- Metabolism



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Energy metabolism explained

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How do our bodies create energy? Like any natural process, we need fuel. Here's how it works...

Energy metabolism is the process where your body converts food into usable energy. It's an ongoing interplay of digestion, absorption, cellular respiration and nutrient transport that fuels everything from your brain function to the beating of your heart. This process is not limited to what you consciously feel, like the boost you get after eating, but operates in every tissue, all the time. Different tissues also have different energy needs, such as muscle, which uses more energy during movement, while the brain requires more of a steady flow of glucose, even when you're resting. The balance between supply and demand is constantly being regulated to meet the body's needs without running short.

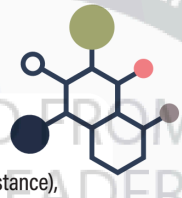
What is cellular respiration?

When you eat, carbohydrates are broken down into glucose, fats into fatty acids and glycerol, and proteins into amino acids. These molecules are absorbed through the gut and transported to cells throughout the body. Inside your cells, a series of complex chemical reactions occur, mostly within tiny organelles called mitochondria, and convert these nutrients into adenosine triphosphate (ATP), the primary energy currency of the body.

This process is called cellular >



What affects your energy metabolism?



While it's often said that metabolism slows with age, recent research shows it stays fairly stable from our 20s through to our 60s. The more noticeable decline tends to happen after 60, which is likely due to changes in muscle mass and hormone levels. Genetics play a role in how efficiently your cells produce energy, but lifestyle factors, such as diet, movement, sleep, hydration and stress, can also have a big impact as well. Chronic illness, hormonal issues (thyroid problems or insulin resistance), and some medications can also interfere with energy metabolism, and lower levels of key nutrients, such as iron, magnesium, B vitamins or vitamin D, can also impair your ability to produce energy efficiently at the cellular level.

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respiration. Using glucose as an example, it enters the cell and undergoes glycolysis, producing pyruvate and a small amount of ATP. The pyruvate is transported into the mitochondria where it enters the citric acid cycle (Krebs cycle) and the electron transport chain, generating large amounts of ATP in the presence of oxygen. Fatty acids and amino acids follow similar but distinct pathways, also contributing to the production of ATP.

Why do we need ATP?

We need this energy not just for physical movement or exercise, but for growth, repair and the maintenance of all essential bodily functions such as breathing, circulation, and regulating body temperature. Even when you're resting, your body is using a significant amount of energy just to keep you alive. This is known as your Basal Metabolic Rate (BMR).

When we feel energetic, it's often because our cells are efficiently producing ATP and our brain is receiving the right balance of signals, which include glucose availability, hormone levels (like cortisol and insulin), and neurotransmitters such as dopamine and serotonin. When you feel tired or sluggish, it might be due to disrupted energy metabolism, such as poor blood sugar regulation, thyroid issues, low iron, dehydration or simply a lack of sleep, which can all interfere with how effectively your body produces and uses energy.

What other factors affect energy metabolism?

Hormonal fluctuations play a role, such as cortisol, which helps to mobilise energy stores when needed (like in the morning or during stress) or insulin, which regulates how nutrients are taken up and stored. If these hormones are imbalanced, then energy levels can dip or spike.

Another important factor is the health of your mitochondria. These tiny powerhouses can become less efficient with age, oxidative stress, or nutrient deficiencies, especially B vitamins, iron, magnesium and coenzyme Q10, all of which are essential for energy production.

Regular movement encourages better mitochondrial function and insulin sensitivity, helping cells use



Energy metabolism myths *busted*

MYTH 1

Eating at night slows your metabolism

There's a common belief that eating late causes weight gain by slowing down your metabolism, but that's not strictly true. Your metabolism doesn't shut off at night but keeps ticking over, just at a slightly lower rate as part of your circadian rhythm. What really matters is the quality and total amount of food you eat over 24 hours. That said, research from King's College London shows that eating late in the evening can affect how your body processes food, disrupt your sleep, and influence appetite the next day so, while it's not about metabolism 'stopping', meal timing can still play a role in how you feel and how your body manages energy.

MYTH 2

Some foods have 'negative calories'

You may have heard that foods like celery burn more calories to digest than they provide. While some foods have a higher thermic effect, especially protein, there's no such thing as a true negative-calorie food. These foods are often low in calories, but they still contribute to your overall intake.

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glucose more effectively. In endurance athletes, these adaptations are the result of training, as repeated exercise makes the body more efficient at switching between carbohydrates and fats for fuel, and enhances mitochondrial density, which improves the capacity to generate energy over longer periods.

Must you train like an athlete to benefit from exercise?

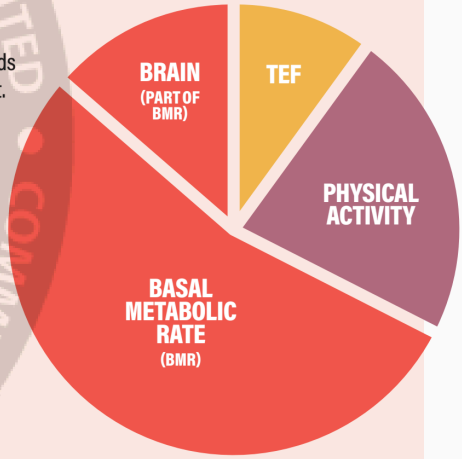
Even moderate exercise, such as brisk walking, can initiate improvements to mitochondrial function. It stimulates the development of new mitochondria and enhances their efficiency, showing that benefits aren't limited just to athletes. Resistance training further supports this by increasing muscle mass, which burns more energy at rest.

What about sleep?

Chronic sleep deprivation reduces glucose tolerance and insulin sensitivity, making it harder for your body to access energy from food. It also alters levels of appetite-regulating hormones like ghrelin and leptin, which can lead to cravings, poor food choices, and further energy dips.

Energy metabolism is a complex but adaptable system. When it's working well, we tend to feel sharp, motivated and ready to go. And when it's not, we feel it through brain fog, energy dips, or that wired-but-tired feeling. There are plenty of ways to support your metabolism through movement, eating well, getting enough sleep, and looking after your stress levels, which all feed into how your body produces and uses energy. Consistency is key, and these are the small things that can keep your metabolism working in your favour.

Where does all that energy go?



Most of the energy your body produces doesn't go to your workouts or brisk walks but towards things you never really think about. Around 60-75 per cent of your daily energy expenditure is used just to keep your body ticking over. This includes maintaining body temperature, cell repair, immune function, and organ function, such as the heart beating, lungs expanding, liver detoxifying and kidneys filtering blood. This is your Basal Metabolic Rate (BMR).

Your brain is one of the most energy-hungry organs in the body. It accounts for about 20 per cent of BMR. Even when you're just scrolling on your phone, your brain is burning through glucose to process information, regulate emotions and maintain focus.

About 10 per cent of your energy is used for digesting and processing the food you eat, which is known as the thermic effect of food (TEF) and protein-rich foods require more energy to digest than carbohydrates or fats.

The remaining 15-30 per cent is what's used during physical activity. This includes structured exercise, but also non-exercise activity thermogenesis (NEAT), which refers to all the small movements you make throughout the day, such as fidgeting, standing up or walking to make a cup of tea.

So, while it might seem like energy is just about fuelling your workouts or getting through the day, most of your energy is spent behind the scenes on essential processes you don't consciously control.

> "Even when you're resting, your body is using a significant amount of energy just to keep you alive."

MYTH 3

Fast metabolism equals better health

A fast metabolism isn't always a good thing. In some cases, it may indicate an underlying issue like hyperthyroidism. What matters more is metabolic efficiency, or how well your body converts and uses energy from the food you eat.

MYTH 4

Skipping breakfast slows your metabolism

It's long been said that breakfast 'kickstarts' your metabolism, but current research shows that it's not quite that simple. Skipping breakfast doesn't damage metabolism, but it may lead to increased hunger and poorer food choices later in the day, depending on the individual.

MYTH 5

Exercise is the main way to burn energy

While exercise is important for health and weight management, most of your daily energy burn comes from your basal metabolic rate (BMR) and daily non-exercise activities (NEAT). That's why overall movement throughout the day, including standing and walking, is just as important as your time spent in the gym.

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