

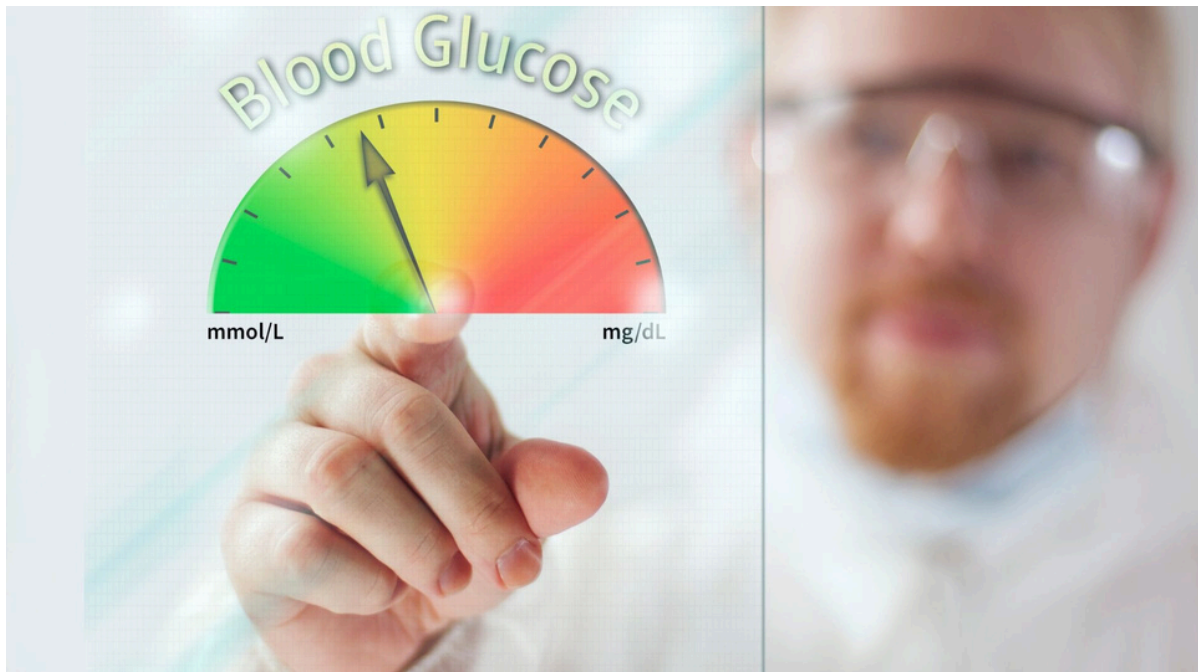
# BLOOD SUGAR LEVEL

## HEALTHY BLOOD SUGAR REGULATION

### Learning outcomes

- Blood glucose levels and what they mean
- Fast-releasing vs slow-releasing carb foods and sugar
- The key role of insulin
- Insulin resistance – its central role in metabolic health and weight management
- How high blood glucose and the blood sugar 'roller-coaster' impact health

### What is blood glucose?



Remember back to the sections on [Carbohydrates and Sugars](#). When we eat a starchy, carb-rich, food our digestive system breaks it down into simple sugar units called 'glucose'.

We also consume simple sugars (mainly fructose) in foods such as fruits, juice or honey - as well as sugar (mainly sucrose) added to fizzy drinks and confectionery.

Finally, there is the familiar table sugar (sucrose) we ourselves add to our foods and drinks. Sucrose is a disaccharide (2 units) molecule that splits into glucose and fructose (50/50) in the intestines before being absorbed.

Once they reach the small intestine, simple sugars are absorbed into the bloodstream and raise the level of blood sugar (glucose).

## Fast & slow-release carbohydrates



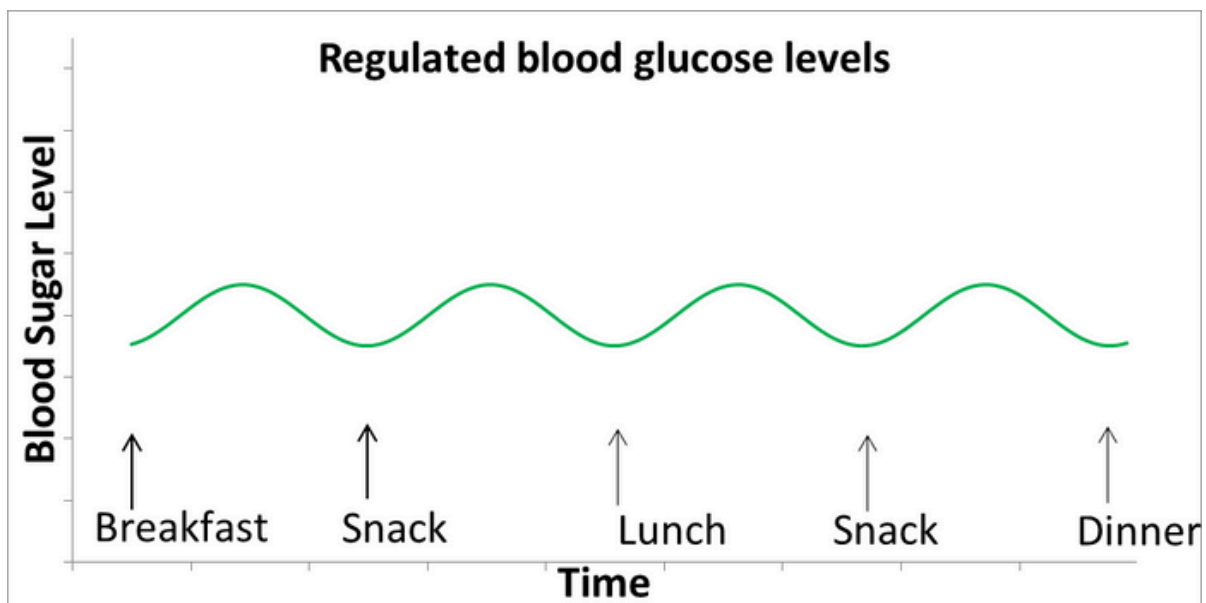
How quickly or slowly a starchy food or sugar turns into glucose and raises blood sugar is important for health.

- **Simple sugars** such as fruit juice, honey, sugar or sweet foods will absorb quickly into the bloodstream creating a spike in blood glucose levels.
- **Refined grains.** The starch in white flour products – white bread & pasta etc (which lack fibre) and starchy vegetables (root veg such as potatoes), breaks down into glucose quickly, causing a blood sugar spike.
- **Fibre-rich, unrefined carbohydrate** foods such as oats or vegetables, travel through the digestive tract more slowly, providing a slower release of sugar, less fluctuation in blood glucose levels and more sustained energy.

## Regulation of blood glucose levels & Insulin

As blood glucose levels rise the pancreas releases a hormone called insulin. The function of insulin is to move glucose from the blood into our cells and tissues so it can be used for energy or stored as glycogen or fat. So a key function of insulin is to regulate glucose in the blood and prevent it from getting too high.

Blood sugar will rise and fall throughout the day naturally, depending largely on the content and quantity of meals - and on insulin, which prevents glucose from remaining high and ensuring it enters cells as a source of fuel. In a healthy person, these waves of glucose stay within healthy parameters (see diagram below).



However, they can become dysregulated, spiking too high and dipping too low creating short-term and long-term health issues.

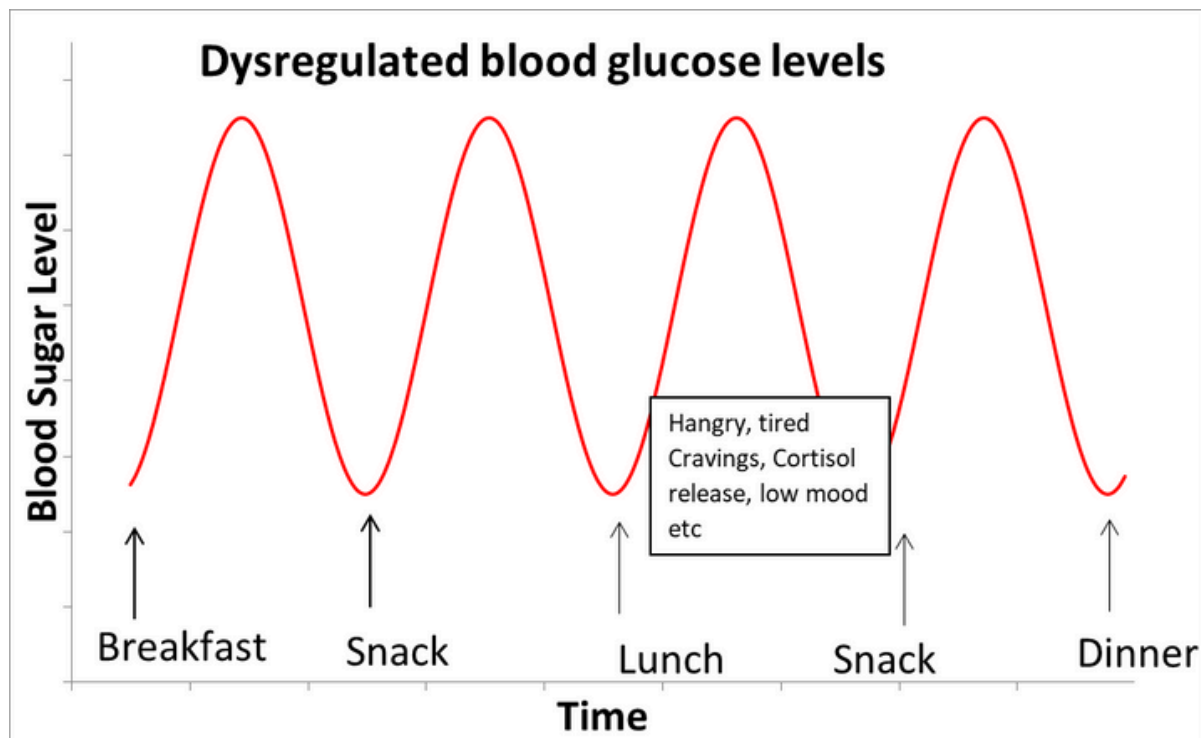
## Blood sugar rollercoaster & short-term impact

Consuming refined grains, starchy vegetables or simple sugars results in fast release of sugar and a spike in blood glucose levels. This requires the pancreas to release a large 'pulse' of insulin to shift the excess glucose into cells. As a result, blood glucose levels can drop sharply - often ending up below fasting levels.

When this happens we can experience that 'hangry' feeling! We can feel shaky, low in energy and experience cravings for 'pick me up' foods such as coffee and biscuits. The brain thrives on glucose for energy, so when it senses a shortage we may experience foggy brain, low mood, irritability or anxiety.

The body responds to this by releasing stress hormones such as adrenaline and cortisol, which puts the body into 'stress' mode.

Cortisol is high in the morning (to give us the get-up-and-go we need), but it dips in the evening time to allow us to wind down and produce the hormone melatonin, which helps us go to sleep. If blood sugar levels are dysregulated there may be a cortisol spike later in the day which can disturb sleep. It can also result in blood sugar dips during the night, which can wake us from sleep.



## Insulin resistance & long term impact

When this blood sugar 'rollercoaster' (excess sugar/carbs ® blood glucose spike ® insulin spike ® sharp glucose fall ® feel 'hangry' ® eat more sugar/carbs ® repeat...) becomes a routine part of daily life, cells in the muscles, liver and elsewhere can gradually get de-sensitised to insulin.

This is known as Insulin Resistance, which can cause persistently higher (than healthy) glucose levels in the blood that may eventually lead to a diagnosis of Type 2 Diabetes.

Insulin levels are elevated because the body is trying to keep blood glucose at healthy levels the body is forced to produce more insulin to achieve this. Persistently raised insulin can damage the body in various ways for years or decades before diabetes is ever diagnosed. Raised blood glucose, in turn, drives chronic inflammation which harms brain cells, and other body tissues.

It particularly affects blood vessels - this is why poorly controlled diabetes so often leads to cardiovascular disease, kidney failure, peripheral neuropathy and blindness (all from blood vessel damage).

Blood flow to the brain may provide plenty of glucose, but insulin resistance means the brain cells cannot access enough of it to provide the energy needed to function properly. Instead, the raised blood glucose causes inflammation and damages brain cells, leading to progressive degeneration and the typical problems with memory etc.

In fact, Insulin resistance is so common in Alzheimer's patients that the disease is sometimes referred to as Type 3 Diabetes!

### Insulin & fat storage

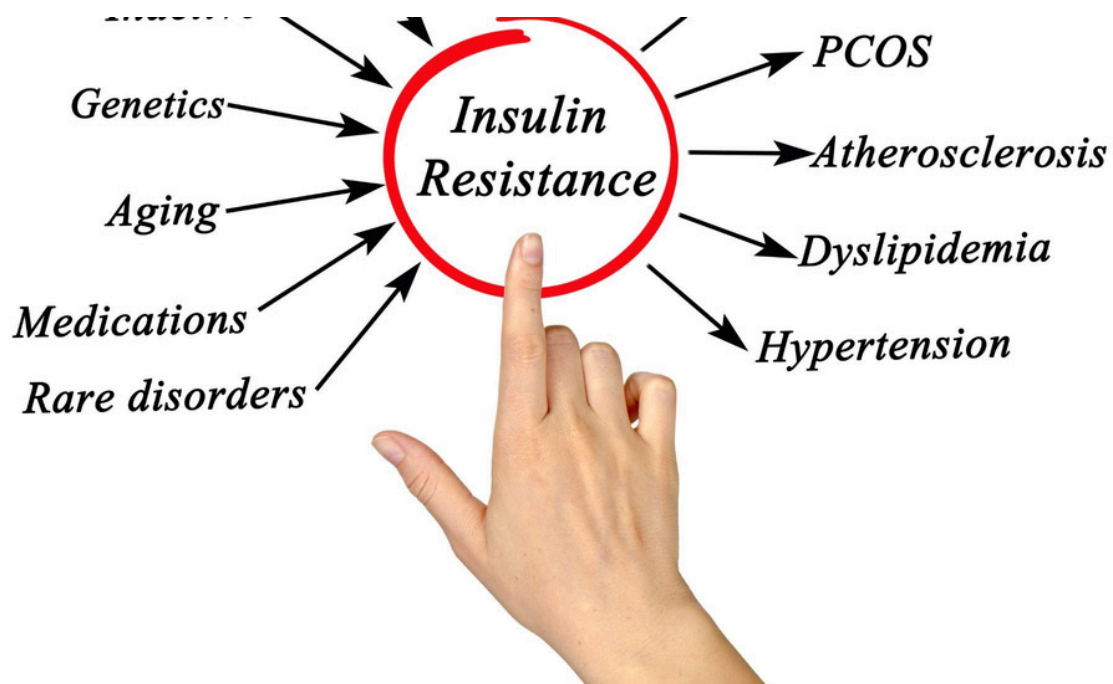
If we consume large amounts of carbohydrates and are not actively using the absorbed glucose for energy (e.g. sitting at work, watching tv), insulin will shunt glucose into the adipose (fat) layer under the skin, where it will be stored as fat.

The more glucose circulating in the bloodstream, the more insulin produced and the more fat we will store. When a person trying to lose body fat has insulin resistance their fat deposits are 'locked away' because high insulin levels stop stored fat from being released and burned for energy. Stored fat can only be released when insulin levels come down. Experts in this field, such as Dr Robert Lustig, believe insulin resistance to be the primary factor in the obesity epidemic:

Watch the video: 'The Cause of Obesity' bottom of this page (15:55 mins)

Short-term benefits of getting off this rollercoaster include better energy, less sugar cravings and snacking, and a more balanced mood. Longer-term benefits include a healthier heart and brain, improved weight control and reduced inflammation in the body as a whole.

So, how do we leave the rollercoaster ride behind and maintain balanced blood glucose levels?



Read on to learn how to get off the Rollercoaster ride and maintain blood glucose levels - how to put it into practice