

The OsteoStrong® Mitochondria Energy Blueprint

Improving cellular energy required for strength, vitality independence and healthy ageing

Energy is not just how you feel in the morning.

Energy is biology.

Every cell in your body requires energy to repair, rebuild, move, think, detoxify, regulate hormones and maintain resilience. At the centre of this process are the **mitochondria** — the tiny power stations inside our cells that convert food and oxygen into ATP (adenosine triphosphate), the body's usable energy currency.

Mitochondria are ancient bacteria that became part of human evolution millions of years ago and now act as the microscopic powerhouses inside almost every cell of your body. We all have trillions of mitochondria supporting the function of our muscles, heart, brain and metabolism every second of every day.

As we age, mitochondrial function declines. When this happens, we may feel it as fatigue, brain fog, slower recovery, reduced strength, poor metabolic health, lower immunity, inflammation, loss of muscle and a general sense that the body has lost its spark.

But the body is adaptive.

When we give it the right signals, it can respond.

1. Movement: The signal that tells the body to produce more energy

Mitochondria respond to demand.

When we move, challenge muscles and create safe physical stress, the body is encouraged to produce more efficient energy systems. This is one reason regular movement is so important for healthy ageing.

Walking, cycling, stretching and mobility all help. But the body also needs stronger signals — the kind that tells muscles, bones and the nervous system they are still required.

At OsteoStrong®, our focus is on delivering a safe, measured, high-force stimulus to support stronger bones, stronger muscles, balance and confidence. This stimulus is part of a bigger energy story: a stronger body is generally a more metabolically active body.

Because bone and muscle respond to the magnitude of load applied, the physiological stimulus created during OsteoStrong® sessions is significantly greater than that achieved with many conventional exercise programs and traditional gym workouts. This also includes the signal that mitochondria receive from the high loads experienced.

OsteoStrong sessions are also intrinsically safer than most conventional exercises, because they are fully supervised 1:1, you are placed in your strongest position to protect joints and connective tissue, and progress is slow, measured and fully controlled. OsteoStrong sessions are very suitable for most older people, who may be unable to lift heavy weights or absorb the high impacts required to trigger osteogenesis.

Another important consideration is movement throughout the day. Walking and regular light activity keeps mitochondria active and responsive. This helps prevent metabolic stagnation and mitochondrial downregulation

2. Muscle: Your metabolic engine

Muscle is not just for movement.

Muscle is one of the body's greatest glucose-storage and energy-regulation organs. Healthy muscle helps support blood sugar control, insulin sensitivity, posture, balance and metabolic resilience.

As muscle declines with age, the body often becomes less efficient at handling glucose and producing energy. Preserving and building muscle is therefore one of the most powerful strategies for healthy ageing.

More muscle means a greater capacity to store glycogen, burn fuel and support mitochondrial health, and importantly, stronger bones.



Importantly Mitochondria adapt when challenged.

- Short bursts of **high intensity** (strength or interval work). This includes activities like OsteoStrong® and HIIT (high intensity interval training) and activities like Japanese walking.
- These types of activity signal the body to create **more and better mitochondria** (biogenesis)
- It also improves efficiency of ATP energy production

The Key to this process is **brief, intense stimulus, then recovery**, which is exactly how the OsteoStrong® system operates.

3. Oxygen: The fuel partner of mitochondria

Mitochondria use oxygen to help produce ATP.

This is why cardiovascular fitness, breathing efficiency and blood flow matter. Movement, deep breathing, interval training, walking and recovery therapies that support circulation can all help deliver oxygen and nutrients to tissues.

Better circulation means better oxygen and nutrition delivery.

Better delivery means better energy production.

4. Nutrition: The raw materials for cellular energy

Mitochondria require nutrients to function properly.

Protein provides amino acids for repair and muscle maintenance. Healthy fats support cell membranes and hormone health. Minerals and vitamins — especially magnesium, B vitamins, iron, zinc, CoQ10 and vitamin D — all play roles in energy production, oxygen transport and cellular repair.

You cannot build energy from poor raw materials.

A mitochondrial-supportive diet includes quality protein, colourful plants, healthy fats, minerals, hydration, plus minimal simple-sugars and ultra-processed foods.

Key nutrients involved in mitochondrial health include:

- **Compete Protein** → repair & maintain muscle & bone, production of energy, hormones and enzymes needed for healthy metabolism & healthy ageing.
- **Magnesium** → ATP production
- **B vitamins** → energy metabolism
- **Iron** → oxygen transport
- **CoQ10** → electron transport chain & immunity
- **Omega-3s** → membrane health

5. Stable Blood Sugar

Large glucose swings stress mitochondria. To avoid this;

- Prioritise complete amino acids - **protein + healthy fats**
- Reduce ultra-processed carbs, processed vegetable oils, margarine and simple sugars.
- Consider eliminating FODMAP's to reduce inflammation and irritable bowel issues. FODMAPs are fermentable carbohydrates and sugars in some foods that are poorly absorbed in the gut and may cause bloating, gas, abdominal pain, reflux, diarrhoea or irritable bowel symptoms.
- Avoid constant snacking.
- Intermittent fasting may reduce blood sugar.

Stable fuel = steady energy output

****Always consult your doctor when making big dietary changes**

6. Inflammation: The energy thief

Chronic inflammation quietly drains energy. It damages mitochondria by increasing oxidative stress and disrupting cellular energy production, leading to fatigue, accelerated ageing, and reduced cellular repair and resilience.

When the body is constantly fighting poor sleep, excess stress, poor diet, gut irritation, visceral fat or toxin load, energy is diverted away from repair and resilience.

Reducing inflammation helps the body shift from survival mode into rebuild mode.

This is where sleep, gut health, nutrition, stress management, movement and recovery all come together.

7. Recovery: Where the rebuilding happens

You don't build energy during stress - you build it after. Deep sleep, rest days, hydration, sunlight, gentle movement, relaxation and parasympathetic nervous system activation all support mitochondrial repair and renewal.

In the right dose, challenge the body is beneficial. But too much stress without recovery can push the body into a constant fight-or-flight state, where energy is diverted away from repair and resilience.

True recovery happens when the nervous system shifts into a calmer, **parasympathetic state** through quality sleep, slow controlled breathing, low-stimulation downtime and proper rest. This is when mitochondria repair, damaged mitochondria are removed through mitophagy, and the body's energy systems reset.

Health is not just about doing more.

It is about applying the right stimulus, then giving the body the time and conditions it needs to adapt. This is where OsteoStrong® shines because it does not cause exhaustion or tiredness.

Poor sleep & recovery = impaired mitochondrial function, full stop.

8. Sunlight and circadian rhythm

Light is a **biological signal**, not just visual. Regular sunlight exposure in the morning and night (sunrise and sunset) and therapies such as Red Light & Pulsed Electro Magnetic Field therapies available at OsteoStrong® help support mitochondrial function by improving cellular energy production and circulation and helping reset the body's circadian rhythm, which regulates sleep, hormones, recovery and metabolism.

Sunrise light entering the eyes signals the brain to suppress melatonin and increase serotonin, cortisol and daytime alertness, while red light at sunset and darkness trigger the opposite response — increasing melatonin production to prepare the body for sleep, recovery and overnight cellular repair.

9. Purpose: The energy behind the energy

There is also a deeper form of energy.

The Japanese call it **ikigai** — your reason to get up in the morning.

Purpose, connection, contribution and meaning affect how we behave, how we recover, how we manage stress and how engaged we remain with life.

A strong body supports a strong life. But a strong reason for living gives the body a reason to stay engaged.

10. Autophagy and Mitophagy: The Body's Cellular Clean-Up System

Detoxification is not just something that happens in the liver.

The body also has built-in cellular housekeeping systems that help remove damaged, worn-out or dysfunctional cellular material.

This process is called **autophagy** — literally meaning “self-eating”. It is the body's way of recycling old or damaged cellular components so they can be cleared, renewed or reused.

Mitophagy is a more specific form of this process. It refers to the clean-up and recycling of damaged mitochondria.

This matters because poorly functioning mitochondria can become energy drains. They may produce less ATP, generate more oxidative stress, and contribute to fatigue, inflammation and accelerated ageing.

In simple terms:

Autophagy helps clean up damaged cellular material.

Mitophagy helps clean up damaged mitochondria.

These processes are part of the body's natural detoxification and renewal system. They help keep cells healthier, more efficient and more resilient.

Autophagy and mitophagy are supported by many of the same foundations of healthy ageing:

- regular movement
- strength-based stimulus
- overnight fasting windows
- deep sleep
- nutrient-dense food
- good blood sugar control
- reduced chronic inflammation
- avoiding constant snacking
- allowing the body time between meals to repair and reset

This is why recovery, meal timing, sleep and metabolic health matter so much.

The body cannot effectively clean, repair and renew if it is constantly digesting, inflamed, stressed or under-recovered.

11. Cold and heat exposure (advanced but powerful)

Cold showers, ice baths and saunas stimulate mitochondrial biogenesis (making more energy engines). This improves cellular resilience helping you become more resistant to stress.

12. Review medications and lifestyle load

Medications save lives—but many can also subtly influence the cellular energy systems that determine how we feel, recover, and adapt.

It is a fact that some medications affect mitochondrial health in certain individuals by altering energy production, increasing oxidative stress,

reducing CoQ10, or interfering with mitochondrial DNA replication. These can include some antibiotics, antivirals, anticancer medications, benzodiazepines, statins, metformin, some anti-seizure medications, corticosteroids, proton pump inhibitors and certain pain medications.

Important: never change medications without medical advice—**but be aware of the potential interactions**

13. Evidence-based supplements

There is a growing area of science behind supplements that may support mitochondrial health and energy production:

- **Creatine** — supports ATP recycling, muscle strength, power and cellular energy availability.
- **NMN** — supports NAD⁺ production, important for mitochondrial repair and healthy ageing.
- **CoQ10** — supports the mitochondrial electron transport chain and acts as a powerful antioxidant.
- **B Vitamins** — essential for converting food into usable cellular energy and supporting nerve and brain function.
- **Omega-3 fatty acids** — support cell membrane health, reduce inflammation and improve metabolic resilience.
- **Magnesium** — critical for ATP production, muscle relaxation, sleep and hundreds of enzymatic reactions.
- **Vitamin D** — supports muscle, immune and mitochondrial function, particularly in deficient individuals.
- **Alpha Lipoic Acid (ALA)** — antioxidant that may help reduce oxidative stress and support glucose metabolism.
- **L-Carnitine** — helps transport fatty acids into mitochondria to be used as fuel.
- **Zinc** — supports immune function, cellular repair and metabolic processes.
- **Protein / essential amino acids** — provide the raw materials needed for muscle repair, enzymes, neurotransmitters and mitochondrial function.
- **Electrolytes (potassium, sodium, magnesium)** — support cellular hydration, nerve signalling and muscular energy systems.

Supplements are supportive tools, not magic solutions. The biggest drivers of mitochondrial health remain movement, osteogenic loading, stable blood sugar, quality sleep, sunlight, recovery, muscle mass and reduced chronic inflammation.

Simple framework

The framework to support your energy production is this:

Stimulate → Recover → Fuel → Repeat

- Stimulate mitochondria (intensity)
- Repair them (parasympathetic)
- Fuel them (nutrition & supplements as required)

Bottom line

Energy isn't something you chase—it's something your cells produce when the conditions are right.

Fix the mitochondria, and:

- Energy improves
- Recovery improves
- Bone and muscle adaptation improve

The OsteoStrong® Message

Mitochondrial health is not one supplement, one diet or one biohack.

It is the result of better biological signals.

Move. Load. Breathe. Eat well. Sleep deeply. Reduce inflammation. Sunlight. Stimulus. Build muscle. Recover properly. Stay connected to purpose.

At OsteoStrong, we help provide one of the missing signals in modern ageing: a safe, measurable strength stimulus for bones and muscles.

Because energy is not just about feeling awake.

It is about having the cellular power to keep living fully.

Strong bones. Strong muscles. Strong energy. Strong life.

At OsteoStrong®, we focus on one important part of this bigger picture: providing a safe, measurable stimulus for bones and muscles. But the goal is broader than strength alone.

It is about helping the body receive the right signals to adapt, repair, renew and stay biologically younger for longer.

Healthy ageing is not just about building new tissue.

It is also about clearing out what no longer serves the body.

OsteoStrong Australia