

Blood glucose testing



How do hormones regulate blood sugar levels?

'Blood glucose testing' is an activity designed to increase understanding of the hormones that control blood sugar in the body, and why this control is important in staying healthy. This activity is designed for students aged 10-14 and involves practical science techniques such as pipetting. Students can gain a practical understanding of the hormones that are secreted in the body when blood sugar levels are too high or too low.

Aims:

- To introduce insulin and glucagon as hormones that help control blood sugar levels
- To give students the chance to develop practical science skills using pipettes and test tubes

Curriculum links:

- Homeostasis
- Hormonal control in humans
- Hormones and eating

Take home messages:

- blood glucose levels need to be kept in a very narrow "safe" range for our bodies to function correctly
- the hormones glucagon and insulin regulate blood sugar levels
- Glucagon is produced by the pancreas and stimulates glucose to be released from glycogen in the liver
- Insulin is produced by the pancreas and allows cells to absorb glucose from the bloodstream

Discussion points:

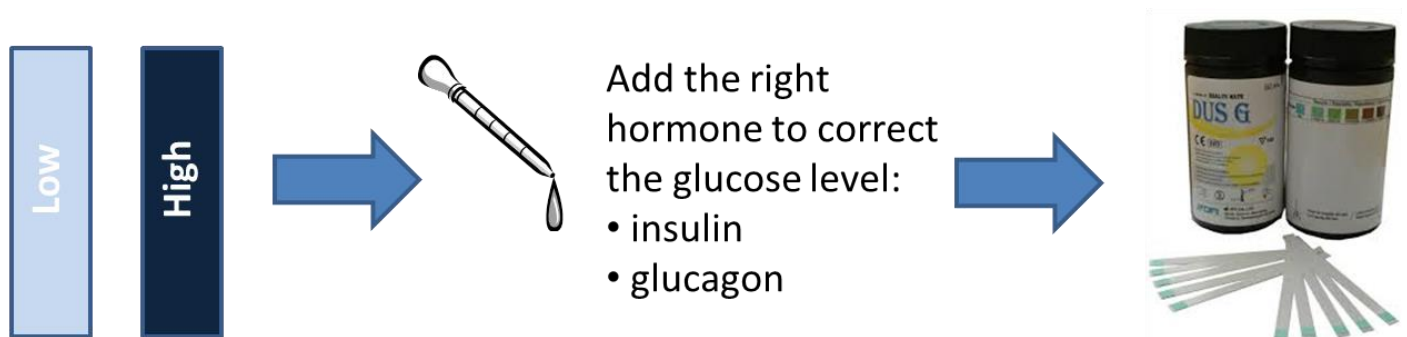
- Diabetes occurs when blood glucose levels are not regulated properly.
- Type-1 diabetes is when you no longer produce insulin and your blood glucose level can become dangerously high unless you are given insulin regularly by injection.
- Type-2 diabetes is when you don't produce enough insulin or no longer respond to the insulin you do produce.
- Type-1 diabetes is an autoimmune disease and tends to be diagnosed in children.
- Type-2 diabetes tends to affect older people or those who are over-weight.

Activity outline

1. **Glucose testing:** test tubes will be prepared containing two different types of 'blood'. Pupils will have to carry out a glucose test on the vials to work out if they have high or low blood sugar.



2. **Correcting glucose levels:** the pupils then have to think about what the body would do to correct the level of blood glucose and bring it back to a normal level. They will add "insulin" (water) or "glucagon" (glucose + water) to the vials and then repeat the glucose test to see if they are back at normal levels.



Activity set up:

1. materials

- Plastic test tubes and rack*
- 2 x 1 L measuring jugs
- 2 x 50 mL beakers
- Plastic droppers/pipettes
- Red food colouring
- Dextrose powder*
- DUS G glucose testing strips*
- Water



*Materials available on www.amazon.com

2. preparation of “blood”

Prepare two litres of red water to represent ‘high glucose blood’ and ‘low glucose blood’ as follows:

High glucose blood:



Fill measuring jug
with H₂O to almost
the top

- add red food colouring (until dark red)
- add two table spoons of dextrose powder

Low glucose blood:



Fill measuring jug
with H₂O to almost
the top

- add red food colouring (until dark red)

3. setting up

Pour half of the high blood sugar solution into a beaker marked GLUCAGON and half of the low blood sugar solution into a beaker marked INSULIN.

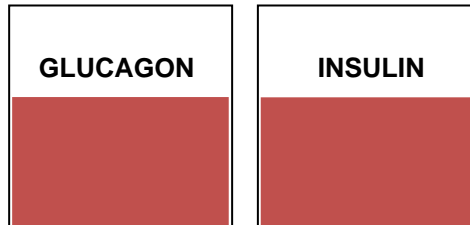


The remainder of the blood solutions should be poured in to test tubes for blood sugar testing. Test tubes should be filled only to the halfway point.

Place the low blood solutions on one side of the rack and the high blood solutions on the other to separate them (not strictly necessary, but makes things easier!).

Pupils will work in groups and taking one of each time of blood then work out which is the high and which is the low.

You should now have two containers of “hormone”



And rack of test tubes of either high or low blood glucose levels.

Top tips

The test strips do take a few minutes to develop, ensure students don't make a judgement too quickly! Use this time to explain the role of insulin and glucagon.

Sources of further information

Further information about glucagon, insulin and diabetes can be found at www.yourhormones.info