

# ÆTHEION<sup>®</sup>

## REDOX TECHNOLOGY

Backed by Science. Used by Doctors.

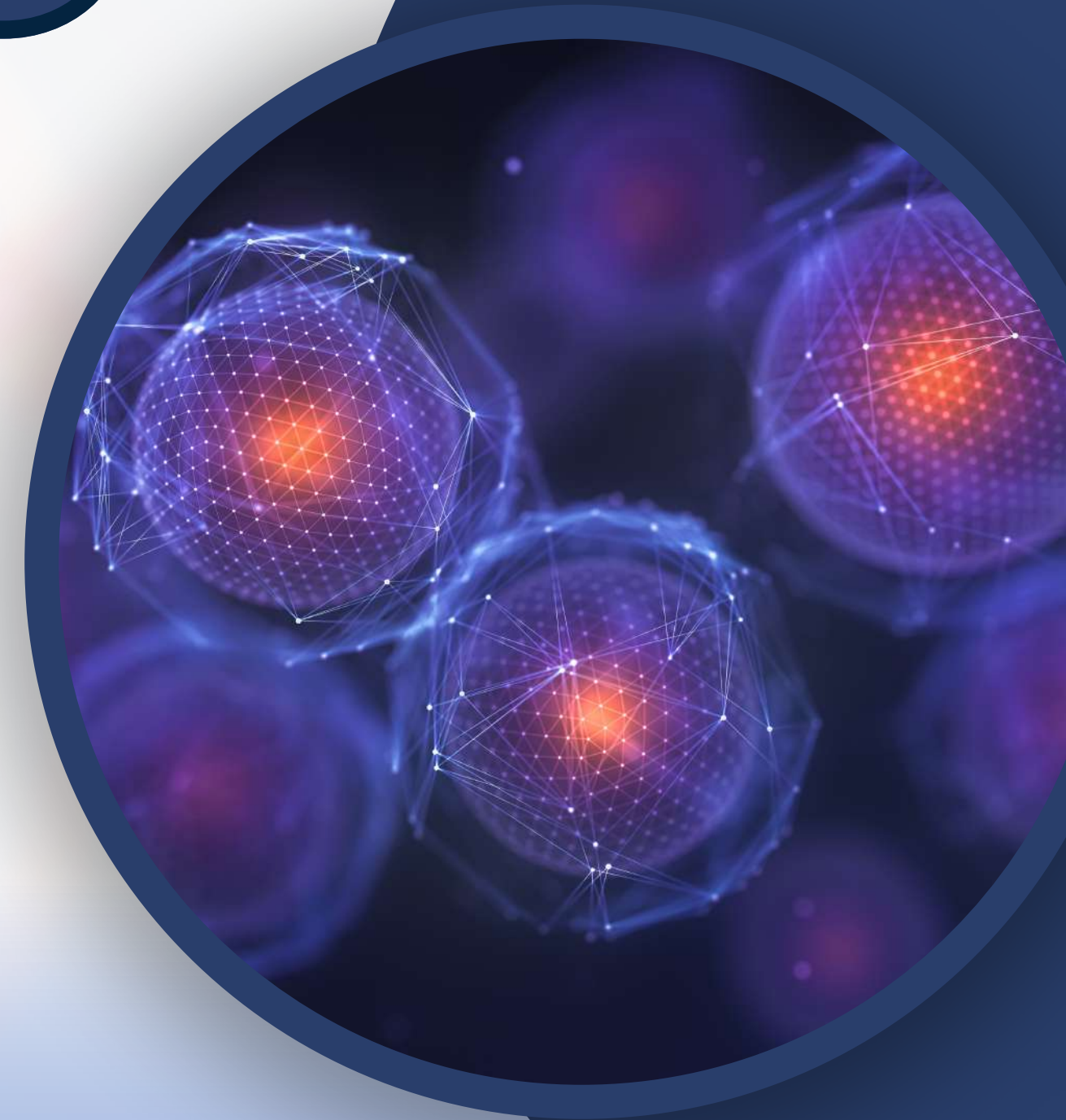


## Introduction to AETHEION® Redox Technology

All AETHEION® products contain the proprietary **Redox Technology** capable of simulating an ionic zinc-copper superoxide dismutase effect.

Redox Technology reduces the skin's oxidation by transferring electrons from a **radical state to a stress-free normal condition**. Oxidative stress is a form of cellular aging.

Utilizing cationic elements such as zinc, copper, magnesium, ammine, sulfur, and hydrogen brings health to the **AETHEION® formulations**. These elements offer diverse benefits that have garnered substantial attention in skincare biochemistry.





# Unraveling the Enigma of Aging

The enigma of aging has captivated human curiosity throughout history, yet a definitive explanation for the aging process remains elusive. Broadly, scientific inquiries into aging fall into two fundamental questions: **"Why do we age?"** and **"How do we age?"**

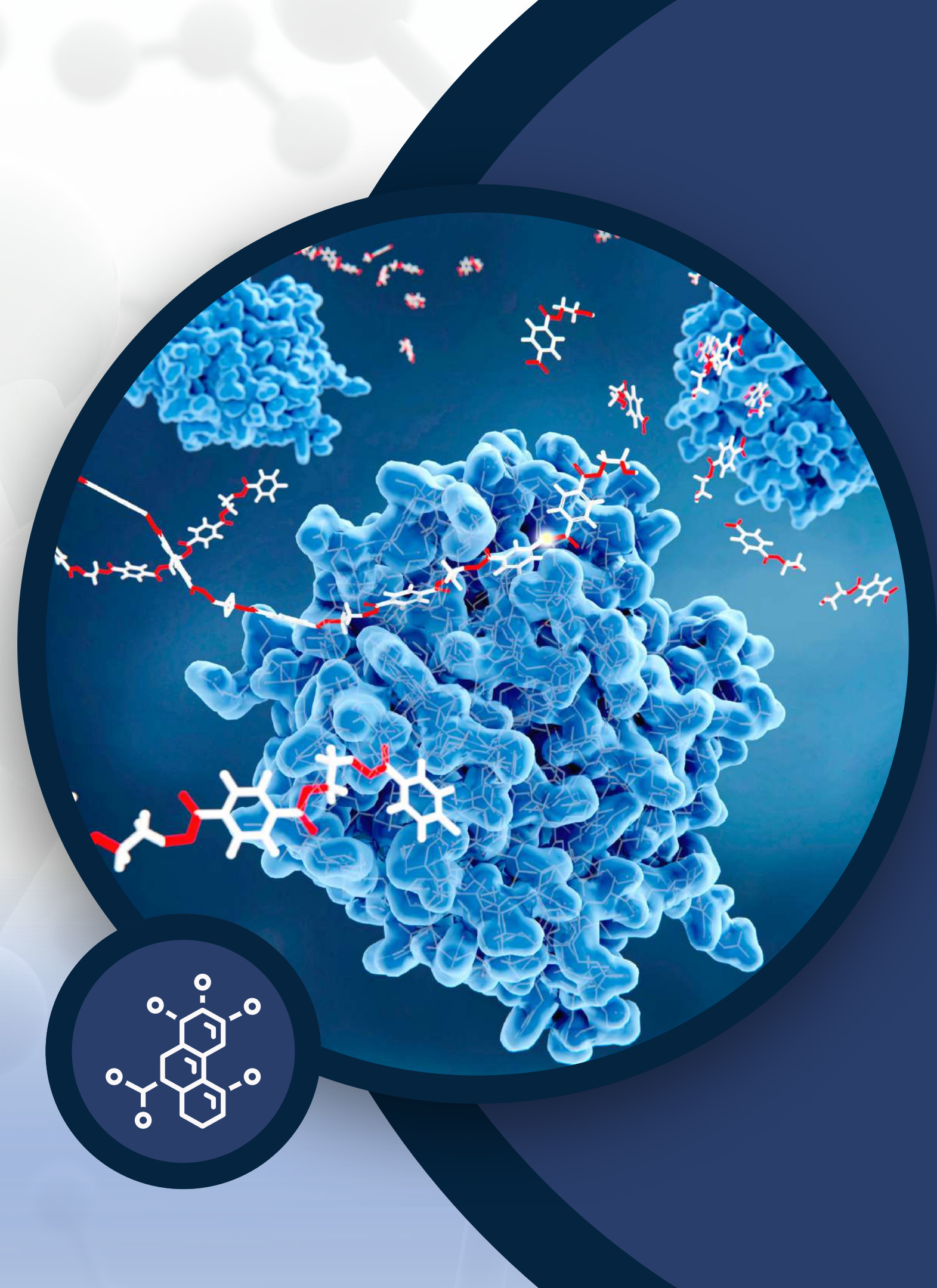
There is an accelerating quest to probe the intricacies of the "How do we age?" hypothesis in the present era. This relentless pursuit is poised to uncover the mechanisms underpinning the aging process and offer insights into potential interventions to decelerate or alter the aging trajectory.

**The free radical theory of aging** states that organisms age because cells accumulate free radical damage over time. **A free radical is any atom or molecule with an unpaired electron in an outer shell.** Free radical damage is closely associated with oxidative damage. Antioxidants are reducing agents and limit oxidative damage to biological structures.

# What is Superoxide Dismutase - SOD?

Superoxide dismutase, or SOD, is an enzyme that changes the **superoxide  $O_2^-$  radical into ordinary molecular oxygen and hydrogen peroxide**. The most common type of SOD in human plasma is cationic Cu/Zn, the same as in bovine plasma.

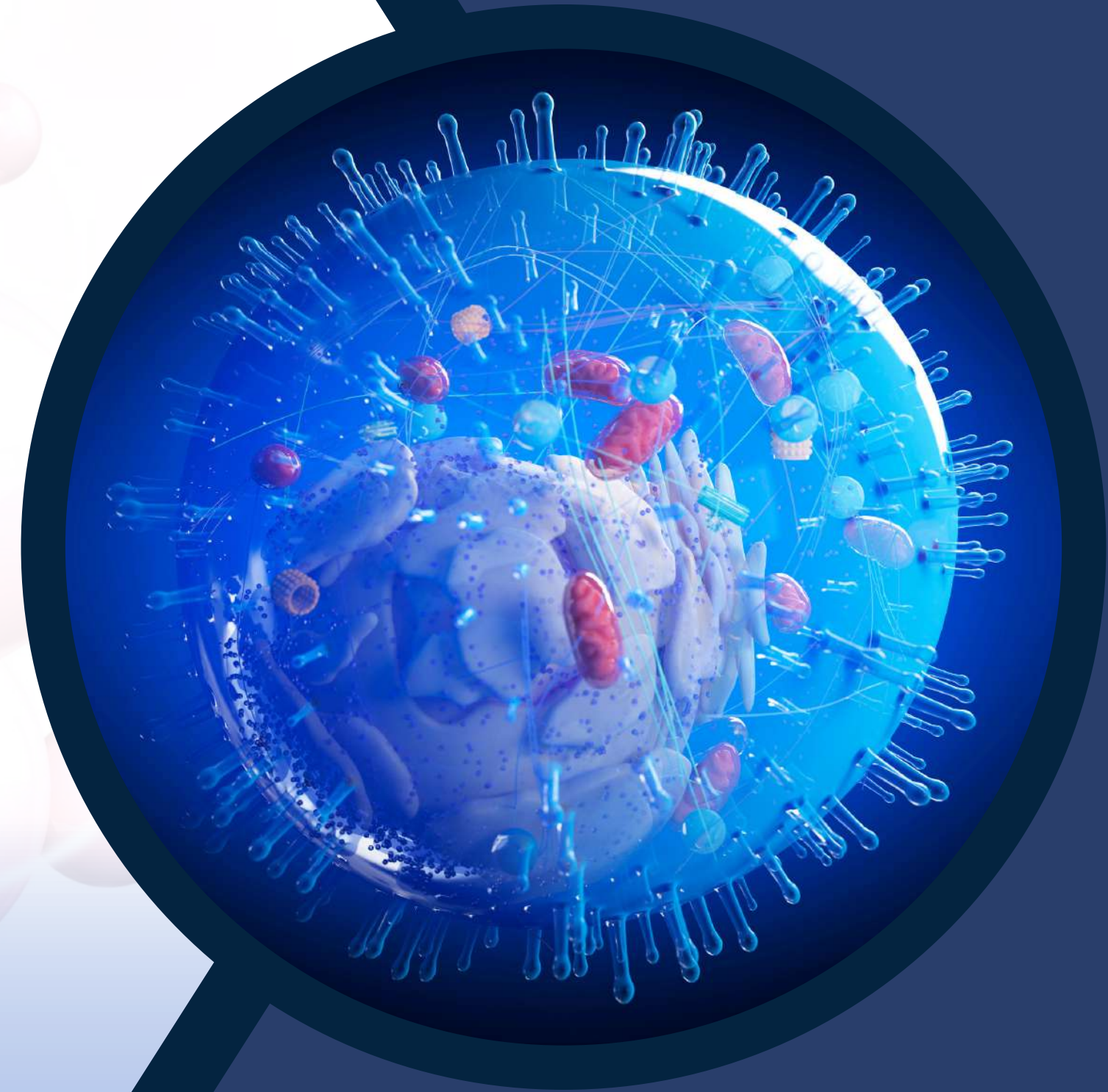
Superoxide Dismutase enzymes (SODs) act as **powerful antioxidants**. SODs protect cellular components from oxidizing by reactive oxygen species (ROS). A free radical or ROS is a superoxide molecular when  $O_2^-$  reduces to  $O_2$ . These molecules absorb an excited electron released from compounds of the electron transport chain. SODs catalyze the production of  $O_2$  and  $H_2O_2$  from superoxide ( $O_2^-$ ).



# Copper/Zinc - SOD

Copper/Zinc SOD (Cu/Zn-SOD) is many tissues' most critical scavenger of cell-damaging free radicals. Cu/Zn-SOD is more efficient than manganese superoxide dismutase (Mn-SOD), a lipoprotein antioxidant in cells' mitochondria. Intracellular copper levels also regulate the activity of Cu/Zn-SOD.

Studies have shown that Cu/Zn-SOD can **protect cells from being damaged by ROS**. Adding Cu/Zn-SOD to human cells protects them from ROS damage. In addition, Cu/Zn-SOD was also able to protect cells from the damage caused by oxidative stress.



# Discover More SOD Benefits for the Skin:

## The Structural Biochemistry of the Superoxide Dismutases



The discovery of superoxide dismutases (SODs), which convert superoxide radicals to molecular oxygen and hydrogen peroxide, has been termed the most important discovery of modern biology, never to win a Nobel Prize.

## Extracellular superoxide dismutase in biology and medicine.



Accumulated evidence has shown that reactive oxygen species (ROS) are essential mediators of cell signaling events such as inflammatory reactions (superoxide) and the maintenance of vascular tone (nitric oxide). Extracellular SOD is found in the extracellular matrix of tissues and is ideally situated to prevent cell and tissue damage initiated by extracellularly produced ROS.

## Current Knowledge of Copper/Zinc Superoxide Dismutase in Human Skin



Primary antioxidants such as superoxide dismutase are our first and most important defense against highly reactive, potentially destructive oxygen-derived free radicals. Researchers believe that SOD decreases with aging, and evidence suggests that boosting falling SOD levels may help guard against disease and extend life span.



# Studies Support The Requirement of SODs in Skin Health

These collective investigations underscore the significance of Superoxide Dismutase (SOD) in the context of skin disorders. They emphasize the pivotal role of SOD in **counteracting oxidative stress, safeguarding the skin against UV-induced damage, regulating inflammatory responses, and fostering comprehensive skin well-being.**

A study published in the Journal of the European Academy of Dermatology and Venereology highlights the role of zinc, a cofactor for SOD, as an essential antioxidant for skin health. The study emphasizes that zinc is concentrated in the skin and affects the activity of enzymes like SOD, which play a crucial role in maintaining skin integrity and protecting against oxidative damage.

[SOURCE](#)

Oxidative events are associated with pathological conditions and the process of normal aging. Notably, physiological levels of oxidants also modulate cellular functions via homeostatic redox-sensitive cell signaling cascades.

[SOURCE](#)



# Studies Support The Requirement of SODs in Skin Health

Another study focused on various plant species and their SOD activity. It suggests that creams containing SOD may have beneficial effects when topically applied to the skin, emphasizing the potential importance of SOD in promoting skin health.

**SOURCE** 

Antioxidant molecules in the skin interact with ROS or their by-products to eliminate or minimize their harmful effects. These antioxidant molecules include glutathione (GSH), alpha-tocopherol or vitamin E, ascorbic acid or vitamin C, glutathione peroxidases, glutathione reductase, glutathione S-transferases (GSTs), superoxide dismutases (SODs), catalase, and quinone reductase.

**SOURCE** 

Oxidative stress, a consequence of the imbalance between pro- and antioxidants, is one of the main provoking factors causing aging-related damages and concerns due to the generation of highly reactive byproducts such as reactive oxygen and nitrogen species during the metabolism, which result in cellular damage and apoptosis. Antioxidants can prevent these processes and extend healthy longevity due to their ability to inhibit the formation of free radicals or interrupt their propagation, thereby lowering the level of oxidative stress.

**SOURCE** 



# Benefits of Superoxide Dismutase

Cellular protection is essential for maintaining the health and integrity of our cells. One key player in this defense mechanism is **superoxide dismutase (SOD)**.

## Neutralizing Reactive Oxygen Species (ROS):



SOD enzymes act as the first line of defense against ROS by catalyzing the dismutation reaction, converting superoxide radicals into less harmful molecules - molecular oxygen ( $O_2$ ) and hydrogen peroxide ( $H_2O_2$ ). This process prevents the accumulation of superoxide radicals, minimizing their detrimental effects on cellular structures.





# Benefits of Superoxide Dismutase

## Hydrogen Peroxide Detoxification:



While hydrogen peroxide is also a potentially harmful molecule, cells possess other defense mechanisms such as catalase (CAT), glutathione peroxidases (GPXs), and peroxiredoxins (PRXs) to convert  $H_2O_2$  into water and oxygen. The combined action of SOD and these enzymes ensures the effective detoxification of harmful ROS, reducing oxidative damage to cells.

## Protecting Against DNA Mutations:



Oxidative stress can lead to DNA damage and mutations, which can have severe consequences for cellular function and contribute to various diseases, including cancer. By preventing the accumulation of superoxide radicals, SOD helps reduce the risk of DNA damage, protecting the integrity of the genetic material within cells.



## ÆTHEION® Redox Technology Anti-Aging Effects

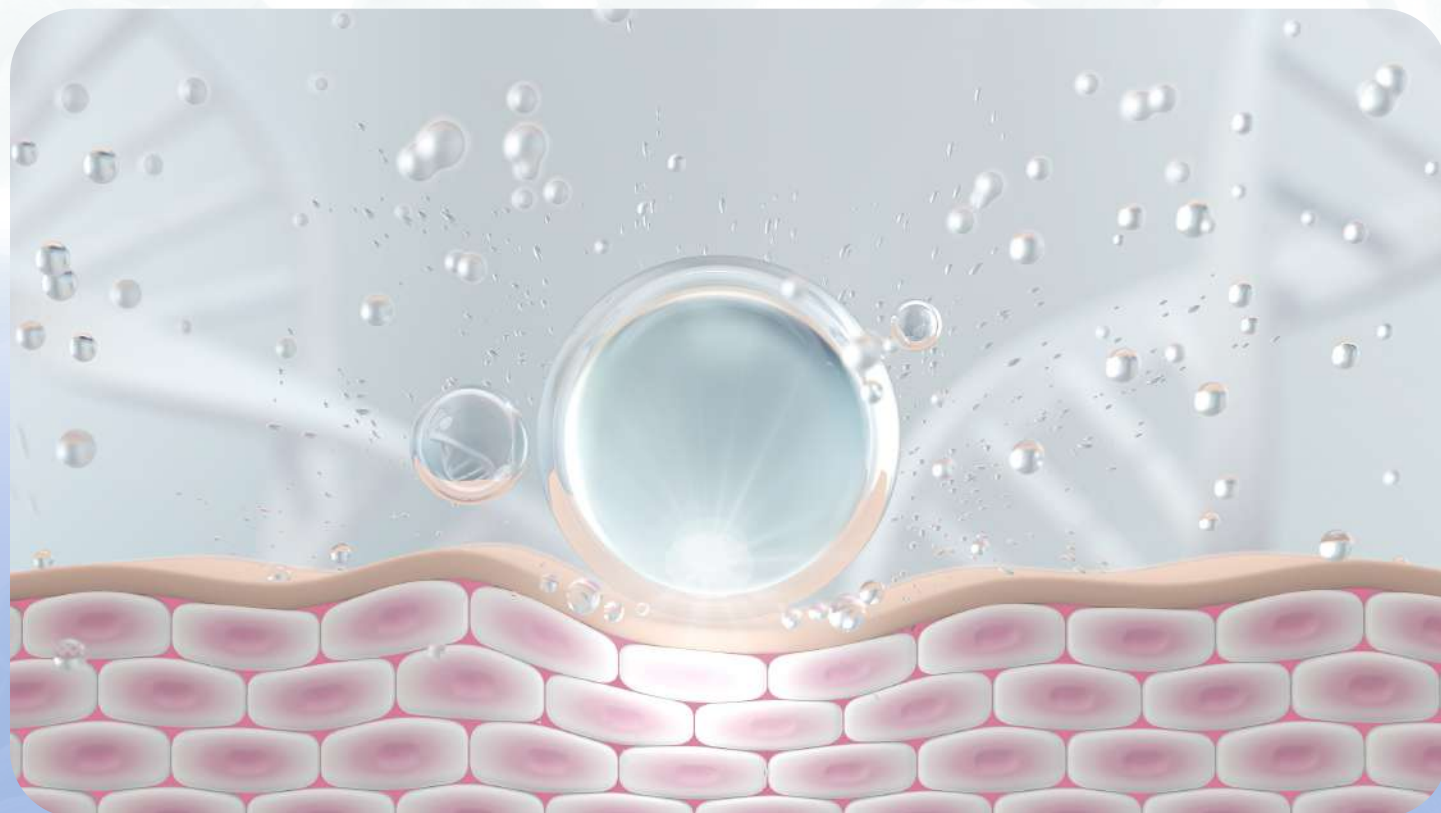
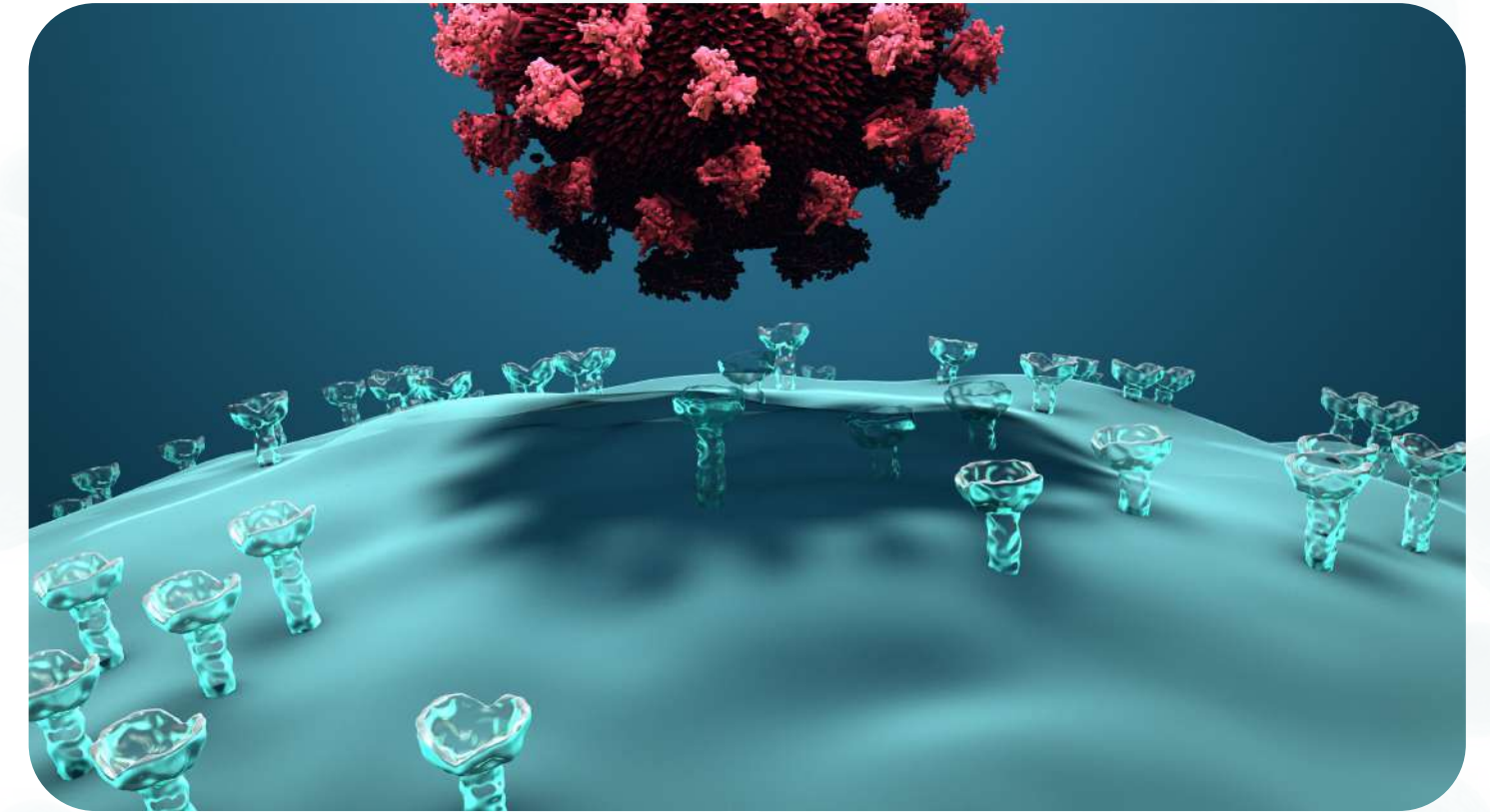
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Aging is a complex **biological process** characterized by the gradual decline of physiological functions and increased susceptibility to visual signs in the mirror. One major contributor to aging is **oxidative stress**, which occurs due to an imbalance between the production of reactive oxygen species (ROS) and the body's antioxidant defense mechanisms.

## Minimizing Oxidative Stress-Induced Cellular Damage:



By neutralizing superoxide radicals, SOD helps reduce oxidative stress and the subsequent cellular damage it can cause. Oxidative stress leads to lipids, proteins, and DNA oxidation, accumulating cellular damage over time. By reducing the levels of superoxide radicals, SOD helps maintain the integrity of cellular components and preserves their proper functioning.



## Preserving Cellular Function and Health:

High levels of SOD in cells help maintain the balance between ROS production and removal, preventing excessive oxidative damage. This preservation of cellular function is crucial for overall health and longevity. Studies have shown that organisms with enhanced SOD activity exhibit improved resistance to oxidative stress and an extended lifespan.

## Anti-Aging Effects of SOD:

Various research studies have demonstrated the potential anti-aging effects of SOD. For example, one study found that phloridzin, a polyphenol found in apples, exerted anti-aging effects on yeast by activating SOD genes. Additionally, research has shown that SOD can protect against age-related diseases, such as neurodegenerative disorders and cardiovascular diseases, by reducing oxidative stress.



## Superoxide dismutase, aging, and degenerative disease.

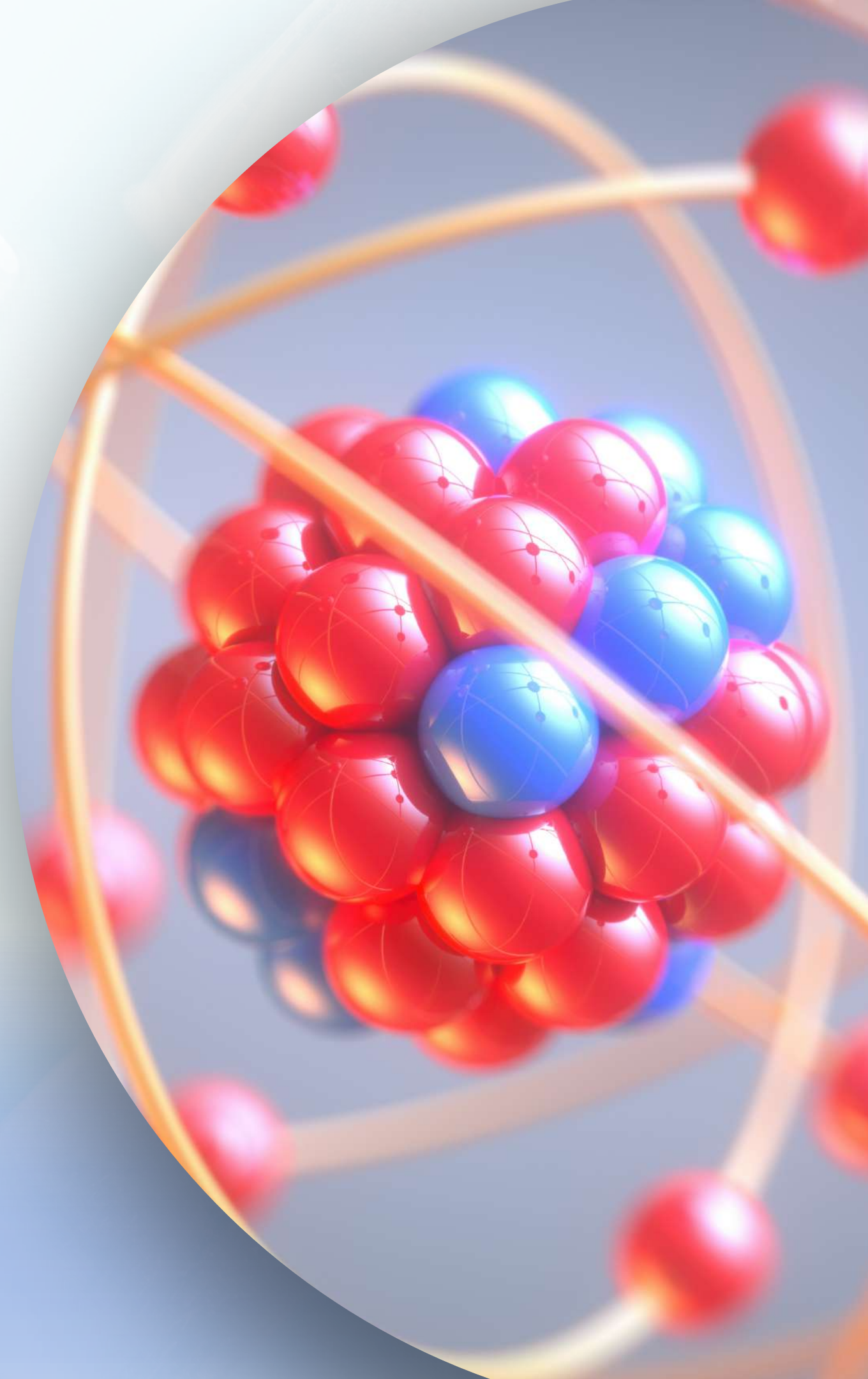
The summarized research suggests that SOD is vital in longevity and degenerative disease. However, much remains to be learned before manipulation of SOD expression can be considered for effective intervention in either process. However, increasing Cu/Zn-SOD and catalase significantly increases the maximum life span.

## Role of Antioxidants in the Skin: Anti-Aging Effects:



Intracellular and extracellular oxidative stress initiated by reactive oxygen species (ROS) advance skin aging, characterized by wrinkles and atypical pigmentation. Because UV enhances cell ROS generation, skin aging is usually discussed with UV exposure.

Antioxidants are a practical approach to prevent symptoms related to photo-induced skin aging. In this review, the mechanisms of ROS generation and ROS elimination in the body are summarized. The effects of ROS generated in the skin and the roles of ROS in altering the skin are also discussed. In addition, the impact of representative antioxidants on the skin is summarized with a focus on skin aging.



# Why ÆTHEION® Redox Technology

The main takeaways regarding Superoxide Dismutase (SOD) and its importance in combating oxidative stress are:



## Crucial Antioxidant

SOD plays a critical role as an antioxidant enzyme in the body, primarily responsible for neutralizing harmful superoxide radicals generated during oxidative stress.



## Protection Against Cellular Damage

By eliminating superoxide radicals, SOD helps protect cells and tissues from oxidative damage, which can contribute to various health issues, including aging and disease.



## Skin Health

Studies indicate that SOD is particularly important for skin health, as it helps counteract the oxidative stress caused by factors like UV radiation, thereby preventing premature aging and skin disorders.



## Inflammation Modulation

SOD's antioxidant properties also extend to regulating inflammation, which is closely linked to oxidative stress. It can help mitigate inflammatory responses, reducing the risk of chronic inflammatory conditions.



# ÆTHEION® REDOX TECHNOLOGY

In summary, SOD's role as a **potent antioxidant** is crucial in maintaining overall health, particularly in protecting cells and tissues from oxidative damage, promoting skin health, and modulating inflammatory processes.

As we navigate the complexities of modern life, it's essential to remember that prioritizing our antioxidant defense system is **not merely a choice; it's a commitment** to our well-being. Just as the skin's health brings quintessential beautification to the surface, nurturing our internal defense mechanisms brings out the radiance within.