SARCOPENIA
— a new pandemic?

Healthy Ageing Whitepaper

AstaReal
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The original, natural astaxanthin

Sarcopenia - a new pandemic?

In fact, sarcopenia has been around since humans started living past their 40's and actually begins to affect our health at a much earlier age. But first, what is it?

Sarcopenia is the slow, progressive loss of muscle mass and strength associated with the aging process. From as early as 30 years of age, our body begins to lose muscle mass and *replace it with fat infiltrate* at an increasing rate—unless we use our muscles and exercise regularly.

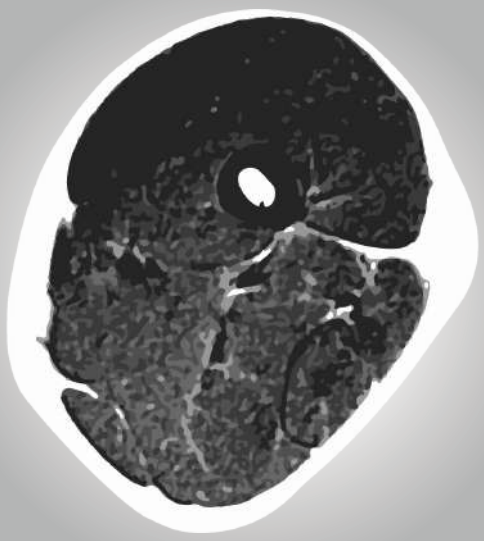
Because many of us prefer watching sports to exercising, the condition progresses and our strength and stamina decline slowly but steadily. We may not notice this for a number of years, or learn to love our "Dad/Mom bod", but as we grow older, symptoms like reduced muscle mass, limited mobility and a decline in physical performance become ever more obvious.

Formerly known as 'locomotive syndrome', sarcopenia was recognised as a disease state (M62.84) by the US Center for Disease Control in 2016.

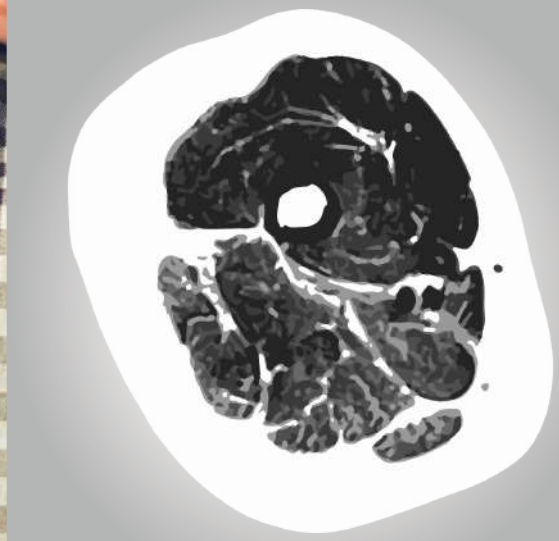
After the age of 50, every year, muscle mass decreases by 1–2%, and muscle strength by 1.5%. It is estimated that worldwide 5–13% of elderly people between 60 and 70 are affected by sarcopenia; rising to 11–50% for those aged 80 or older.[2]

Why do we lose so much muscle?

A key cause of skeletal muscle loss is *oxidative stress.*



This scan shows the cross-section of a healthy, young adult's thigh. Their strong muscle are surrounded by only a thin layer of fat (shown in white).



This scan shows a thigh cross-section from someone approaching retirement with muscle atrophy, but limb size is similar due to a significant increase in fat.

Oxidative stress plays an important role in muscle atrophy and its progression to sarcopenia. With increasing age, or under stress or physical exertion our bodies produce aggressive oxygen species, like free radicals that oxidize and damage muscle tissue at concentrations which overwhelm our own antioxidant system.

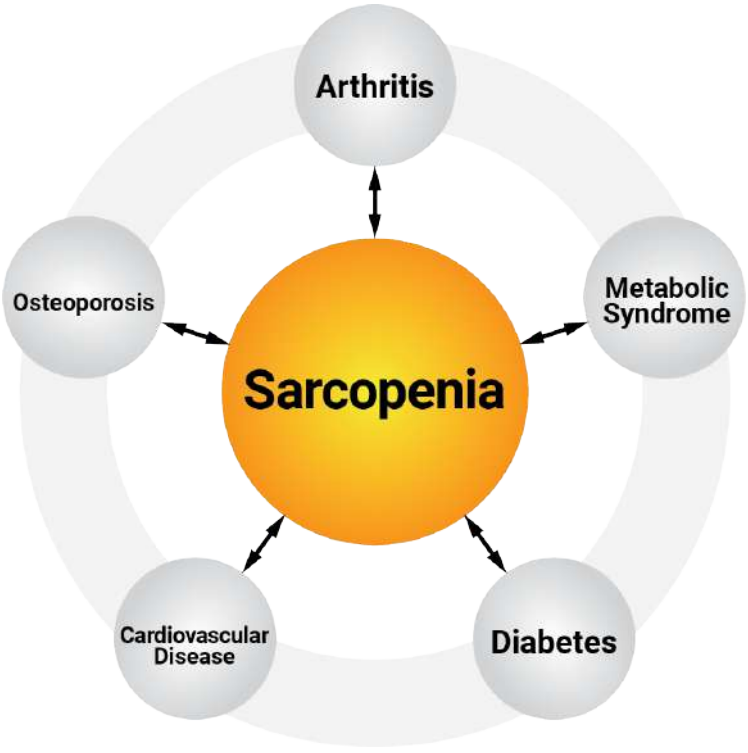
Symptoms of sarcopenia

Typical symptoms of this geriatric disorder are:

- Getting tired easily
- Feeling strain when climbing steps or stairs
- Being unable to cross the road quickly enough
- Losing balance when walking, and experiencing frequent falls
- Experiencing increasing frailty

As you can well imagine, all of the above symptoms have a large negative impact on our ability to lead a happy and active life.

Frailty and Geriatric Disability



As our society grows older, sarcopenia, which is often associated with osteoporosis, arthritis, metabolic syndrome, diabetes or cardiovascular disease, has increasingly become a central factor in frailty and geriatric disability.

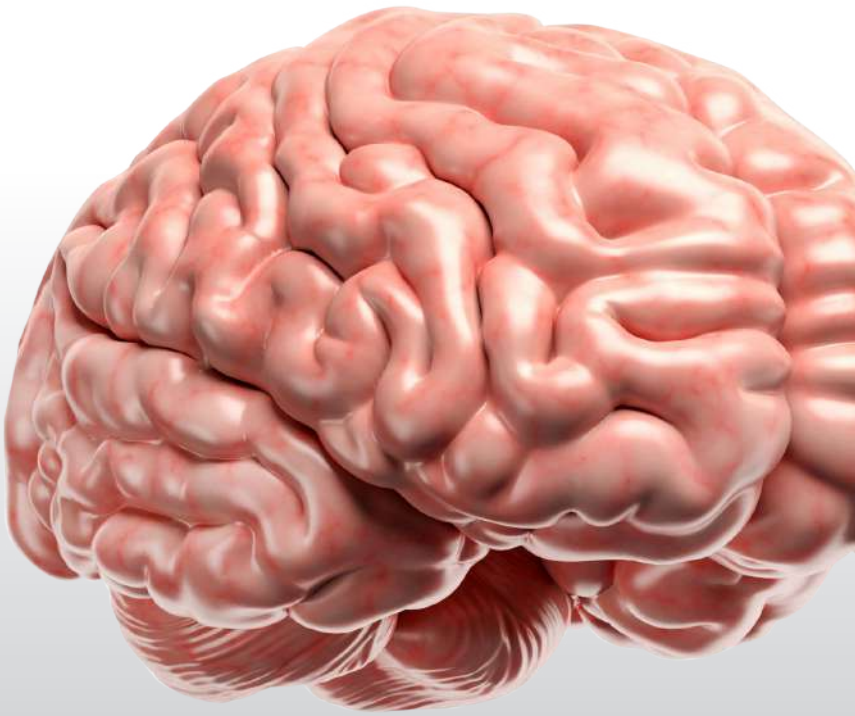
What makes matters worse?

Sarcopenia is not only associated with age-related physical decline, but has also been linked to decline in cognitive functions, such as memory, executive function and increased risk of mild cognitive impairment (MCI) or Alzheimer's disease (AD)[3–5].

Declining Cognitive Function

Additional evidence for the link between physical and cognitive decline comes from a sub-type of sarcopenia known as *sarcopenic obesity*; the combination of age-related progressive muscle loss and obesity. A recent study on sarcopenic obesity suggested that besides physical decline, cognitive functions, such as **memory,** the **sense of time** and **orientation**, and **executive function**, are also impaired[6]. As increased oxidative stress, reduced vascular function, chronic inflammation and muscle atrophy contribute to physical decline, metabolic impairments like insulin resistance exacerbate cognitive decline.

This reinforces the findings of an earlier study which analyzed data from the US National Health and Nutrition Survey (NHANES) which suggested a strong association between sarcopenic obesity and cognitive decline in adults aged 70 and over[7]. Therefore managing sarcopenia is important for quality of life because it affects both physical and cognitive functions.



How do I know if I am at risk?

If you are over 30 years of age you can lose as much as 0.5% of your muscle mass each year and the rate of loss increases with each decade. Even at this age you are already at risk and should ask yourself a few questions about your lifestyle, including:

- Do I exercise regularly?
- Is my diet healthy and well balanced?
- Do I get enough vitamins and minerals?
- Do I have a healthy intake of dietary antioxidants?

If the answer to any of the questions is "no", then it is time to get off the couch, exercise, and eat more healthily.

But what if you are already in your sixties?

Then there is a real possibility that you are already affected by sarcopenia and your body shows the first signs of muscle atrophy through declining strength and stamina.

Several tools are available to diagnose sarcopenia[3]:

- Muscle strength: hand grip dynamometer
- Performance: gait speed, get-up-and-go test
- Muscle mass: bio-impedance analysis (BIA)

So, you have been diagnosed with sarcopenia - what now?

Lifestyle choices are important elements in managing muscle loss and sarcopenia.

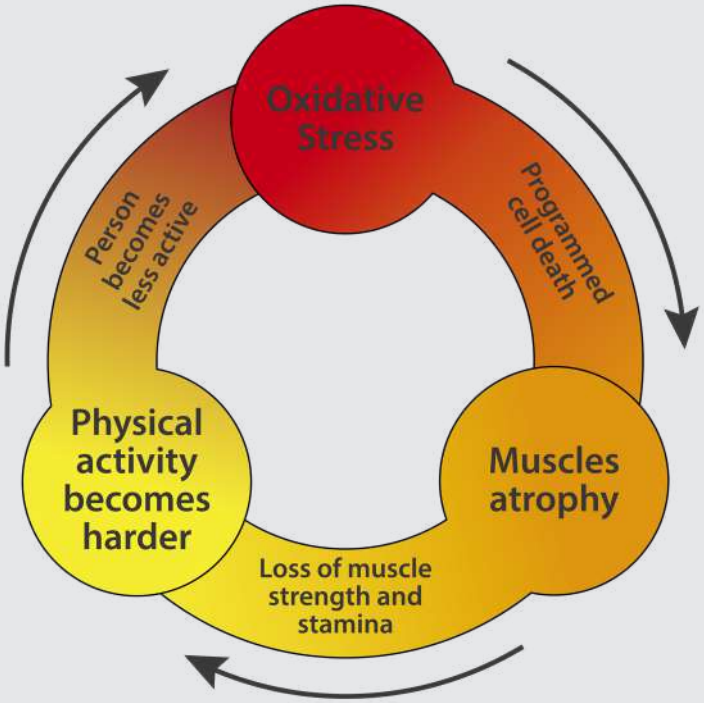
Several studies have been looking at **resistance training** and its effects on muscle health in the elderly, especially those with sarcopenia[4–6]. All these studies confirmed that resistance training dramatically increased muscle volume (+6.7%) and strength (+125–156%), demonstrating that regular physical activity is beneficial for maintaining muscle health in the elderly[4].

However, exercise alone will only have a limited effect on maintaining and growing muscle. We also have to give our body substance in the form of **protein** and **amino acids** to build muscle.

A recent study[7] supports emerging calls to increase the recommended protein intake in older adults and sarcopenia patients to levels between 1.2–1.5 g/kg[8–10]. The call for increased protein intake is based on the "anabolic resistance" hypothesis, explaining the reduced synthesis of muscle protein due to low levels in essential amino acids, especially leucine, in older people[11].

The progressive loss of mobility

A vicious and accelerating cycle

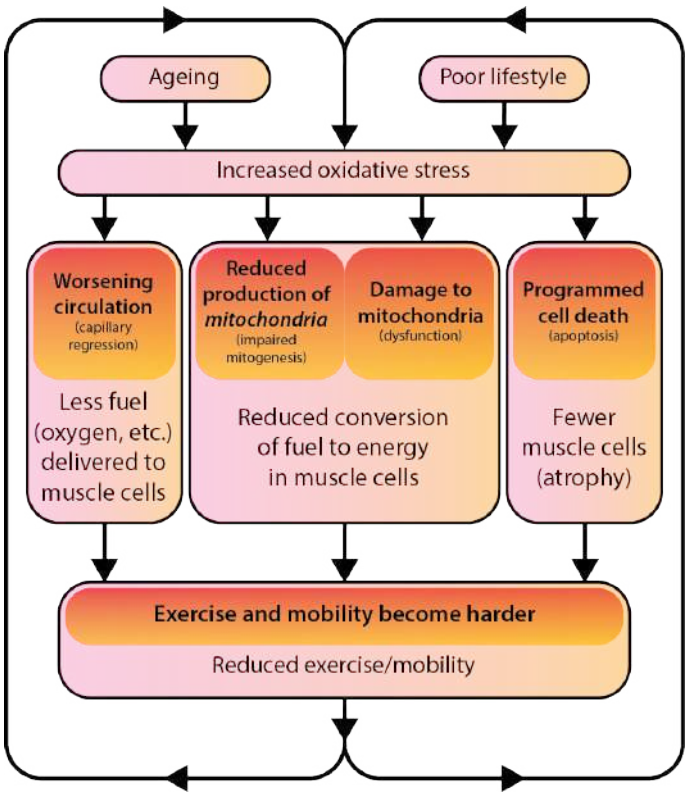


As we age, levels of reactive oxygen species (ROS) rise, causing oxidative damage to muscle tissue and eventually leading to muscle atrophy, the programmed death of muscle cells. The age-related loss of muscle strength and stamina make physical activities harder and we cease to exercise, becoming less mobile. Physical inactivity, however, increases the overproduction of ROS even more and aggravates the loss of muscle mass.

Oxidative stress is a key step in sarcopenia's cycle of muscle loss.

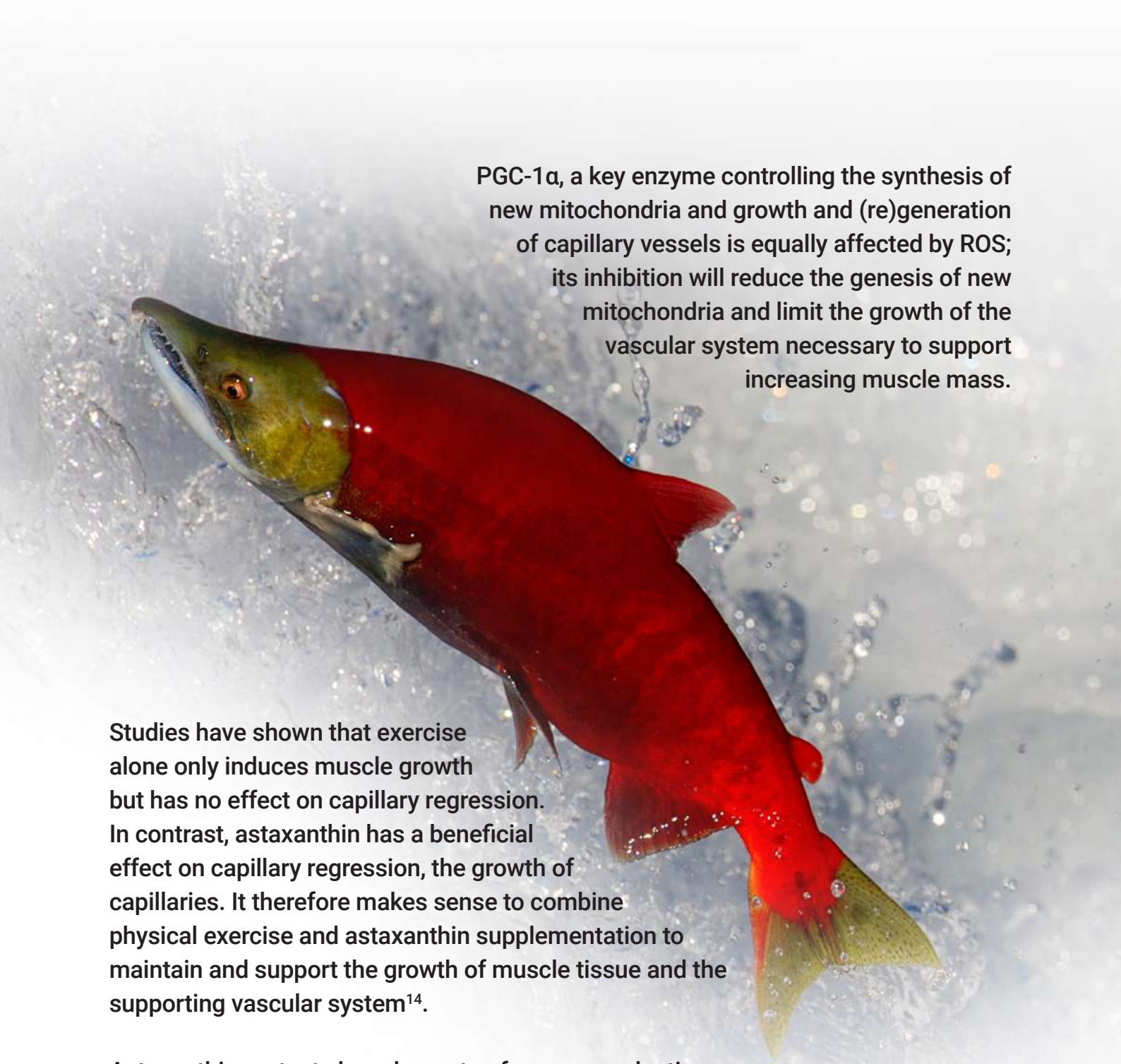
Compounding this, it is not only our muscle mass, but also the capillary system, which provides the muscle cells with oxygen and nourishment, which is threatened by ROS. High levels of ROS induce capillary regression, and the network of blood vessels shrinks, limiting both the supply of oxygen and energy to our muscles[13, 14].

Furthermore, the effect of increasing ROS levels will not only affect muscle tissue and the capillary system, but also our cell's power plants, *mitochondria*, limiting the energy our muscles need for physical activities.



Muscle loss is just one of the four vicious circles impacting upon our strength and mobility.

PGC-1α, a key enzyme controlling the synthesis of new mitochondria and growth and (re)generation of capillary vessels is equally affected by ROS; its inhibition will reduce the genesis of new mitochondria and limit the growth of the vascular system necessary to support increasing muscle mass.



Studies have shown that exercise alone only induces muscle growth but has no effect on capillary regression. In contrast, astaxanthin has a beneficial effect on capillary regression, the growth of capillaries. It therefore makes sense to combine physical exercise and astaxanthin supplementation to maintain and support the growth of muscle tissue and the supporting vascular system[14].

Astaxanthin protects key elements of energy production and angiogenesis by reducing ROS levels, providing the conditions for increased muscle growth stimulated by regular exercise.

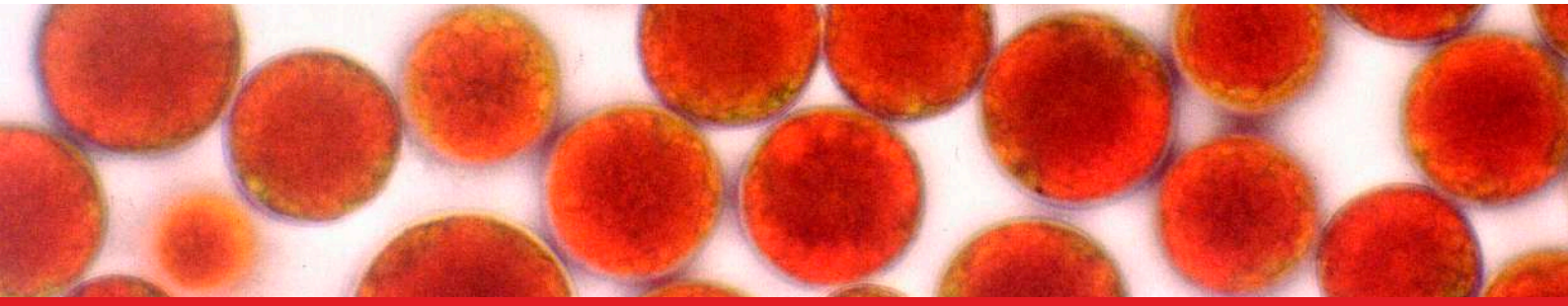
By ingesting these microalgae, astaxanthin begins its journey up the food chain, protecting the shrimp's eyes from ultra-violet light or helping salmon during their incredibly strenuous upstream migrations to spawn. The discovery of the antioxidative properties of astaxanthin sparked a long string of studies revealing astaxanthin's diverse health benefits for humans.

What can I do?

What can help to fight oxidative stress are natural antioxidants which we can obtain through a healthy and balanced diet.

Very often, however, our lifestyle requires us to look for other sources such as dietary supplements and functional foods to provide us with the many vitamins, minerals, antioxidants and protein which we need.

The most powerful antioxidant nature has to offer is astaxanthin, which is found in a variety of marine organisms, such as salmon, shrimp or lobsters, and also in birds like the flamingo or the frigate bird.

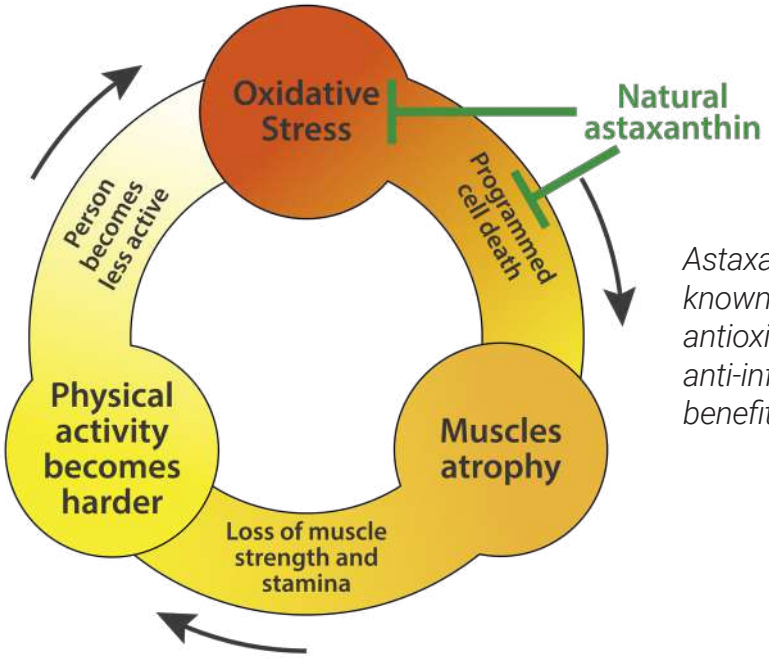


However, the source of natural astaxanthin is to be found further down the food chain, in the unicellular alga Haematococcus pluvialis. One of the freshwater algae, it produces large quantities of astaxanthin to protect itself from the oxidative stress caused by harsh environmental conditions such as draught, high salinity or strong sun light.

Haematococcus pluvialis can be found naturally across the world, and is the source of the astaxanthin in the majority of these species

Astaxanthin can help to stall these vicious cycles.

Tackling the root cause of oxidation can arrest capillary regression, muscle atrophy and mitochondrial dysfunction, and preserve mitogenesis



Astaxanthin is well known for its strong antioxidant[15] and anti-inflammatory benefits[16]

Several studies have examined the benefits of astaxanthin for muscle strength, endurance and recovery and showed that astaxanthin not only enhances endurance[17] and strength[18], but also increases fat utilization and mitochondrial energy production[19].

Clinical studies testing the effect of astaxanthin on muscle anabolism have been performed with both young, healthy participants and seniors[20].

The latest research

However, a recent clinical study clearly demonstrated that the combination of astaxanthin supplementation and functional training indeed builds muscle strength and endurance and improves overall mobility[21] in people suffering from sarcopenia.

Compared to a placebo group, individuals (65–82 years of age) taking 12 mg of astaxanthin per day showed significant improvements.

After just 4 months with astaxanthin, subjects showed:

- 14.4% increase in muscle strength
- 2.7% increase in muscle volume
- 11.6% increase in muscle quality

These recent advances in sarcopenia-related research strongly suggest that the combination of functional exercise, dietary supplementation with amino acids and the strong antioxidant astaxanthin improves muscle status in senior citizens.

The support and build-up of muscle mass, increasing strength and endurance significantly improves the quality of life of the elderly, giving them the mobility to lead an active and independent life.

This whitepaper was written by Dr. Jörg Schnackenberg, a technical manager at AstaReal, the first company in the world to commercially cultivate the *Haematococcus pluvialis* alga, and the first to produce an astaxanthin health supplement. AstaReal has been researching natural astaxanthin's cultivation and health benefits for over 30 years.

For more information about natural AstaReal astaxanthin's benefits and how you can use it when formulating a wide range of product formats, please get in touch: *support@astareal.co.jp*

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30 YEARS of RESEARCH & INNOVATION

[1–22] For references, please contact us.

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