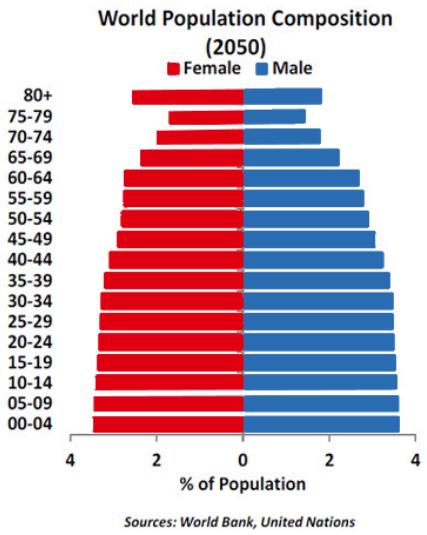
# AstaReal® Astaxanthin

**Adding *Quality of Life* to Ageing**

## The Impact of Age on Quality of Life

People worldwide are living longer, and the world population is undergoing dramatic demographic changes. Between 2015 and 2050, the number of people aged 60 or older will double from 841 million people in 2015 to more than 2 billion in 2050.




*Sources: World Bank, United Nations*

While the shift in a country's population towards older ages is commonly associated with high-income countries, low- and middle-income nations are catching up quickly. By 2050, two-thirds of the world's population aged 60 years or older will live in low- and middle-income countries. *(www.who.int/news-room, Oct. 4 2021).*

Although an increasing life expectancy certainly is a positive development, these additional years may not be spent in good health. Evidence suggests that the number of *silver years* lived in good health hasn't changed much over the past years. Non-communicable age-related chronic diseases can significantly affect an individual's quality of life and put tremendous pressure on societies and national healthcare systems. Since 2015 the global healthcare expenditure growths at an annual rate of 2.7% and will reach 10.2% of the global GDP by 2030 *(OECD Indicators, Health at a Glance 2019).*

Ageing is a complex process, and it remains challenging to explain why people age in so many different ways. While some older people can maintain the physical and mental strength of a much younger person, others experience a continuous decline in their health and become dependent on daily care. The reason why some people age healthier than others is still a matter of debate, but research points to the importance of nutrition. A healthy, well-balanced diet rich in antioxidants emerges as the right way to stay healthy and prevent age-related chronic diseases.



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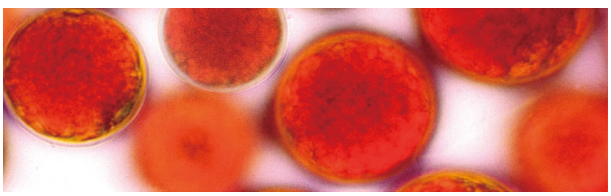
When looking closer at age-related diseases, we find that they all have one characteristic in common: a weakened antioxidant balance. While we age, our body experiences oxidative damage at the molecular and cellular level that often leads to the dysregulation of metabolic processes (e.g., metabolic syndrome, type-2 diabetes, etc.), increasing the risk of deteriorating physical and mental health, chronic diseases, and even death.

There is ample evidence from numerous clinical studies that a diet rich in natural antioxidants helps our body maintain a healthy antioxidant balance, strengthens the immune system, and prevents the premature decline of our physical and mental strength.

So, eating plenty of vegetables and fruits rich in antioxidants is taking care of the problem, right? Unfortunately, that's not working. With increasing age, our body progressively loses the ability to extract the necessary nutrients and vitamins from the diet, or the food does not contain the amounts our body needs.

## Astaxanthin, the most potent antioxidant, is abundant in Nature

Did you ever ask yourself why seafood such as shrimp, lobster, or salmon have a reddish-pink color? The color comes from a carotenoid called *astaxanthin*, produced by tiny microalgae consumed by these creatures as part of their diet. As astaxanthin accumulates in these organisms, it protects them from oxidative stress in often harsh environments.



Unfortunately, the astaxanthin level in seafood such as salmon is relatively low. About 12 servings of King Salmon are required to provide an effective dosage of 6 mg natural astaxanthin. A more practical way to get one's daily dose of natural astaxanthin is dietary supplements. Many scientific publications and clinical studies have shown that supplementing with astaxanthin from the microalga *Haema-tococcus pluvialis* is safe and effective in numerous health areas.

## When your skin shows your age

The moment you look in the mirror to find the first wrinkles and fine lines around the eyes is inevitable – or isn't it? The aging process, stress, but also environmental factors contribute to the *marks of aging* in our faces. As UV-induced free radicals compromise the dermal collagen layer, astaxanthin as a nutritional supplement promotes healthy skin from the inside out.

Unlike serums or creams that reach only the surface, orally taken astaxanthin can penetrate all layers of the skin and protect the integrity of the collagen layer in the dermis, neutralizing UV-induced free radicals in the epidermis and keeping the outermost layer of the skin hydrated, smooth and elastic. Studies with AstaReal® Astaxanthin, demonstrated that astaxanthin effectively protects human skin cells from oxidative damage and enhances the cells' viability in the presence of free radicals. Another AstaReal study showed that regular supplementation with 6 mg of astaxanthin reduced transepidermal water loss and improved the skin's smoothness and elasticity after just six weeks.

## Signs of Aging

- Fine lines or wrinkles
- Dry or rough skin
- Age spots
- Sagging

Age spots or liver spots are widespread among adults older than 50, but also younger people who spend much time in the sun can get them. Although harmless, this hyperpigmentation is considered a blemish, and consumers are searching for ways to enjoy the sun but avoid discoloration of the skin. Age spots result from an overproduction of melanin, a natural skin pigment produced by skin cells in the epidermis to protect the skin from the harmful effects of UV irradiation. But also, with increasing age, skin cells become more sensitive to UV-induced reactive oxygen molecules, which stimulates the overproduction of melanin.

Several studies have investigated the mechanism and found evidence that astaxanthin interferes with melanin production by down-regulating key enzymes and factors responsible for excessive melanin production. Combining a topical astaxanthin product (0.094% astaxanthin) with dietary supplementation with 6 mg AstaReal® Astaxanthin per day for 8 weeks greatly improved the participants' skin condition.

## Benefits

- Revitalizes dry skin
- Helps maintain elasticity, smoothness and skin health
- Strengthens collagen layer
- Reduces wrinkles and improves skin microtexture
- Reduces uv-induced oxidative damage

## In the blink of an eye

Eye diseases and vision impairment are major health concerns worldwide. The eye is an incredibly complex organ fulfilling the perhaps most important task in our lives, keeping us in touch with our surroundings. Approximately 80% of the sensory information from the world around us is perceived through vision. Roughly 130 million sensory cells in the retina send billions of signals to the brain every waking second of our life. By the time we reach our 50's, our eyes have been exposed to sunlight, artificial light, and pollution, have stared on computer screens for more than 250.000 hours. Of course, over time, these insults have consequences, leading to eye fatigue, blurred vision, dry eyes, and age-related degenerative eye diseases.

One of the most dangerous assaults on our eyes is caused by oxidative stress triggered by an excess of reactive oxygen species, or ROS. These ROS can be generated by UV light and over-exertion of our eyes by staring at close objects such as smart devices or PC screens. The eyes are particularly vulnerable to oxidative stress caused by UV light and the mitochondria-rich ciliary muscle that helps the eye focus on objects at different distances. Oxidative stress sets in when our natural antioxidant defense is overwhelmed, and the ROS get the upper hand.

What started as temporary mild symptoms of "tired eyes" can quickly become chronic, leading to impaired vision, discomfort, and reduced quality of life.

## Signs of Aging

- Difficulty to read fine print
- Tired eyes
- Dry eyes
- Cataracts & glaucoma
- Age-related macular degeneration

The good news is that astaxanthin, Nature's most potent antioxidant and anti-inflammatory, can cross the Blood-Retina-Border and restore the antioxidant defense in the eyes. It is widely understood that our body's antioxidant protection weakens with age.

Still, astaxanthin has been shown to restore our natural defenses by reducing the ROS load and stimulating the expression of endogenous antioxidant molecules. Astaxanthin not only neutralizes aggressive oxygen molecules. It also down-regulates signal molecules that trigger inflammation.
It improves ocular blood flow that helps supply the eye with oxygen and nutrients and accelerates the removal of toxins and waste.

Astaxanthin was found to work well with other carotenoids, especially with lutein and zeaxanthin. It enhances the absorption of harmful blue light, helping protect the retina from damage across the entire solar spectrum.

As people get older, weakening of the endogenous antioxidant system renders them more prone to degenerative eye conditions, namely the big 4, cataract, glaucoma, diabetic retinopathy, and AMD (age-related macular degeneration). Several studies have shown that astaxanthin's unique antioxidant and anti-inflammatory capabilities can help prevent the onset or alleviate the consequences of age-related eye diseases.

The prophylactic supplementation with AstaReal® Astaxanthin was shown to reduce the risk of inflammation after cataract surgery significantly. Another AstaReal study demonstrated that astaxanthin increased retinal blood flow and induced positive changes in blood pressure, intraocular pressure, and plasma glucose levels, helping prevent AMD and diabetic retinopathy.

The increasing use of digital devices like computers and smartphones among consumers of all ages has led to a new eye health concern called the Computer Vision Syndrome. While in 2018, adult US-Americans spent on average 8.41 hours per day using digital devices for work or leisure, screen time had increased to 13.28 hours per day by March 2020, which can partially be attributed to the ongoing Covid-19 pandemic.

The Computer Vision Syndrome is described by an entire group of related eye and vision problems caused by the extended use of computers or digital devices. Symptoms include eye discomfort and fatigue, dry eye, blurry vision, but also stiff neck or shoulders, headaches, and declining mental performance. Studies with natural astaxanthin have demonstrated that astaxanthin can relieve eye fatigue by improving capillary blood flow. Astaxanthin was found to enhance the quality of vision by preventing oxidative damage and preserving the "zoom-in / zoom-out" function of the ciliary muscle.

## Benefits

- Improves symptoms associated with computer vision syndrome
- Reduces eye fatigue
- Reduces inflammation of the ciliary muscle
- Supports accommodation
- Promotes capillary blood flow to nourish the eyes

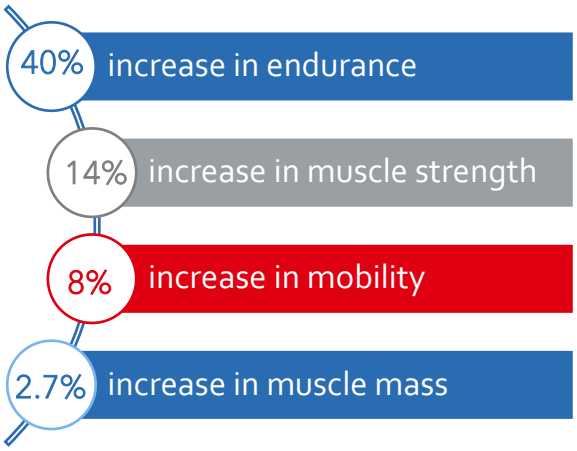
## Signs of Aging

- changing posture & gait
- losing muscle mass
- deteriorating strength & stamina
- physical fatigue
- limited mobility

## Keep Moving!

It starts in your late 30's or early 40's and progressively accelerates after the age of 65: sarcopenia, the gradual loss of muscle mass that affects your endurance, your performance, even your mobility. It is estimated that 5-13% of people aged between 60 and 70 years are affected by sarcopenia; once the age of 80 is reached, these numbers increase to 11-50%. Exercise training has been established as the gold standard for slowing down or reversing the effects of sarcopenia. Recent research indicates that dietary supplementation with antioxidants and anti-inflammatories in combination with exercise training improves muscle strength, endurance, and mobility. Researchers at the University of Washington tested an antioxidant formulation (AstaMed MYO™) that contained astaxanthin (12 mg), tocotrienol (10 mg), and zinc (6 mg).

Individuals aged between 65 and 85 undergoing treatment with AstaMed MYO™ in combination with an exercise protocol for four months showed a:




while there was no improvement in the control group that underwent only the exercise training without astaxanthin supplementation. These results confirm an earlier study showing that astaxanthin increased muscle strength in young, healthy subjects by 55%. Research clearly indicates that supplementation with natural astaxanthin improves muscle function and performance. We understand that astaxanthin has a robust protective effect on muscle cells and increases the cells' energy output. This is when we have to look at the organelles within our cells that convert nutrients into energy, the mitochondria.

## Benefits for Muscle Health

- provides antioxidant support and enhances exercise effect
- reduces muscle damage and inflammation
- improves muscle strength and helps support ageing muscles
- supports mitochondrial function



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## Mitochondria : the cells' powerhouses

The ability of the skeletal muscles to provide the energy for physical activities depends on the mitochondrial capacity to convert fuel into energy. This capacity is negatively affected by increasing oxidative stress related to the aging process. Astaxanthin's remarkable effect on muscle performance is explained by its unique features as a lipophilic molecule. Astaxanthin has a high affinity to membrane structures, especially mitochondria membranes. And indeed, preclinical studies revealed that astaxanthin tends to accumulate in mitochondria,and protect the organelle's membrane structure from oxidative damage, stimulates mitochondria biosynthesis and increases their density, enhances fat utilization, and increases energy output to fuel our daily activities.

### Signs of Aging

- Sub-optimal nutrient conversion
- Limited mitochondria biogenesis
- Reduced mitochondria activity
- Reduced energy production

### Benefits

- Improves nutrient conversion
- Enhances fat utilization
- Stimulates mitochondria biogenesis
- Rebalances mitochondrial redox status

## Immunosenescence – the aging immune system

With the silver years comes an increased risk of more severe infections and higher morbidity. More than 90% of deaths associated with influenza are observed in individuals older than 65, and the age-related decline in response to vaccination may play an important role.

Acute inflammation is a temporary response to pathogens or injuries that triggers complex reactions to remove pathogens and repair damaged tissue. However, the aging immune system gradually loses its bite. We become increasingly susceptible to chronic inflammation, leading to increased inflammatory biomarker concentrations such as IL-1β, IL-6, C-reactive protein, and TNF-α.

As the name already indicates, the immune system is a collection of specialized immune cells, tissue, and immune cell-producing organs (bone marrow, spleen, thymus, etc.) that is constantly looking for invading pathogens or abnormal endogenous cell growth.

The immune system consists of two branches, the innate and the adaptive immune system. If pathogens have breached the first line of defense, the skin or the epithelial lining of the gastrointestinal or respiratory system, the first branch, the innate immune system, is activated. In a fast but unspecific response, specialized immune cells (macrophages, neutrophils, monocytes) attempt to neutralize invading pathogens through inflammatory processes, e.g., releasing reactive oxygen species and lytic enzymes.

## Signs of Aging

- Increased proneness to infections
- Frequent cold spells
- Chronic inflammations
- Increased severity of symptoms

If pathogens like bacteria or viruses overrun the innate immune system, the adaptive immune response sets in, more specific and powerful. During the adaptive immune response, the immune system learns about a particular intruder; it learns to recognize it and instruct immune cells to attack and destroy the intruder. The major players of the adaptive immune system are T- and B-cells, Natural Killer Cells, and immunoglobulins.

However, oxidative stress increases with age, and the number and viability of immune cells and antibody production are declining. Early studies with human neutrophils showed that the presence of astaxanthin significantly enhanced the cells' phagocytic and microbicidal potency. It suppressed TNF-α, and the expression of inflammation markers, indicating that it could also improve the human immune system. Only one year later, the first human study demonstrated that rebalancing the antioxidant status had a profound effect on the potency of the immune system. Supplementation with natural astaxanthin increased the proliferation of T- cells, and B-cells boosted the cytotoxic powers of Natural Killer cells and suppressed inflammatory events

In the following years, evidence accumulated, demonstrating the immune-enhancing effects of natural astaxanthin. In performance athletes, who are notoriously prone to inflammation of the upper respiratory tract, it could be shown that astaxanthin increased the salivary immunoglobulin A, the first line of defense against bacterial infections.

## Benefits

- Protects immune cells against oxidative stress
- Strengthens and balances the immune system
- Enhances antibody production
- Supports healthy inflammatory response
- Promote healthy immune function

## *Why should you add natural astaxanthin to your diet?*

A healthy diet combined with regular exercise is well known to support the immune system. A well-balanced diet rich in vitamins, minerals, and antioxidants provides all the building blocks and exercise to stimulate and strengthen our immune system.

However, with increasing age, the body finds it increasingly difficult to extract the necessary amount of nutrients from the diet, resulting in suboptimal levels of many nutrients essential for immune function. Astaxanthin is no exception. Our annual intake of natural astaxanthin through our daily diet is not even coming close to an effective dose we should get every day. The solution is to supplement our daily diet with natural astaxanthin, Nature's most potent antioxidant.

## *Source and quality are key*

There are quite a few sources where astaxanthin is coming from. But astaxanthin extracted from the microalga *Haematococcus pluvialis* is the ingredient of choice. In more than 160 human studies, astaxanthin from *H. pluvialis* exceeded all other forms in its efficacy, and AstaReal is proud to have conducted or supported over 70 of these human studies..

Quality is of the essence when formulating health supplements with natural astaxanthin. AstaReal, the pioneer in cultivating *H. pluvialis* and commercializing algal astaxanthin, grows the algae in closed, fully controlled photobioreactors. Cultivating the cells in a clean environment under optimized growth conditions allows us to extract astaxanthin from fully matured cells, providing a constant supply of pure natural astaxanthin of the highest quality. With AstaReal's innovative technology, we can provide a variety of natural products sought after by the food and supplement industry.

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