



# LIVINGBYDESIGN

MOVE EAT THINK

WHAT YOU SHOULD  
KNOW ABOUT YOUR

# BLOOD SUGAR



# WHAT IS BLOOD SUGAR?



Glucose comes from all kinds of carbohydrates. It's in simple carbohydrates, like table sugar and refined flour.

It's also found in complex carbohydrates, like whole wheat.

Glucose is found in fruit, and even a small amount of the protein and fats we eat are converted into glucose.

However, the main source of glucose is carbohydrates.

Anyone who has done a low-carbohydrate diet knows the body can burn fat for fuel.

But generally, most tissues prefer glucose as their fuel. This is especially true for the brain, heart and skeletal muscles.

## HOW SUGAR IS METABOLIZED IN THE BODY

The function of insulin is to regulate the level of sugar that's circulating in the blood, while keeping fuel on hand for daily activities and/or for any "fight or flight" situations.

When there is enough sugar in the blood to keep cells fueled, insulin triggers the liver and

muscles to temporarily store sugar as glycogen.

In between meals, when blood sugar starts to get low, the hormone glucagon triggers the conversion of glycogen back into blood sugar.

This provides immediate energy to keep us going through the day.

This release also happens when we need a burst of energy for emergencies (fight or flight).

Beta cells produce insulin in the pancreas (an organ located behind the stomach between the liver and spleen).

As food is digested, glucose is released into the blood. This increase in blood sugar triggers insulin production.

In contrast, when blood sugar levels become low, other cells in the pancreas make glucagon, which signals the liver to convert glycogen back into glucose.

When everything in the body is working as it should, blood sugar levels are tightly regulated.

# WHAT HAPPENS WHEN BLOOD SUGAR REGULATION GOES AWRY

**Type 1 Diabetes:** When the pancreas can't produce enough insulin, type 1 diabetes occurs. This happens because beta cells – cells in the liver that produce insulin – are destroyed by the immune system.

This means type 1 diabetes is an autoimmune disease. Because insulin isn't being produced, there isn't a way to allow glucose into cells.

**Type 2 Diabetes:** Too much insulin is common in this condition because the signal that insulin uses to tell cells to open isn't functioning properly.

This prevents cells from getting the fuel they need. This is what's known as insulin resistance. In both type 1 and type 2 diabetes, the amount of sugar in the blood becomes too high.

This causes stickiness and blockages in the blood vessels, from which the complications of diabetes arise.

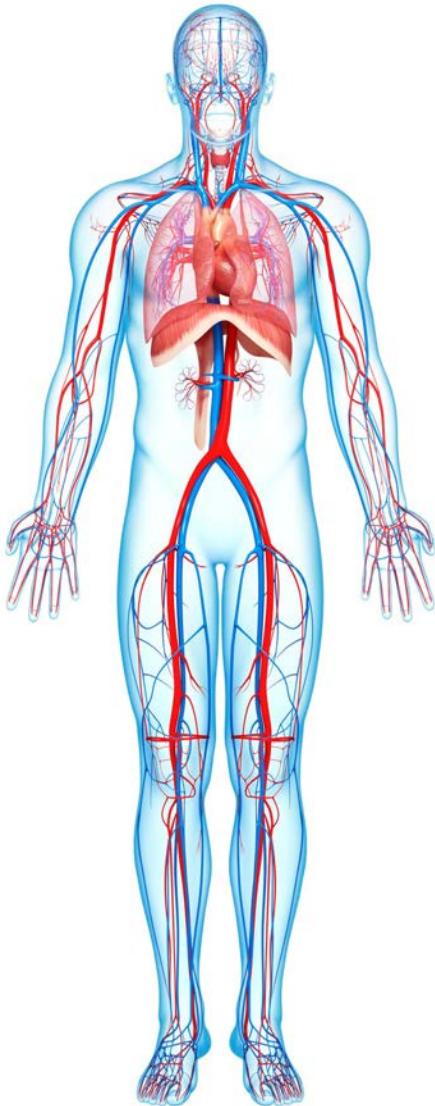
**Diabesity:** This is a relatively new term used when diabetes and obesity are both present. The two affect each other, and often go hand in hand.

The hormones that regulate appetite affect, and are affected by, blood sugar levels:

**Leptin:** This hormone known as the “satiety hormone” is produced by fat cells in response to insulin production. It signals to the brain that you're full.



**IN ORDER FOR BLOOD SUGAR TO ENTER CELLS, YOUR  
PANCREAS PRODUCES INSULIN – THE HORMONE THAT  
TRIGGERS CELLS TO TAKE IT IN.**



**Leptin resistance:** This is common in people who are obese. This may sound counterintuitive. But with excess body-fat, a person actually has higher levels of leptin.

However, the brain no longer responds properly to the fullness signal from leptin. This is similar to insulin resistance in diabetics. Insulin resistance is even one of the triggers for leptin resistance.

**Ghrelin:** Known as the hunger hormone, ghrelin is secreted in the digestive tract. It tells the hypothalamus that the body is hungry.

The production of ghrelin is triggered when the stomach is empty. When the stomach is full, it triggers a stop to ghrelin secretion.

Ghrelin contributes to the regulation of blood sugar by halting the release of insulin from the pancreas.

Ghrelin also triggers glucose production in the liver. Both of these processes translate to higher blood sugar levels.

What may be a surprise is that ghrelin levels are reduced in obesity, which should lead to reduced appetite. Scientists aren't quite sure why, but insulin, leptin and ghrelin functions are often disrupted in obesity.

# MANAGING YOUR BLOOD SUGAR

**Blood sugar levels** can be affected by:

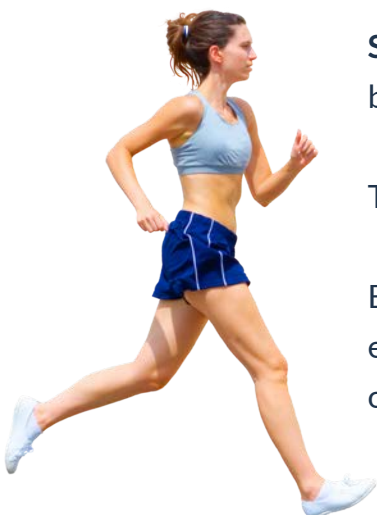
- Menu Plan
- Physical activity
- Stress
- Body fat



**Menu Plan:** Simple carbohydrates, like table sugar or products made from refined flour are rapidly turned into blood sugar. Too much of these simple carbohydrates over time can derail healthy insulin and blood sugar regulation, leading to issues like type 2 diabetes. When you eat too much sugar, it forces the body to work harder to find balance.

**Complex carbohydrates,** like whole grains, vegetables and fruits, are also sources of blood sugar. But they also provide fiber, which slows down the digestion of carbohydrates and the subsequent release of blood sugar.

**Physical Activity:** How much or how little you move is also a major influence on blood sugar levels. More movement equals more fuel burned. Blood sugar levels can drop after exercise as a result of the sugar being used for energy. To reap the positive benefits of physical activity, complex carbohydrates are more beneficial than simple carbohydrates.



**Stress:** Stress triggers the production of adrenaline and cortisol, both of which signal the liver to release sugar.

This is done to help our bodies deal with an imminent threat.

But, the body can't distinguish an actual life-threatening emergency, like a near miss car accident -- from work-related overload. However, the effect is the same.

# MANAGING YOUR BLOOD SUGAR

**Chronic stress** over time can be problematic because of the chronic release of blood sugar that isn't being used to fight or run – this is how cortisol can cause belly fat.

When blood sugar gets too low, it also triggers a stress response. This is why it's important not to go too long without eating and why stress response can trigger **binge eating** for someone who struggles with emotional eating.

**Body-Fat:** Blood sugar influences body-fat and can play a role in obesity. The main thing to remember is that blood sugar imbalances can cause weight gain. And, gaining weight can cause blood sugar **imbalances**.

It's a cycle that's often difficult to break.