fall**.

The amount of blood glucose therefore needs to be regulated. How does the body do this?
Blood glucose rises just after eating, but quickly returns to normal.

Where does the sugar go, and why is it not left in the blood?
The hormones of the pancreas

Blood glucose levels are controlled by the pancreas.

If blood glucose levels are too high, the pancreas releases the hormone insulin. This makes the liver convert glucose into glycogen, which is stored in the liver and muscles.

If blood glucose levels are too low, the pancreas releases the hormone glucagon. This makes the liver convert glycogen into glucose, and release it into the blood.
How does the body control blood glucose levels?

The level of circulating blood glucose is constantly monitored by the pancreas. What happens when the level changes after you eat or exercise? Press on each button below to find out more.

eat  exercise
### Key terms

**Match these key words to their descriptions**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glucose</td>
<td>a type of sugar used by the body to provide energy</td>
</tr>
<tr>
<td>insulin</td>
<td>an energy storage molecule in the liver and muscles</td>
</tr>
<tr>
<td>glycogen</td>
<td>a hormone released when blood glucose levels are too low</td>
</tr>
<tr>
<td>glucagon</td>
<td>a hormone released when blood glucose levels are too high</td>
</tr>
<tr>
<td>pancreas</td>
<td>organ that produces insulin</td>
</tr>
</tbody>
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The symptoms of diabetes

The lack of insulin control in a diabetic means that blood glucose levels can rise dangerously high after eating, which can cause cell damage.

Symptoms of diabetes develop quickly and can be severe. Initial symptoms include:

- increased thirst, hunger and production of urine
- loss of weight, tiredness and nausea.

Later symptoms include vomiting and abdominal pain. If untreated, diabetes can lead to coma and even death.
How does diabetes affect the body?

What happens to the blood glucose levels of people with type 1 or type 2 diabetes? Press on each button below to compare the blood sugar levels of people with different types of diabetes to those of a healthy person.

healthy  type 1  type 2
Treating type 1 diabetes

Type 1 diabetes develops when the insulin-producing cells in a person’s pancreas are destroyed, and their body cannot produce enough insulin. This means that glucose builds up in their blood. Type 1 diabetes often develops in childhood.

People with type 1 diabetes must inject themselves with insulin before they eat. This helps to keep their blood glucose at a safe level. The amount of insulin needed depends on how much the person eats and how active they are.

The injection is usually into the **subcutaneous fat** – the fat that is stored directly beneath the skin.
Treating type 2 diabetes

Type 2 diabetes develops when a person’s body becomes resistant to insulin. This type typically affects people over 40 years old, and accounts for 85–95% of people with diabetes.

Most people with type 2 diabetes can manage their illness through diet and exercise.

Physical activity will reduce the amount of glucose in the blood.

Eating small, regular meals can stabilize blood glucose levels, and avoiding sugary foods can prevent blood glucose levels from rising.
### Type 1 or type 2?

**Do these statements refer to type 1 or type 2 diabetes?**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>1.</strong> Develops when the pancreas cannot produce enough insulin.</td>
<td>?</td>
</tr>
<tr>
<td><strong>2.</strong> Develops when the body becomes resistant to insulin.</td>
<td>?</td>
</tr>
<tr>
<td><strong>3.</strong> Needs to be treated with regular insulin injections.</td>
<td>?</td>
</tr>
<tr>
<td><strong>4.</strong> Affects 5–15% of people with diabetes.</td>
<td>?</td>
</tr>
<tr>
<td><strong>5.</strong> Can be managed through diet and exercise.</td>
<td>?</td>
</tr>
</tbody>
</table>

**type 1**  
**type 2**
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Insulin treatment was discovered in 1921 by the Canadian surgeon Frederick Banting and his medical student Charles Best.

Press on each tab to find out more about their research.
Should animals be used for medical research?

0 + yes
0 - unsure
0 + no
Recap

Insulin: a recap

1. Insulin is a ▼ secreted by the ▼.

2. Insulin makes ▼ and muscle cells take in ▼, where it is stored as ▼.

3. People who cannot produce enough insulin are said to have ▼.

4. Without insulin, blood glucose levels get dangerously ▼.
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Obese people are people who are extremely overweight. 

**Body Mass Index (BMI)** is a way of calculating whether a person is a healthy weight:

\[
\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{ (m)}}
\]

A BMI of 20–25 is healthy for an adult. If somebody has a BMI of 30 or higher, they are defined as **obese**.

**Height-to-weight** charts can also be used to gauge a person’s weight. However, the results are fairly arbitrary and take no account of muscle bulk and frame.
Obesity is defined as having a body mass index (BMI) of 30 or more. The basic BMI is calculated using the following formula:

\[ \text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{ (m)}} \]

Press "start" to begin.
Height-to-weight charts can also be used to indicate whether or not somebody is a healthy weight. For each height and weight that appears, use the chart to decide which weight category the person belongs to.

Press "start" to begin.
The link between BMI and diabetes

Press a button to find out more information about the rising rate of obesity and its links to type 2 diabetes.

- the growing rate of obesity
- BMI and type 2 diabetes
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Glossary of keywords: controlling blood sugar

**body mass index (BMI)** – A widely recognized method of calculating whether a person is a healthy weight. BMI can be calculated by dividing a person's weight (in kilograms) by their height squared (in metres).

**Charles Best** – The medical student that co-discovered insulin treatment in 1921 after removing the **pancreas** from dogs.
Anagrams relating to controlling blood sugar

How quickly can you unscramble words about controlling blood sugar?

Press **start** to begin.

**clue**
Multiple-choice quiz

Will you taste sweet success in your exams?
See how much you know about controlling blood sugar.

Press "start" to begin.

start