

Investigating the maths inside:

Knowing nutrition

Reading: Glucose, insulin and diabetes

# Glucose

Glucose is a simple sugar which is essential for our survival. After food is digested in our gastro-intestinal tract, glucose is absorbed into the bloodstream and carried around the body. It is used as an immediate source of energy, or stored for future energy requirements. Glucose is the only source of fuel for the brain.

The normal range of blood glucose concentration is between 4.0 to 6.0 mmol/L (or 72 to 108 mg/dL) when fasting, or up to 7.8 mmol/L (140 mg/dL) after eating. It returns to normal levels within three hours.

# Insulin

In a healthy person, optimal blood glucose concentration is maintained by two hormones produced by the pancreas, insulin and glucagon. The concentration of glucose circulating in our bloodstream is constantly monitored by the liver. When we have eaten, blood glucose concentration increases. This stimulates the pancreas to produce insulin.

Insulin, in turn, promotes the uptake of glucose by all cells in the body. The liver and skeletal muscles are especially well-adapted to storing excess glucose as the more complex polysaccharide, glycogen. As a result, excess glucose is removed from the bloodstream by the liver and skeletal muscles.

The hormone glucagon, is released by the pancreas when glucose levels fall below the normal range. The liver is stimulated to release glucose (from stored glycogen as well as from protein and fat, if necessary) into the bloodstream.

# Health problems

Health problems arise when the control of blood glucose concentration breaks down.

Both decreased blood glucose (**hypo-**glycaemia) and elevated blood glucose (**hyper-**glycaemia) are very serious conditions that may be fatal.

# Type 2 diabetes

When insulin is not produced in sufficient quantities, or the body cells are resistant to the effects of insulin, hyper-glycaemia can develop into Type 2 diabetes.

Over time, high blood glucose levels can damage the body's organs. Possible complications include damage to large and small blood vessels, which can lead to heart attack, stroke, and problems with the kidneys, eyes, gums, nerves and feet (gangrene and amputation in the worst-case scenarios).

# In Australia

Around 1.7 million Australians have diabetes.

This includes:

* all types of diagnosed diabetes (1.2 million known and registered)
* silent, undiagnosed type 2 diabetes (up to 500,000 estimated)

(https://www.diabetesaustralia.com.au/about-diabetes)

The total annual cost for Australians with type 2 diabetes is up to $6 billion including healthcare costs, the cost of carers and Commonwealth government subsidies. The average annual healthcare cost per person with diabetes is $4,025 if there are no associated complications. However, this can rise to as much as $9,645 in people with both micro- and macrovascular complications. (https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/e7282521-472b-4313-b18e-be84c3d5d907.pdf)