

Wellness Reimagined Report



ISSUE 01

THE LONGEVITY ISSUE

Welcome

Welcome to the inaugural edition of the Wellness Reimagined 2024 Report, brought to you by the Wellness Access Institute (WAI).

This report goes beyond a mere collection of articles. It represents a global conversation led by our esteemed board of scientists and experts, challenging and redefining our understanding of health and wellbeing.

In the following pages, we'll explore ageing and longevity through the eyes of doctors, geroscientists, biotechnologists, cardiologists, and other leading industry experts, encouraging you to rethink and explore

wellness in its entirety. We hope this report ignites your curiosity and inspires you to relentlessly pursue the science behind the trends.



At WAI, we are driven
by **science** and
guided by **purpose**.

Our mission is to accelerate scientific advancements from the lab to everyday life, making wellness not just accessible, but consumable.

2023 witnessed a seismic shift in wellness.

The pursuit of wellness, once considered peripheral, is now acknowledged as central to a fulfilling life. The Global Wellness Institute reports a robust 10% annual growth rate in the global wellness economy, double that of the global economy, with projections reaching a staggering \$12.9 trillion by 2031.

We're at a pivotal moment in wellness, for ourselves, science, and society. Post-COVID-19, there's a renewed interest in holistic wellbeing and preventative care, catalysing a shift beyond the absence of illness to proactive preservation of health and optimisation of wellness.

Technological innovation undeniably drives this transformation. Companies like Insilico Medicine are harnessing AI for unprecedented speed in drug discovery. Wearable devices provide real-time health tracking, while virtual and augmented reality, seen in brands like Peloton, offer immersive, personalised fitness experiences.

Yet, rapid growth breeds challenges. Misinformation and unverified claims cloud consumers' quest for reliable sources and effective solutions. The task ahead is integrating these advancements practically into daily life, ensuring equitable distribution of wellness resources, and turning scientific insights into accessible wellness solutions.

This report spotlights ageing and longevity. By 2050, it's estimated that one in six people globally will be over 65, up from one in 11 in 2019. This 'silver tide' prompts us to rethink wellness in the context of ageing, longevity, and enhancing healthspan. Never before has it been so crucial to promote a future where ageing equals preserved wellness.

At the Wellness Access Institute (WAI), we're a collective of bold innovators working to overcome these hurdles to human wellbeing. This report presents not just data but a vision - a future where wellness and longevity are universally accessible, scientifically backed, and seamlessly integrated into our daily lives.

Together, let's propel this wellness revolution and shape a future worth accelerating.

OUR FOUNDERS



Mr Warren Liu

Co-founder, Access

Co-founder, Wellness Access Institute

Warren is an entrepreneur and innovator with an impressive 25 years of experience in strategy, business incubation, leadership, and global expansion. In 2017, Warren co-founded Access, an enterprise focused on health, wellness, and beauty. He has become a prominent figure in the global wellness industry, overseeing the development of numerous products that cater to the needs of modern consumers. As a Co-founder, Warren is responsible for guiding the corporate growth strategy, product innovation pipelines, and strategic direction for the company's multiple platforms and portfolio of premium wellness brands.

In 2022, Warren co-founded the Wellness Access Institute (WAI) to establish a dedicated innovation platform with a core focus on revolutionising access to modern wellness solutions. Warren's unparalleled passion for driving positive change in the wellness industry positions him as a visionary leader at the forefront of innovation and advancement.

OUR FOUNDERS



Mr Greg MacPherson

Founder, SRW Laboratories

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Greg is a rare combination of biotechnologist, futurist, and pharmacologist. As the founder of SRW Laboratories, he pioneers holistic nutraceuticals that empower individuals to optimise their cellular health as they age. Greg's passion for overcoming health challenges began with his early career as a pharmacist and has since been heavily engaged in the development and delivery of healthcare solutions.

Greg is also a published author. His first book, 'Harnessing the Nine Hallmarks of Ageing', was released in 2020, and his second book, 'The Longevity Dividend', is scheduled for launch in early 2024.

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OUR CONTRIBUTORS



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Michael is Co-founder of Natural Innovations Group and has dedicated 30 years to the cosmeceutical and wellness industry. Noted for establishing TGA-licensed manufacturing facilities worldwide, he played a key role in Swisse's operations. His expertise lies in creating unique ingredients for the global dietary supplements market with a focus on sustainability.



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Mike is a biotechnologist and founder of Algavive Ltd, dedicated to exploring the vast potential of algae, seaweed, and other aquatic photosynthetic organisms. With over 30 years of experience and a Ph.D. in redox biochemistry and cell biology, Mike develops biotechnological solutions from understanding algae, and is highly cited in scientific literature.



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Dr Ross Walker, MBBS (Hons), FRACP, FCSANZ

Ross, an esteemed cardiologist with over 40 years of experience, runs the Sydney Heart Health Clinic and chairs the Gut Foundation of Australia. He is the author of seven best-selling health books and hosts the radio show Healthy Living on the Nine Radio Network. Ross introduced Coronary Calcium Scoring to Australia and is recognised for his expertise in stress echocardiography and arterial screening.

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01

Cellular Secrets in Healthy Ageing

by **Greg Macpherson,**
BPharm

Human ageing is complex and there's much we're still uncovering. While we're living longer, our healthspan isn't moving as quickly, leading to poor health and age-related ailments in later years. However, recent research on extending our healthspan has surged, and the key might lie in our cellular health.



**DID YOU KNOW**

Lifespan vs Healthspan

Lifespan is the total number of years lived by an individual. Healthspan is the number of disease-free years lived.

THE LONGEVITY METRIC BEGAN WITH 'LIFESPAN'

Many people consider the goal of extending human longevity impossible, but the reality is that we have been extending our lifespan for the last two hundred years. Back in the mid-nineteenth century, the human lifespan had been static at thirty-five to forty years for most of the preceding human history. Fast forward to today and humanity has made the incredible achievement of increasing lifespan by three decades since the mid-twentieth century.

This longevity advance was achieved through science, research, and our increasing understanding of the world around us and within us. During this time, we have effectively conquered the treatment and management of infectious diseases (for now), increased the chance of surviving childbirth and early childhood, established treatments for illnesses like diabetes and heart disease, and understood the impact of adequate nutrition for optimal health.

LIMITATIONS OF LONGEVITY

It has been said that "The pursuit of longevity should not come at the cost of quality of life."¹ Focusing solely on lifespan can be restrictive, and at times, damaging. More than just impacting one's quality of life, a sole focus on longevity often overlooks the quality of life during later years.

¹ Mikhail, A. (2023, April 15). Healthspan may be more integral to your well-being than lifespan. Here is how to lengthen it. Fortune. <https://fortune.com/well/2023/04/15/healthspan-may-be-more-integral-to-your-well-being-than-lifespan-how-to-lengthen-it/>



THE INTRODUCTION OF HEALTHSPAN

One's 'healthspan' is widely agreed to be the period of one's life lived 'healthy', or, free from serious disease. A disease is considered serious if it is a leading cause of death, such as heart disease, stroke, Alzheimer's, type II diabetes, and many types of cancer². If one is past their healthspan, it will often mean they are suffering from a chronic or degenerative condition, with a poor quality of life.

The aim of longevity research isn't to cling on to life at all costs but to extend the human 'healthspan' by maintaining physical and mental function well beyond our current life expectancy. Healthy ageing involves cultivating and sustaining the capacity to remain well and active in your later years. This shift is at the core of the anti-ageing field. Instead of pouring resources into treating individual diseases, the focus shifts to addressing the root cause: the ageing process itself.

DID YOU KNOW

The gap between health span and life span is roughly 10 years.³

² World Health Organization. (n.d.). The top 10 causes of death. Retrieved September 7, 2023, from <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death> ³ Garmany, A., Yamada, S., & Terzic, A. (2021). Longevity leap: mind the healthspan gap. *npj Regenerative Medicine*, 6, 57. <https://doi.org/10.1038/s41536-021-00169-5>

CELLULAR AGEING IS RELATED TO MOST COMMON DISEASES

Over the last decade, there has been a remarkable increase in both the funding and human capital being directed towards extending the years we spend on this planet in good health. This has been driven by the realisation from leading researchers that

The common diseases that we associate with old age are simply a cluster of symptoms driven by the cellular ageing process.

These thought leaders have critically looked at the trillions of dollars spent over the last few decades on medical research addressing the major health issues of older age like Parkinson's disease, Alzheimer's disease, and cancer, and that whilst having made satisfactory progress, we have not delivered the outcomes we had hoped for.

HEALTHSPAN HACKS

Recent studies have identified key behaviours that extend healthspan include maintaining a nutritious diet, engaging in regular exercise, effectively managing stress, getting enough sleep, and having deep social connections. These alone can deliver a decade of healthspan. Even more amazing is the discovery that there are cellular pathways that can be targeted by certain supplements and pharmaceuticals to slow ageing at a cellular level.

Whilst most of these compounds are currently available to us all, they need to be tested in clinical trials for ageing. However, it is only a matter of time before their effectiveness is validated and we can all start to benefit from extended healthspans and with that, humanity is going to enjoy the benefit of another step change in longevity.

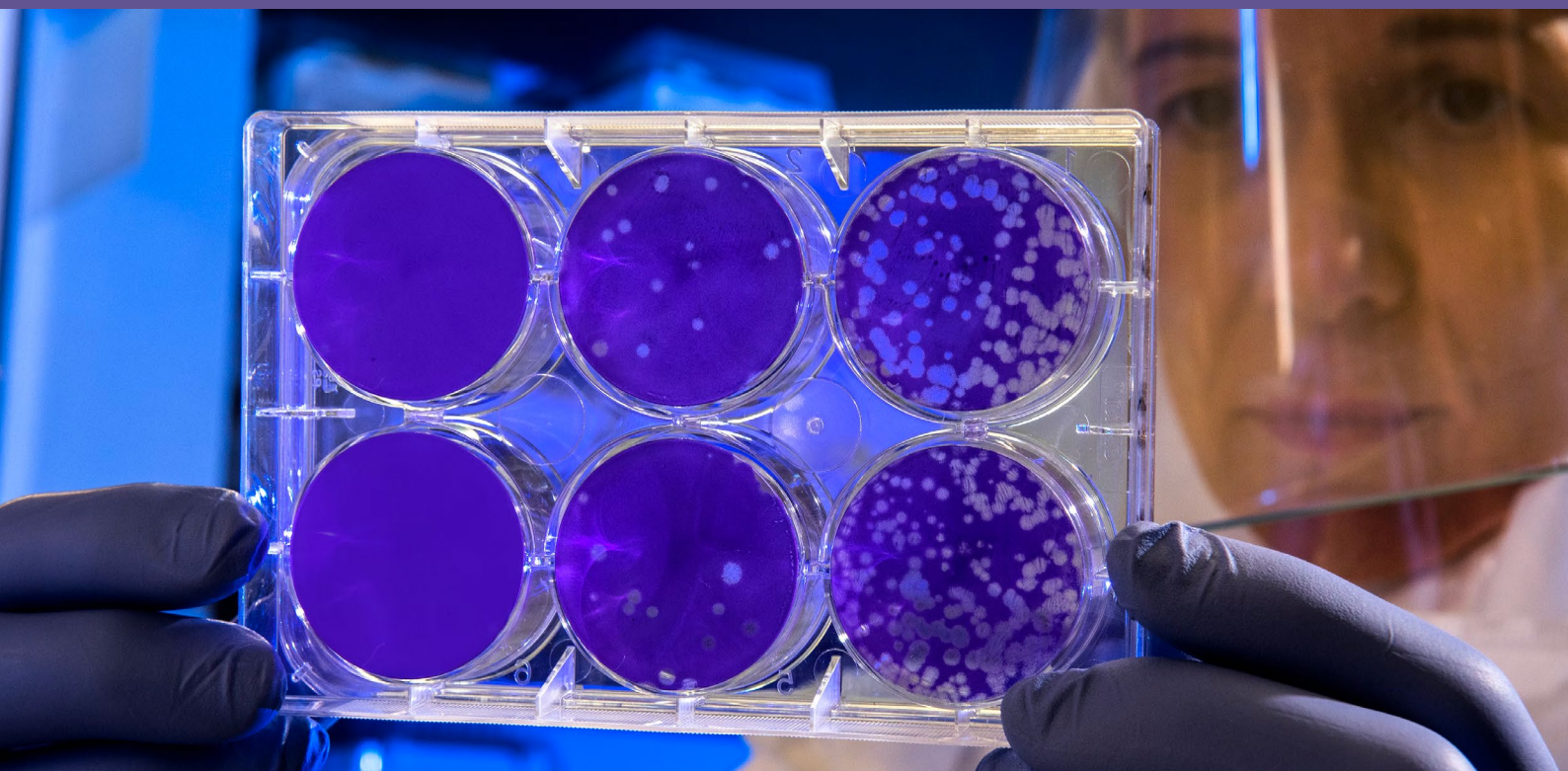


02

Breaking the Senescence Cycle: Could Eliminating 'Zombie' Cells Prevent the Onset of Disease?

by **Dr Matt Yousefzadeh,
Ph.D.**

Silent accelerators of ageing and disease progression, senescent cells build up over time and are amplified by stressors. Not only do these cells harm neighbouring cells, but they also perpetuate a cycle of decline. Can the emerging field of Senolytics provide the key to eliminating these cells and delaying age-related diseases?





AN ACCUMULATION OF STRESSORS

The human body is composed of an estimated 37 trillion cells⁴ and is subject to stress every single day. This stress can come in many subtle forms, from both internal and external sources. Stressors include harmful UV exposure, environmental toxins, lifestyle factors like poor diet, diseases, social or psychological stress, and even DNA damage from daily metabolic processes. Each of these can cause harm to our cells.

Over time, this accumulation of stressors can strain cellular function and set in motion a process involving the emergence of senescent cells. This process is a significant, still not fully understood, contributor to ageing and chronic diseases.

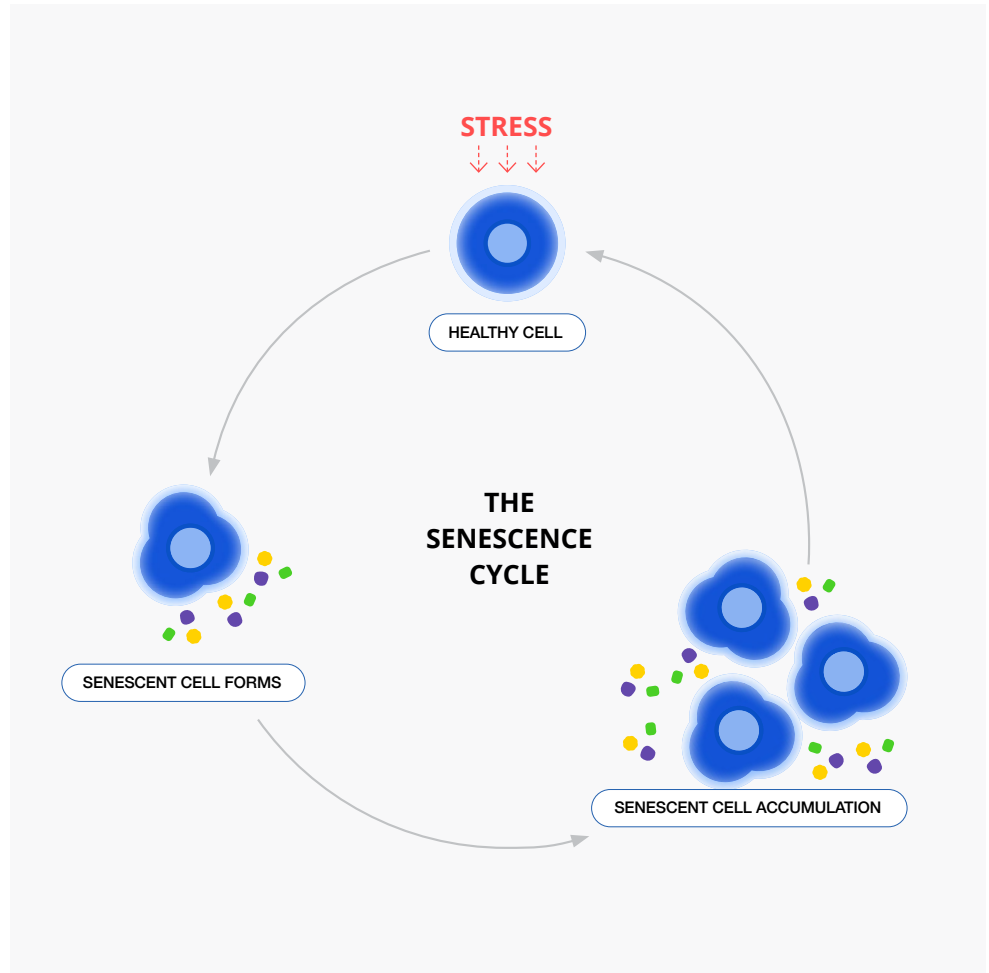
CELL FATES: OUR CELL RESPONSE TO STRESS

Cells undergoing stress can respond in different ways or invoke different 'cell fates'. One potential cell fate is 'apoptosis', a type of programmed cell death that prevents damage spread and eliminates malfunctioning cells. Another potential cell fate is 'transformation', where a stressed or damaged cell can undergo changes that lead it to become a cancer cell. Another cell fate is cellular senescence.

DID YOU KNOW

Each day, billions of cells in your body can transition into a senescent state.⁵

⁴ Bianconi E, et al. "An estimation of the number of cells in the human body." *Annals of Human Biology*. 2013. ⁵ Campisi J. "Aging, cellular senescence, and cancer." *Annual Review of Physiology*. 2013.



WHAT IS CELLULAR SENESCENCE?

Normal, healthy cells follow a typical cycle: they grow, divide, and then die off. Senescent cells are stable healthy cells that, in response to stress, reach a state of irreversible growth arrest. They no longer actively proliferate like healthy cells, but they also don't die.

Cellular senescence serves as an important anti-cancer response. When a cell is stressed, it typically stops growing and dividing as a protective measure. This effectively prevents the transformation of the senescent cell into a cancerous one.

'ZOMBIE' CELLS: THE DAMAGING EFFECT OF SENESENCE

Despite their self-imposed freeze in development, senescent cells are still technically alive and metabolically active, leading to them being dubbed 'zombie cells'. The harmful effects of senescent cells stem from their secretion of harmful substances and inflammatory molecules which can affect cells both near and far away, possibly causing them to also become senescent. The inflammation released from senescent cells can cause injury, prime the tissue for chronic diseases, negatively impact organ function, and increase the risk of cardiovascular disease, diabetes, and stroke. Numerous studies have shown that senescent cells accumulate in our bodies with age and disease. The biological burden of these 'zombie' cells is known to have a detrimental effect on not only our lifespans but also our healthspans.

THE SENESENCE CYCLE: AGEING AND CELLULAR STRESSORS

As we age, our bodies experience higher levels of cellular stress and a decrease in maintaining balance, or homeostasis, and proper functioning. This accumulation of stress events leads to an increase in cellular senescence, creating a negative feedback loop. Once dormant, these cells release inflammation that further damages tissues, resulting in a cycle of impaired repair and accelerated ageing.

The build-up of these 'zombie' cells over time creates a vicious cycle where ageing and senescence reinforce each other. With each round of cellular stress and inflammation, our bodies are pushed further along the path of decline.

AGE AND DISEASE INCREASE SENESENCE CELL FREQUENCY

Over the last decade, numerous studies have shown that senescent cells accumulate more rapidly in individuals with common age-related diseases like cardiovascular disease, dementia, diabetes and metabolic syndrome, macular degeneration, and osteoarthritis. Currently, scientists are working on a global level to try to gain a better understanding of cellular senescence. Priorities include understanding exactly which types of cells within the body become senescent with the onset of age and how this influences the ageing process, not only within that tissue but also others nearby.

Senescent cells can now be measured in humans using a simple blood test. This allows us to observe how senescent cells accumulate with age and how their numbers respond to various medical interventions aiming to enhance human health.

DID YOU KNOW

Regular exercise can reduce senescence in certain cell types by up to 25%.⁶

SENOTHERAPY: A BREAKTHROUGH IN TREATING CELLULAR SENESCENCE

Over the past eight years, scientific advancements have given rise to a new field of study known as senotherapeutics. This area focuses on strategies to combat cellular senescence and branches into two main sectors: senolytics and senomorphics.

Senolytics are compounds designed to selectively target and eliminate senescent cells—those that have ceased dividing and contribute to ageing. These drugs aim to reduce the number of these cells and mitigate their damaging effects on our tissues and organs. Early studies suggest that senolytics could be a promising avenue for treating age-related diseases.

One such example of a senolytic is fisetin—a natural product found in various fruits and vegetables. Research demonstrates that

fisetin can lessen the burden of senescent cells and decelerate ageing-related changes in lab models.

In contrast, senomorphics are compounds that don't eradicate senescent cells. Instead, they work to limit the inflammatory effects these cells can have.

Currently, numerous clinical trials are underway to explore the potential benefits of senolytics for treating various conditions, including cognitive impairment, chronic kidney disease, and lung fibrosis. Fisetin, in particular, is undergoing Phase I/II clinical trials for frailty, osteoarthritis, COVID-19, and sepsis. These clinical trials will offer invaluable insights into the potential benefits of senolytics in treating chronic conditions, and aid in establishing effective dosing regimens.



⁶ Baker DJ, et al. "Clearance of p16Ink4a-positive senescent cells delays aging-associated disorders." *Nature*. 2011.

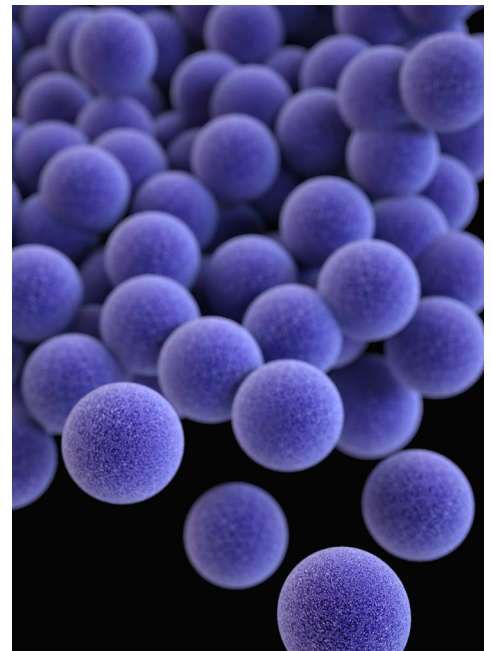
DID YOU KNOW

A decade ago, the healthcare industry's approach to ageing underwent a paradigm shift. Instead of treating chronic diseases individually, the focus shifted to treating the common root cause: ageing. This concept, known as 'The Geroscience Hypothesis', identified key root causes of ageing, which included cellular senescence.

MANAGING SENESCENCE THROUGH LIFESTYLE MODIFICATIONS

Every day scientists are learning how to better identify these senescent cells. This process allows us to monitor the onset and progression of diseases more accurately, as well as understand how to target these cells more effectively in the interest of enhancing our health.

Meanwhile, we've come to understand that dietary and lifestyle interventions, such as caloric restriction and exercise, can mimic the effects of senolytics to a certain extent. These interventions can decrease the load of senescent cells while improving body function and overall health. Simple modifications to our diet and increasing physical activity are practical ways we can reduce senescence and inflammation. These manageable adjustments can also set off a positive domino effect on other factors contributing to ageing.

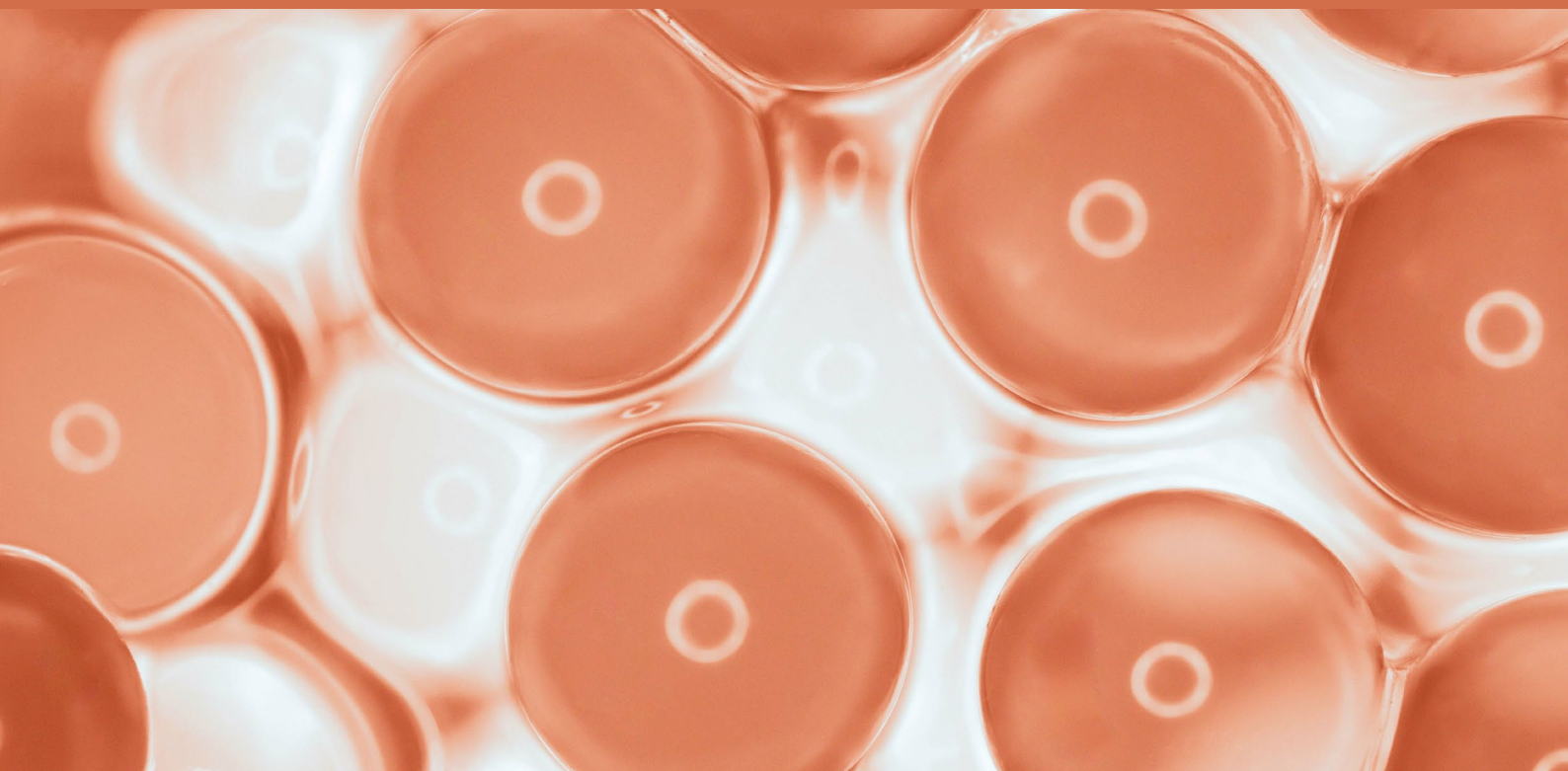


03

Glutathione: The Master Antioxidant Your Body Makes, and How to Support It

by **Dr Andrew John
Clarke, Ph.D.**

Glutathione is a vital antioxidant that plays a critical role in healthy ageing, longevity, and disease prevention. While most antioxidants are found in the foods we eat, glutathione isn't an antioxidant we can take - it's one our body makes. Yet as we age, our levels decline. So, what sets this antioxidant apart and how can we support its production?





Glutathione, hailed as ‘the mother of all antioxidants’⁷, is a powerful compound that combats harmful free radicals and reduces oxidative stress in the body. Its antioxidant properties play a vital role in protecting and maintaining optimal cellular function, detoxifying the body, supporting the immune system, and promoting cognitive health.

This versatile and multi-functional antioxidant is essential for various aspects of the body’s health. It safeguards our DNA from damage, mitigates cell and tissue inflammation, and contributes to disease prevention and longevity. Some researchers even suggest that the level of glutathione in our cells could be a key predictor of our lifespan^{8,9,10}.

THE BUILDING BLOCKS OF GLUTATHIONE

What makes glutathione unique is that it’s naturally produced by the cells in our bodies. It is generated by cells in various tissues and organs throughout the body, including the brain, but the primary site of production occurs in the liver. It’s a tripeptide that comprises three amino acids: glutamine, glycine and cysteine, which serve as the building blocks of glutathione. Our cells arrange these amino acids to synthesise and create new glutathione molecules. However, as we age, our cells start to slow down and the efficiency of our metabolic machinery to produce and recycle glutathione decreases. This decline in glutathione production makes us more vulnerable to age-related diseases¹¹.

DID YOU KNOW

Boosting glutathione may lengthen your lifespan. Scientists studying glutathione precursors in mice revealed findings that elevated glutathione levels were a key contributor to a 24% lifespan increase.¹²

⁷ Hyman, M. (2010, May 19). Glutathione: The mother of all antioxidants. Dr. Hyman. <https://drhyman.com/blog/2010/05/19/glutathione-the-mother-of-all-antioxidants/>
⁸ Casella, R., Evangelisti, E., Zampagni, M., Becatti, M., D’Adamo, G., Goti, A., Liguri, G., Fiorillo, C., & Cecchi, C. (2014). S-linolenoyl glutathione intake extends life-span and stress resistance via Sir-2.1 upregulation in *Caenorhabditis elegans*. *Free Radic Biol Med*, 73, 127-35. Doi:10.1016/j.freeradbiomed.2014.05.004. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/24835770/>
⁹ Lopez-Torres, M., Perez-Campo, R., Rojas, C., Cadenas, S., & Barja, G. (1993). Maximum life span in vertebrates: relationship with liver antioxidant enzymes, glutathione system, ascorbate, urate, sensitivity to peroxidation, true malondialdehyde, in vivo H2O2, and basal and maximum aerobic capacity. *Mech Ageing Dev*, 70(3), 177-99. Doi:10.1016/0047-6374(93)90047-u. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/8246633/>
¹⁰ Kumar, P., Osahon, O.W., & Sekhar, R.V. (2022). GlynAC (Glycine and N-Acetyl cysteine) Supplementation in Mice Increases Length of Life by Correcting Glutathione Deficiency, Oxidative Stress, Mitochondrial Dysfunction, Abnormalities in Mitophagy and Nutrient Sensing, and Genomic Damage. *Nutrients*, 14(5), 1114. doi:10.3390/nu14051114. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/35268089/>
¹¹ Sekhar, R.V., Patel, S.G., Guthikonda, A.P., Reid, M., Balasubramanyam, A., Taffet, G.E., & Jahoor, F. (2011). Deficient synthesis of glutathione underlies oxidative stress in ageing and can be corrected by dietary cysteine and glycine supplementation. *Am J Clin Nutr*, 94(3), 847-53. doi:10.3945/ajcn.110.003483.
¹² Kumar et al., 2022).



THE LIMITATIONS OF 'TAKING' GLUTATHIONE

While glutathione supplements are available, these tend to primarily serve as precursors for its production. When ingested, glutathione is broken down into its amino acid components by the digestive system. It cannot be assumed that for each molecule of glutathione ingested and broken down, a corresponding molecule will be produced by the body. To experience

the optimal effects of glutathione, our bodies still need to produce the final product. However, if conditions are not optimal, the body may not do so effectively. Recognising the role and importance of supporting glutathione production in our bodies allows us to take control of our cellular health, potentially enhancing overall well-being and longevity.

DID YOU KNOW

The term 'antioxidant' refers to substances that can counteract highly reactive molecules called free radicals. These free radicals have the potential to cause damage to DNA, cell membranes, and other components within cells.

What Makes Glutathione So Important?

IT ENHANCES LONGEVITY AND CELLULAR REPAIR

At the cellular level, glutathione plays a crucial role in healthy ageing and longevity. It neutralises harmful molecules called reactive oxygen species (ROS), such as free radicals, which can damage DNA. Disruption in the delicate balance between free radicals and antioxidants leads to oxidative stress, causing damage to our DNA, fatty tissues, and proteins within our cells. This oxidative stress can potentially contribute to the development of chronic diseases. By neutralising the detrimental effects of reactive oxygen species, glutathione reduces oxidative stress, facilitating cellular repair and rejuvenation.

IT PROMOTES YOUTHFUL SKIN

Glutathione is gaining popularity as an ingredient in skincare products, thanks to its ability to protect the skin from oxidative damage caused by UV radiation, pollution, and other environmental factors. In addition to providing antioxidant protection, glutathione improves skin elasticity, reduces wrinkles by promoting collagen synthesis, and helps lighten dark spots and hyperpigmentation.

IT REDUCES INFLAMMATION AND THE RISK OF CHRONIC DISEASE

Glutathione's role in mitigating the development of chronic disease is primarily linked to its function as a powerful antioxidant. It also plays a crucial role in cellular energy production, ensuring the well-being of cells and contributing to the overall health of tissues, organs, and bodily systems.

At the organelle level, within the cell, glutathione acts as a protective shield, guarding proteins and cell membranes against damage caused by oxidative stress. By neutralising reactive oxygen species, it prevents these harmful molecules from causing oxidative damage to our cells. Oxidative damage, a major contributor to inflammation, is a key factor in the onset of numerous chronic diseases, including cardiovascular disease, diabetes, and neurodegenerative disorders.

Glutathione's neutralising qualities make it a potent antioxidant and anti-inflammatory agent, which can help prevent and potentially reverse certain medical conditions.

Why Your Glutathione Levels May Be Depleting

While our bodies naturally produce glutathione, various factors can affect our ability to produce an optimal amount.



GLUTATHIONE NATURALLY DEPLETES AS WE AGE

It's important to actively support glutathione production as we get older, as cells will naturally slow the production of glutathione over time.



GENETIC PREDISPOSITION

Some people may have genetic variations that affect how their body produces or uses glutathione, leading to lower glutathione levels and making them more susceptible to cellular damage caused by harmful molecules.



LIFESTYLE MATTERS

Multiple lifestyle factors, such as poor nutrition, exposure to environmental toxins, and stress, can contribute to a decline in glutathione levels. By adopting a healthy diet, engaging in regular exercise, and minimising exposure to environmental, physiological, or psychological stressors, we can positively impact glutathione production.



CHRONIC ILLNESS

The occurrence of a chronic illness can lead to a reduction in glutathione levels as a result of heightened oxidative stress and inflammation. Certain treatments may also adversely impact glutathione levels. These effects vary depending on the individual, so it is crucial for those diagnosed with chronic conditions to seek personalised support.

Ways to Support Glutathione Production

01 A SULFUR-RICH DIET

Sulfur is a mineral found in certain plant and protein-based foods that plays a vital role in the synthesis of glutathione. This essential compound is derived from two amino acids: methionine and cysteine.



Meat and Seafood

Turkey, Beef, Tuna, Pork, Chicken



Dairy Products

Ricotta, Yoghurt, Tofu, Eggs



Nuts and Seeds

Brazil Nuts, Sunflower Seeds, Walnuts



Whole Grain

Quinoa, Oats



Cruciferous Vegetables

Broccoli, Cauliflower, Brussel Sprouts, Kale, Radishes, Cabbage, and Watercress



Allium Vegetables

Garlic, Onion, Leeks, and Shallot



02 REGULAR EXERCISE

Engaging in regular physical activity has been scientifically proven to elevate glutathione levels in the body. The most effective way to boost glutathione is through a combination of cardiovascular exercises and strength training^{13,14}.

03 SLEEP QUALITY

Our quality of sleep can affect glutathione levels and can be influenced by lifestyle factors such as caffeine, stress, and sleep hygiene. Aim to get 7-9 hours of uninterrupted sleep every night to promote optimal glutathione levels and overall well-being.

04 REDUCE OF ALCOHOL AND SMOKING

Excessive alcohol consumption and smoking are the primary culprits in depleting glutathione levels. By reducing or eliminating these habits, not only can we prevent depletion, but also enhance the body's natural ability to produce glutathione.



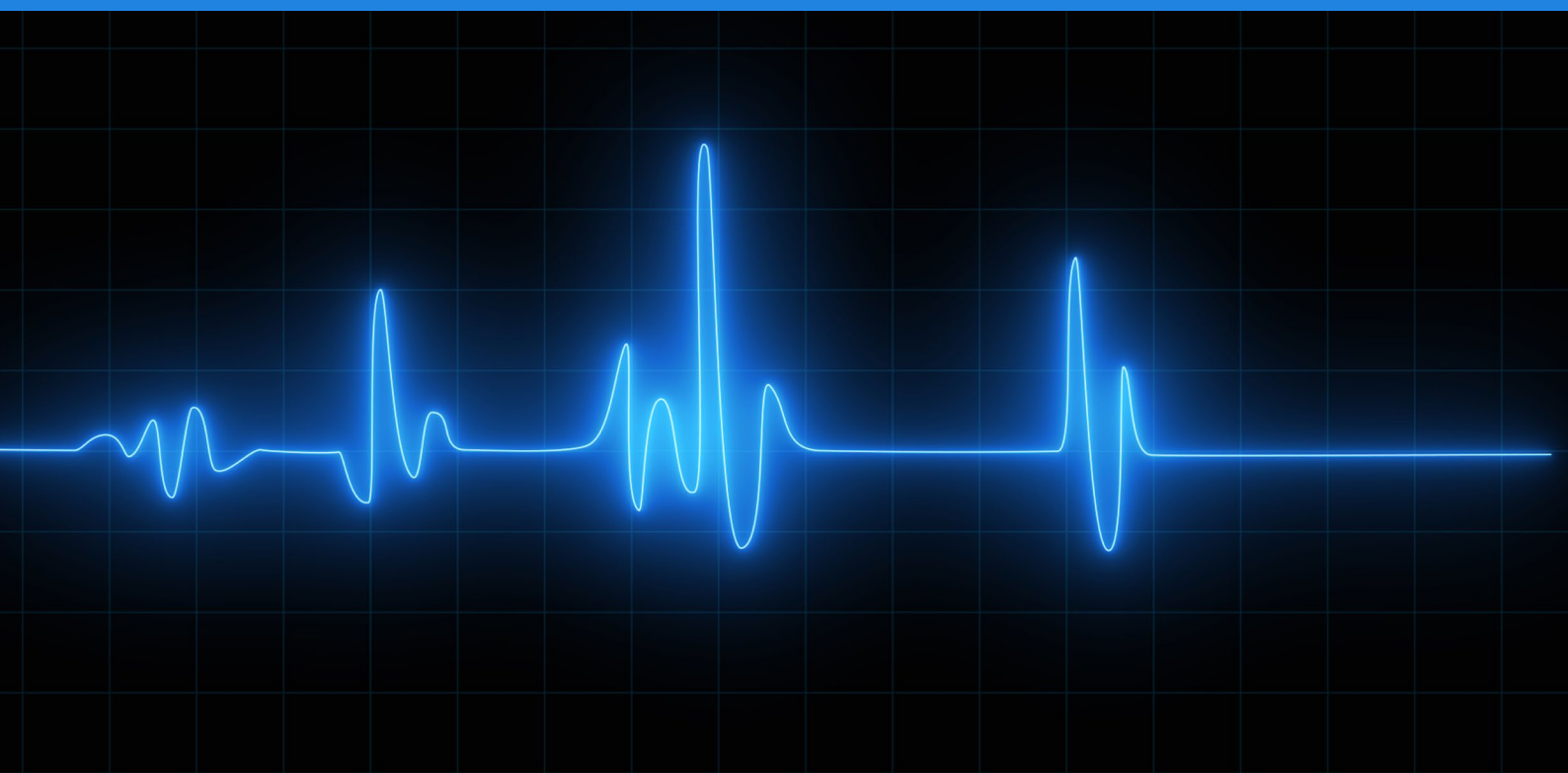
¹³ Healthline. (n.d.). 10 Natural Ways to Increase Your Glutathione Levels. ¹⁴ Elokda, A.S., & Nielsen, D.H. (2007). Effects of exercise training on the glutathione antioxidant system. *Eur J Cardiovasc Prev Rehabil*, 14(5), 630-7. Doi:10.1097/HJR.0b013e32828622d7.

04

Doctors Take the Lead in Preventative Strategies with Coronary Calcium Scoring

by **Dr Ross Walker, MBBS (Hons), FRACP, FCSANZ**

Imagine a proactive approach to heart health that goes beyond waiting for symptoms to emerge. Coronary calcium scoring is proving to be a game-changer in reimagining heart health.





UNDERSTANDING ATHEROSCLEROSIS

Atherosclerotic vascular disease, also known as coronary heart disease, is a silent predator that strikes without warning, making it challenging to detect before symptoms manifest and implement effective preventive strategies.

Atherosclerosis is the gradual accumulation of fat, inflammatory tissue, and cells, often accompanied by progressive calcification, in the walls of arteries. This process can persist

for decades without causing symptoms until the rupture of existing plaques occurs. When plaques rupture in the coronary arteries, it can lead to acute coronary syndrome and subsequent thrombosis (clot) within the artery. In other parts of the body, such as the brain, a stroke may occur, or blockages may develop in peripheral arteries.

DID YOU KNOW

Cardiovascular diseases are the leading cause of death globally, claiming 17.9 million lives each year.¹⁵

CURRENT BARRIERS: OVERCOMING WAITING AND COSTLY ALTERNATIVES

All too often, traditional heart health assessments work against patients in the fight against cardiovascular diseases. These assessments rely on reactive approaches based on cholesterol levels and symptom-based diagnoses, resulting in delayed interventions and limited early detection.

Popular choices with cardiologists globally are advanced diagnostic tests like intravenous CT coronary angiography. These often more invasive tests come with higher costs, greater risks (such as for exposure to higher doses

of radiation), and the potential for reactions to the necessary dye, all accompanied by extra expenses. The lack of awareness about alternative testing models contributes to missed opportunities for early detection, along with barriers related to healthcare access, implementation, and limited research evidence.

To overcome these barriers, a powerful solution emerges as a highly successful screening test for asymptomatic patients: the coronary calcium score.

¹⁵ World Health Organization. (n.d.). Cardiovascular diseases. Retrieved September 8, 2023, from https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1

CORONARY CALCIUM SCORING: A PREVENTATIVE STRATEGY

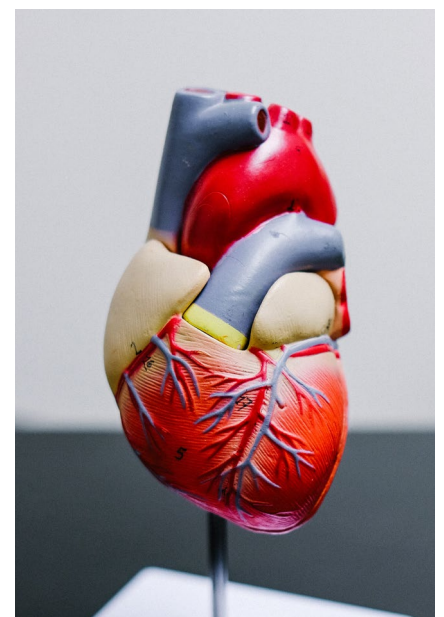
Coronary calcium scoring is a powerful, non-invasive test that uses a specialised CT scan to assess calcium build-up in the coronary arteries. It serves as a reliable marker for atherosclerosis and has the potential to detect coronary artery disease before symptoms appear. This early detection offers a crucial advantage, allowing for timely preventive measures.

Since first introduced into my practice in 1999, I've seen first-hand how coronary calcium scoring has revolutionised the early detection of atherosclerosis. It is now considered the simplest and most accurate predictive test available.

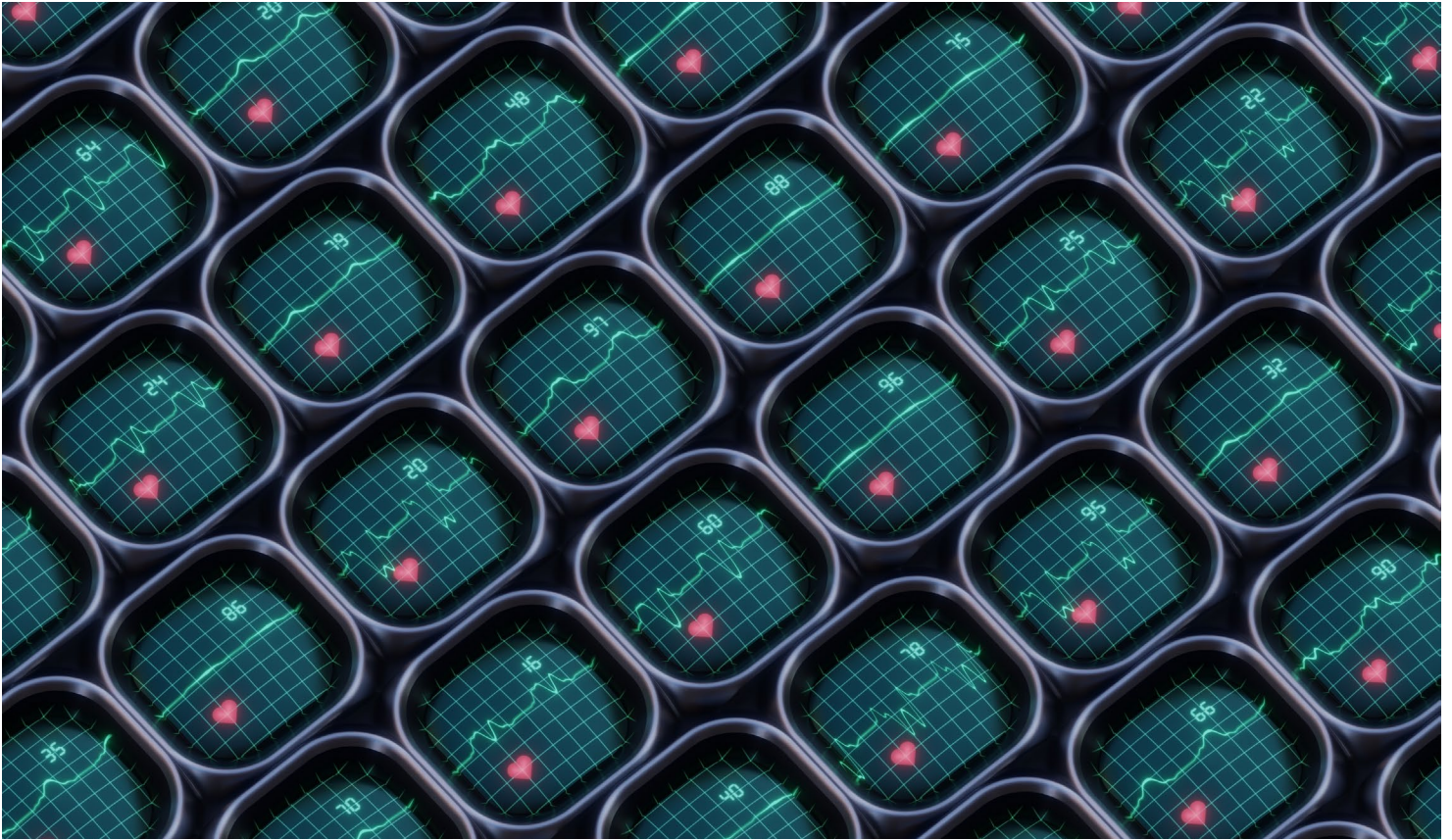
By identifying early signs of calcium deposition, this test empowers individuals to make informed decisions and tailor treatments based on their unique needs, being particularly beneficial in assessing cardiovascular risk for men aged 50 and women aged 60. Its benefit lies in its simplicity, accuracy, and ability to detect atherosclerosis at an early stage, offering the potential for timely intervention and improved cardiovascular outcomes.

EARLY DETECTION, BETTER OUTCOMES

Numerous studies suggest that a high level of coronary calcium should trigger proactive risk factor modification. Additionally, statin therapy has shown remarkable benefits in patients over the age of 50 with coronary calcium scores exceeding 100¹⁶. By implementing routine coronary calcium scoring, we can greatly mitigate the risk of vascular events, including heart attacks.



¹⁶ Mitchell, J. D., Fergstrom, N., Gage, B. F., Paisley, R., Moon, P., Navak, E., Cheezum, M., Shaw, L. J., & Villines, T. C. (2018). Impact of Statins on Cardiovascular Outcomes Following Coronary Artery Calcium Scoring. *Journal of the American College of Cardiology*, 72(25), 3233-3242. <https://doi.org/10.1016/j.jacc.2018.09.051>



A HOLISTIC APPROACH TO HEART HEALTH

In addition to preventative measures such as coronary calcium scoring, lifestyle modifications play a crucial role in maintaining heart health. By adopting essential lifestyle principles such as a balanced Mediterranean diet, regular exercise, sufficient sleep, effective stress management, and nurturing happiness, you can achieve an impressive 83% reduction in vascular risk when combined with appropriate pharmaceutical therapy.

MOVING FORWARD: REGULAR FOLLOW-UPS AND PROGRESSION MONITORING

Each case is unique, and ongoing success requires regular follow-up and monitoring. For those in lower or moderate risk ranges, repeating the coronary calcium score every five years can effectively track the disease's progression. By incorporating volume measurements alongside the coronary calcium score, we can gain further insights into plaque regression.

Armed with this knowledge, we hope to empower patients to proactively, and more confidently navigate their cardiovascular health, to live longer, healthier lives. The coronary calcium score undoubtedly serves as an important stepping stone towards a new era of heart health management.



05

Can the Gut Microbiome Slow Down or Even Prevent Ageing?

by **Aubrey Levitt, M.F.A.**

As we age, various functions essential for maintaining optimal health begin to decline. Scientists are studying the vital role of trillions of gut microbes in preserving well-being and their intricate connection to the ageing process. Can our gut bacteria replace or restore these essential functions that decline with age?





UNDERSTANDING THE GUT MICROBIOME

The gut microbiome is a community of around 40 trillion microorganisms, including bacteria, fungi, and viruses, residing in our gastrointestinal tract. The bacteria in our gut play a vital role in digestion, nutrient absorption, metabolism, inflammation, and immune system regulation, impacting our overall health.

THE IMPORTANCE OF GUT DIVERSITY

A healthy gut is a diverse gut. Gut diversity, also known as gut flora or microbiota diversity, refers to the variety of microorganisms present in your gut. Having a wide range of healthy bacteria helps the body to perform essential functions such as aiding digestion and regulating blood sugar levels and metabolism.

A diverse microbiome breaks down fibres that are unable to be digested by the body, facilitating the absorption of vital nutrients that foster overall health and well-being. Our gut bacteria play a vital role in the creation and synthesis of essential nutrients such as vitamins A, B, C, D, E, and K, as well as minerals like calcium, iron, zinc, and magnesium¹⁷.

Gut diversity is intrinsically linked to immune function. From birth, our gut bacteria help to train the immune system, making our body resilient against infectious diseases and less prone to chronic inflammation.

When an imbalance in diversity occurs, known as dysbiosis, it can disrupt these key functions, resulting in broader health problems. For example, when antibiotics are given, they can destroy gut diversity, resulting in a higher risk for subsequent infections and an increase in inflammation.

THE RELATIONSHIP BETWEEN AGEING AND OUR GUT MICROBIOME

The gut microbiome is a key modulator of healthy ageing. Gut microbiome diversity naturally changes and declines with age and patterns in the gut microbiome have been associated with a decline in various age-related functions. The gut microbiome's influence on the immune system and inflammation may accelerate or decelerate the ageing process.

¹⁷ Hadadi, Noushin, Vincent Berweiler, Haiping Wang, and Mirko Trajkovski. "Intestinal Microbiota as a Route for Micronutrient Bioavailability." *Current Opinion in Endocrine and Metabolic Research* 20 (October 2021): 100285. <https://doi.org/10.1016/j.coemr.2021.100285>.

MICROBIAL DIVERSITY NATURALLY DIMINISHES WITH AGE

Our gut microbiomes undergo changes both in infancy and later in life. During adulthood, the gut microbiome generally remains stable, except for significant changes in diet, lifestyle factors, antibiotics, medications, and stress¹⁸. Patterns in our gut bacteria can even predict our age¹⁹. Over time we may be able to use this information to turn back the clock, by utilising our gut bacteria as a means to influence or enhance various physiological functions.

The most significant change in the gut microbiome, after childhood, occurs after

the age of 60, when gut microbiota diversity significantly decreases²⁰. This decrease in microbial diversity is closely linked to the development of age-related diseases and increased susceptibility to infection. The decline of beneficial bacteria and an increase in pathogenic bacteria causes inflammation to increase. Low diversity and chronic inflammation have been linked to Crohn's Disease, Irritable Bowel Syndrome, cancer, diabetes, cognitive decline, and frailty.^{21,22}

DID YOU KNOW

70-80% of our immune system is found in the gut.²³

THE PARALLEL IMPACT ON IMMUNITY

A well-functioning immune system is essential for maintaining overall health and well-being.

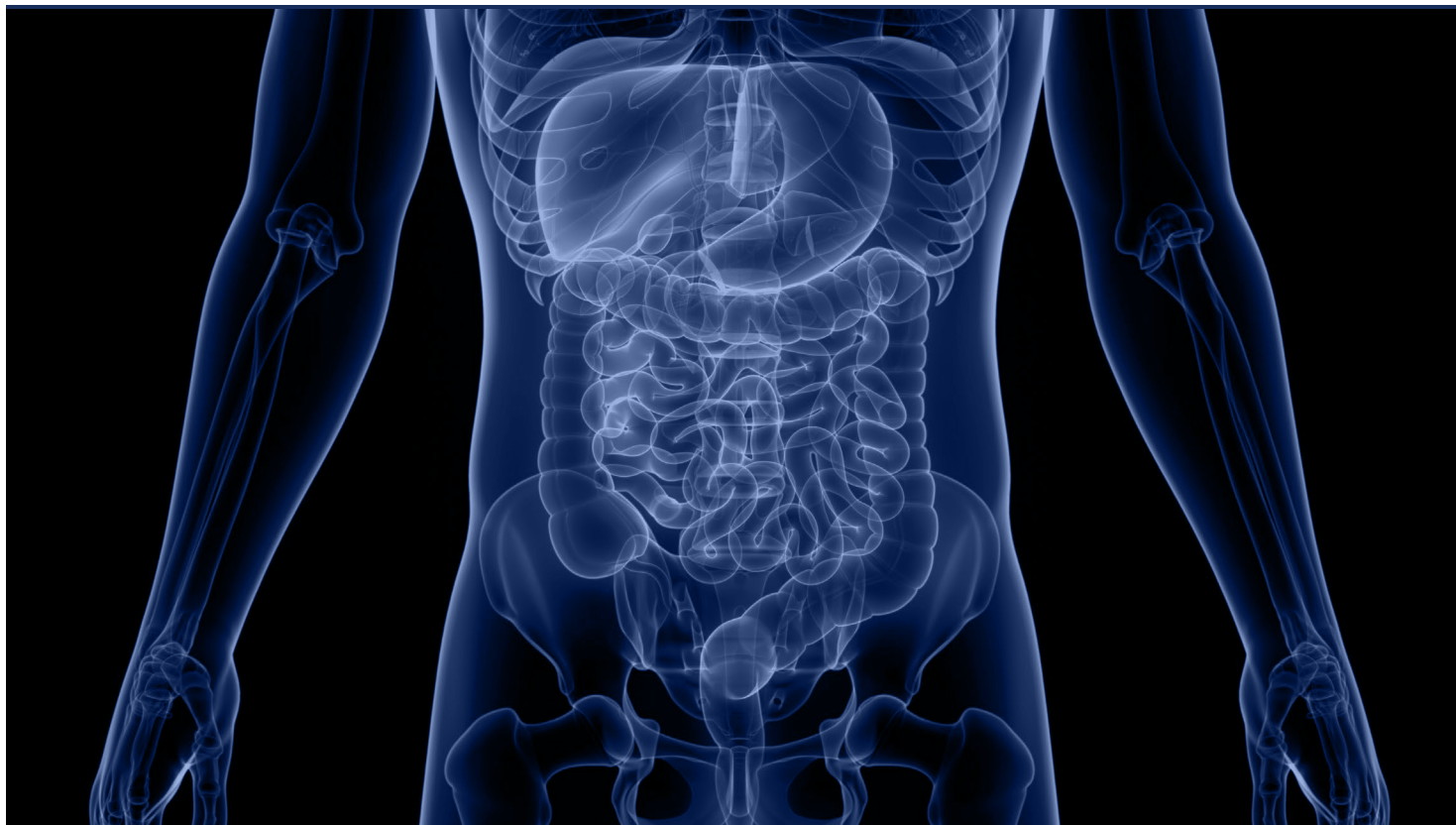
The decline in gut microbiota diversity and the weakening of our immune system as we age are interconnected. As we age, our immune function naturally declines, a phenomenon known as immunosenescence. Maintaining diversity in the gut microbiome could be crucial for regulating immune responses and providing a barrier to crowd out pathogens.

Loss of immune function not only accelerates ageing in the body but also prolongs recovery from illness. This vulnerability can contribute to the risk of various age-related diseases, including heart disease, diabetes, cancer, and Alzheimer's.

The natural decrease in microbial diversity as we age can also perpetuate a weakened immune response and influence the immune cells in our gut. Immune cells play a crucial role in clearing out senescent cells that produce inflammatory material.

Studies have shown that a healthy diverse microbiome can reduce inflammation and modulate immune responses. Therefore, restoring the gut microbiome in elderly individuals has the potential to reduce infection risks and improve overall health.

¹⁸ Conlon, Michael, and Anthony Bird. "The Impact of Diet and Lifestyle on Gut Microbiota and Human Health." *Nutrients* 7, no. 1 (December 24, 2014): 17-44. <https://doi.org/10.3390/nu710017>. ¹⁹ Galkin, F., Aliper, A., Putin, E., Kuznetsov, I., Gladyshev, V. N., & Zhavoronkov, A. (2018). Human microbiome aging clocks based on deep learning and tandem of permutation feature importance and accumulated local effects. *bioRxiv*. <https://doi.org/10.1101/507780>. ²⁰ Thursby E, Juge N. Introduction to the human gut microbiota. *Biochem J*. 2017 May 16;474(11):1823-1836. doi: 10.1042/BCJ20160510. PMID: 28512250; PMCID: PMC5433529. ²¹ Mosca, Alexis, Marion Leclerc, and Jean P. Hugot. "Gut Microbiota Diversity and Human Diseases: Should We Reintroduce Key Predators in Our Ecosystem?" *Frontiers in Microbiology* 7 (March 31, 2016). <https://doi.org/10.3389/fmicb.2016.00455>. ²² Ferrucci, L., & Fabbri, E. (2018). Inflammaging: Chronic inflammation in ageing, cardiovascular disease, and frailty. *Nature Reviews Cardiology*, 15(9), 505-522. <https://doi.org/10.1038/s41569-018-0064-2>. ²³ Wiertsema, S. P., van Bergenhenegouwen, J., Garssen, J., & Knippels, L. M. J. (2021). The Interplay between the Gut Microbiome and the Immune System in the Context of Infectious Diseases throughout Life and the Role of Nutrition in Optimizing Treatment Strategies. *Nutrients*, 13(3), 886. <https://doi.org/10.3390/nu13030886>



**CAN LOSS OF GUT DIVERSITY PREDICT, OR EVEN INFLUENCE, AGE-RELATED CONDITIONS?
CAN RESTORING GUT MICROBIOME DIVERSITY HELP SLOW AGEING?**

In short, we don't know.

While the gut microbiome has been linked to chronic illnesses and immunosenescence, there is still a great deal of research that needs to be done to understand its precise role in ageing. Interestingly, studies have shown that individuals who live longer and remain more active tend to have a greater diversity in their gut microbiome. This suggests that preventing the decline of gut microbial diversity could potentially slow ageing by reducing inflammation and the effects of age-related immune function.

Exploring the significance of the gut microbiome in ageing unlocks exciting opportunities for innovative treatments. Since our gut microbiome is heavily changeable and influenced by diet and lifestyle, the gut may provide a gateway to manipulations for better health. Fecal transplants, prebiotics, probiotics, and postbiotics are among the potential interventions that could restore healthy gut bacteria. These therapies have the potential to improve overall health and may even help extend life expectancy.

Tips to Supporting a Healthy Gut Microbiome

01 INCORPORATE 'BIOTICS': SUPPLEMENT SUPPORT

Prebiotics, probiotics, and postbiotics offer a wide range of microbiome benefits that are often missing in modern diets. Prebiotics provide essential fibres that are exclusively digested by our gut bacteria, addressing a common dietary deficiency. Probiotics possess anti-inflammatory effects that help combat ageing, while postbiotics promote mitochondrial health and boost immune function.

While each can be bought individually, tribiotics are unique in that they contain a synergistic mix of prebiotics, probiotics, and postbiotics. Formulated for optimal health benefits, tribiotics provide an effective way to support microbiome balance while safeguarding against the damaging effects of ageing.



PREBIOTICS



PROBIOTICS



POSTBIOTICS

02 INCORPORATE 'BIOTICS': NATURAL SOURCES

(i) Increase Fermented Foods Intake

Fermented foods are the original tri-biotic, combining prebiotics (fibres), probiotics (live bacteria), and postbiotics (bioactive gut compounds). Including fermented foods in your diet can have a significant impact on supporting a healthy gut microbiome and may promote healthy ageing. These foods help prevent allergic reactions, gastrointestinal disorders, diabetes, cardiovascular disease, cancer, obesity, and even cognitive decline. However, if an imbalance has already occurred an individual might have an intolerance to the increase in histamines found in fermented foods.

(ii) Increase Your Fibre Intake

Consuming a fibre-rich diet has been linked to an 80% higher likelihood of longer life among older populations. Fibre intake has been shown to lower cholesterol, reduce inflammation, aid in weight management, and even prevent the onset of cancer. Studies have shown that individuals who avoid age-related diseases consume around 29 grams of fibre per day, while the average adult consumes less than 15 grams.

(iii) Integrate Polyphenols into Your Diet

Polyphenols are beneficial plant compounds that are rich in antioxidant properties linked to longevity. They have the potential to reverse cell damage by combating oxidative stress and inflammation in the body. However, the effects of polyphenols can vary depending on the specific compound and how it's consumed.



TOP 10 FERMENTED FOODS

Sauerkraut, Kimchi, Kombucha, Kefir, Yoghurt, Apple Cider Vinegar, Sourdough, Miso, Tempeh, Tofu



TOP 10 FOODS HIGHEST IN FIBRE

Beans and Legumes (White Beans), Avocado, Seeds (Chia Seeds), Squash, Green Peas, Leafy Green Vegetables (Spinach), Broccoli, Whole Wheat Pasta, Oranges, Sweet Potatoes



TOP 10 FOODS WITH POLYPHENOLS

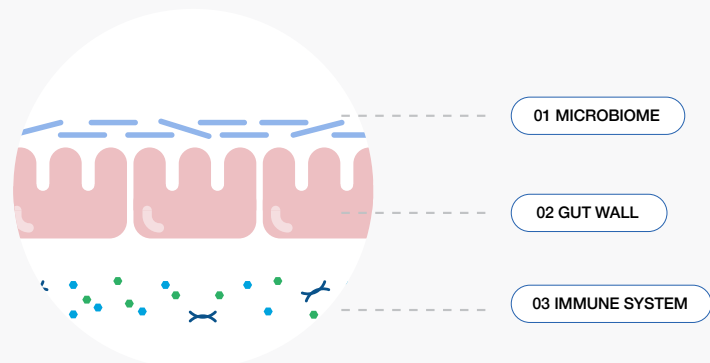
Berries (Blueberries, Blackcurrants, Blackberries), Spices (such as Cloves), Dark Chocolate, Beans, Olives and Extra Virgin Olive Oil, Tea (Both Green Tea and Black Tea), Red Wine, Roasted Soybeans

03 SOCIAL INTERACTIONS

Our gut diversity is influenced by diet, lifestyle, and even social interactions. Some research shows that individuals with larger social networks tend to have a more diverse microbial community. This could be related to stress reduction, but it is suggested that social interactions can have an impact on health and the microbial community in the human gut²⁴.

WHY A HEALTHY MICROBIOME MATTERS

It keeps your gut healthy and protected and supports your immune system



- Microbiome -** The microbiome is a layer of microorganisms including friendly bacteria
- Gut Wall -** Friendly bacteria in the microbiome protect the gut wall from damage, and help with everything from digestion to mood.
- Immune System -** Friendly bacteria also help to regulate and support the immune system.



²⁴ Johnson, K. V. A. (2019). Gut microbiome composition and diversity are related to human personality traits. *Human Microbiome Journal*, 15, 100069. <https://doi.org/10.1016/j.humic.2019.100069>

06

Redefining Our Approach to Radiant Skin at Any Age

by **Akihiro Ueda, M.Eng., M.B.** & **Dr Albert Dashi, Ph.D.**

Achieving age-defying skin goes beyond addressing the superficial signs we can see. Rather, the key to healthy radiant skin at any age lies in understanding and nurturing your unique skin microbiome. Our scientists are shifting the benchmarks of what healthy skin looks like as we age, and how to attain it.





The beauty industry has long prioritised addressing the visible signs of ageing over any underlying cause. Their ad campaigns promote youthful complexions and market products that conceal, correct, or minimise imperfections. However, this pursuit of younger-looking skin neglects one crucial factor: the health of our skin's unique microbiome.

Rather than a reliance on off-the-shelf solutions to reverse the effects of time, recent research into understanding our skin microbiome suggests that a more customised approach to skincare might be the key to long-lasting results.

WHAT IS THE SKIN MICROBIOME?

The human skin is a thriving habitat for trillions of microorganisms, including bacteria, fungi, and viruses. These microorganisms form diverse communities called microbiomes throughout the body. They interact and work together, contributing to glow the healthy

radiance of your skin. Different communities of microorganisms also inhabit other parts of the body, like the gut and oral cavity, each playing a unique role in maintaining your overall health.

DID YOU KNOW

Skin Microbiome vs. Skin Microbiota

The “skin microbiota” represents the individual microorganisms living on the skin’s surface. In contrast, the “skin microbiome” encompasses the entire ecological system formed by these microorganisms, along with their genetic material and their interactions with each other and the skin environment.

LIKE THE 'LIFE FORCE' OF OUR SKIN

The microbiome is a crucial ecosystem that maintains the health, integrity, and resilience of our skin. It serves as the first line of defence against external aggressors and is increasingly recognised as playing a vital role in the ageing process of the skin.

With its dynamic population of microorganisms, the skin microbiome acts as a protective barrier, mitigating damage from environmental factors

and facilitating the skin's natural repair and renewal processes. It defends against external harmful pathogens, shields us from toxins, manages inflammation, aids nutrient absorption, and helps promote healthy wound healing.

A diverse and balanced skin microbiome has been shown to combat environmental aggressors and delay premature skin ageing.²⁵

WHAT MAKES A HEALTHY SKIN MICROBIOME?

Achieving a healthy skin microbiome requires maintaining the diversity and balance of microbial communities on the skin. The skin microbiome acts as a smart, dynamic barrier, selectively allowing substances in, retaining moisture and nutrients, and defending against irritants and pathogens to prevent

inflammation and infection. However, should an imbalance (or 'dysbiosis') occur, it may result in irritation, sensitivity, problematic skin conditions like acne, rosacea, or eczema, and can even accelerate signs of ageing in the skin such as loss of elasticity, uneven skin tone, fine lines, and wrinkles.

²⁵ Prescott, S. L., Lacombe, D-L., Logan, A. C., West, C., Burks, W., Caraballo, L., ... Pawankar, R. (2017). The skin microbiome: Impact of modern environments on skin ecology, barrier integrity, and systemic immune programming. *Journal of Allergy and Clinical Immunology*, 140(1), 248-260. <https://doi.org/10.1016/j.jaci.2017.04.022>

Demystifying a Culture of Comparisons in Skincare

01 NO TWO PEOPLE ARE THE SAME

Our skin's microbiome is established at birth. As newborns, we inherit our initial microbiome from our mother. As we grow and encounter different environments, our microbiome becomes more diverse, accumulating a wider

range of microorganisms. This continuous adaptation and change persists throughout our lives. As adults, our skin microbiomes are as distinctive as our fingerprints, and no two individuals have identical microbiomes.

02 YOUR MICROBIOME EVOLVES AS YOU AGE

As we age, our skin microbiome experiences notable transformations in both composition and diversity. Research indicates that these changes may impact the natural ageing process of the skin. It's important to note that the relationship between microbiome diversity and ageing is not solely about a decline in diversity leading to accelerated ageing. Instead, it's about the intricate balance of specific microorganisms. Each age group exhibits a distinct set of microorganisms inhabiting the skin.

These age-related shifts can potentially compromise the skin's protective barrier and modify the makeup and diversity of microbial communities. As skin ages, it undergoes internal structural changes that, along with other factors, contribute to the development of distinct microbial balances unique to different age groups. These dynamic interactions between the skin and its microbiome play a pivotal role in the ageing process, although the precise mechanisms involved continue to be an active area of research.

03 IT'S NOT JUST ABOUT THE SKIN

(i) The Influence of Gut Health:

Until recently, the term 'microbiome' was more commonly recognised in association with gut health. In fact, the gut microbiome also plays a crucial role in regulating overall health, including skin health. A well-balanced gut microbiome aids digestion, nutrient absorption, and vitamin synthesis, but its influence extends beyond the digestive system.

Research suggests that a healthy and balanced gut microbiome can also positively impact skin health, potentially slowing down the ageing process. The gut microbiome can influence the

skin's response to external impacts, control inflammation, and manage oxidative stress, all of which are vital for maintaining skin health and minimising the effects of ageing.

Conversely, an imbalanced gut microbiome can have adverse effects, leading to chronic skin inflammation that may accelerate skin ageing through increased oxidative stress and potential tissue damage. Therefore, maintaining a balanced gut microbiome could be key to managing the health of our skin microbiome and promoting healthy ageing.²⁶

²⁶ Salem, I., Ramser, A., Isham, N., & Ghannoum, M. A. (2018). The gut microbiome as a major regulator of the gut-skin axis. *Frontiers in Microbiology*, 9, 1459. <https://doi.org/10.3389/fmicb.2018.01459>



(ii) The Impact of Lifestyle and Environment:

Our microbiome is in constant communication with its environment and our skin. Beyond age, lifestyle and environmental factors can significantly influence skin microbiomes. Exposure to external stressors such as exercise, diet, sleep, UV radiation, pollution, harsh weather conditions, and dietary habits can worsen the skin condition and disrupt the

microbiome. Skincare habits and practices like over-exfoliating or using skin cleansing products with harsh chemicals that strip the skin of its natural oils and beneficial bacteria also play a role. All these factors influence the types of microorganisms that thrive on the skin, ultimately resulting in varying balanced microbial communities.

DID YOU KNOW

The skin has about 10 trillion microbial cells, and a single square centimetre of the human skin can contain up to one billion microorganisms. These unique communities vary across your body, impacting both your immune system and the skin's health²⁷.

²⁷ Weyrich, L. S., Dixit, S., Farrer, A. G., Cooper, A. J., & Cooper, A. (2015). The skin microbiome. *Australasian Journal of Dermatology*, 56, 268-274. <https://doi.org/10.1111/ajd.12252>

Skincare Solutions: A New Approach to Glowing Skin

01 SKIN SEQUENCING TECHNOLOGY

The condition of the skin microbiome is often measured by analysing the diversity and balance of microbial communities present on the skin. Advancements in skincare research have led to the development of sophisticated technologies that can assist scientists in analysing and understanding skin health and ageing status.

One such platform involves sequencing the DNA of skin microorganisms to identify

their types and quantities. Next-generation sequencing platforms offer valuable insights to address common skin conditions and improve our understanding of skin health and ageing. By identifying and measuring the levels of these beneficial microorganisms, scientists can create highly personalised skincare products to manage specific skin conditions and reduce the effects of ageing.

02 DISCOVER YOUR SKIN: PERSONALISED SKINCARE

For skincare to truly thrive, it is more effective when it works in harmony with the skin and its microbiome. Only recently, the technology to facilitate at-home advanced skin health tests has been developed to enable individuals to discover the state of their unique skin microbiome. These convenient adhesive 'patch tests'²⁸ allow anyone to collect a sample of bacteria from the skin's surface and send it

to skin specialists for review. This process provides valuable insights into the unique microbial composition of your skin, enabling personalised skincare products. With this knowledge, you can confidently choose products that address your specific concerns, promoting long-term skin health and radiance.

DID YOU KNOW

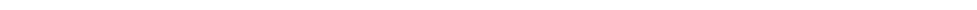
Over the past decade, the term 'microbiome' has gained significant traction in the skincare industry as brands begin to understand its value in skin health and ageing. A recent report estimated the global probiotic cosmetics market to grow at a rate of 6.6% from 2020 to 2027 (valuing it at USD 14.6 billion in 2019)²⁹.

²⁸ Sequential Skin, <https://www.sequentialskin.com/test-your-microbiome> ²⁹ Grand View Research. (2020). Probiotic cosmetics market size, share & trends analysis report by product (Skin care, Hair care), by distribution channel (Hypermarket & Supermarket, Pharmacy & Drug Store), by region, and segment forecasts, 2020 – 2027. <https://www.grandviewresearch.com/industry-analysis/probiotic-cosmetics-market>



03 SUPPORTING BENEFICIAL BACTERIA

When there is a lack of beneficial or friendly bacteria on your body, harmful bacteria can flourish. To support the skin microbiome effectively, it is more productive to include 'biotics', such as probiotics, prebiotics, and postbiotics. You can easily incorporate them into your daily routine by using a combination of topical skincare treatments and ingestible solutions or supplements.

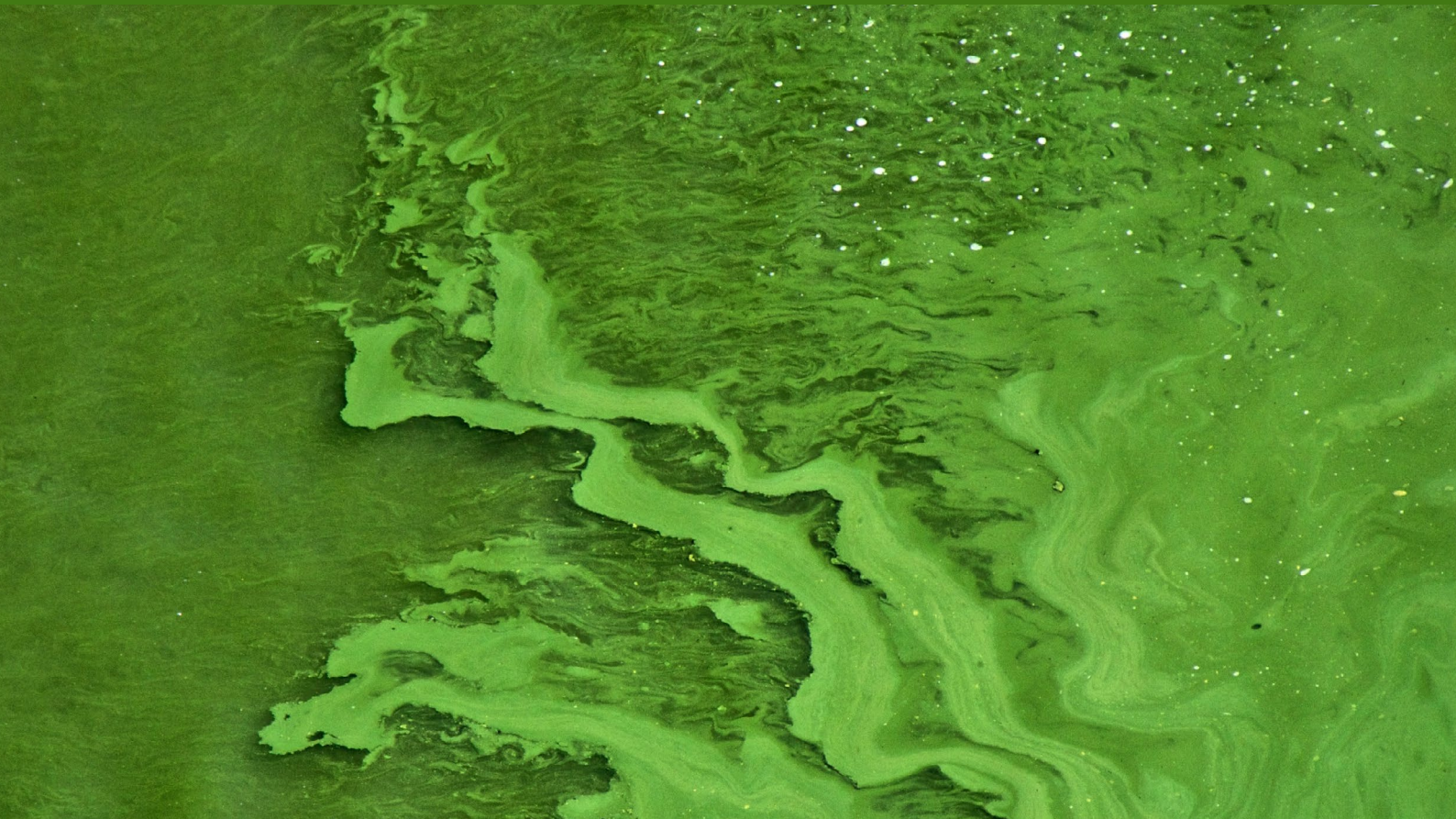


07

The Algae Advantage: Natural Inspiration for Anti-Ageing Innovations

by **Dr Mike Packer, Ph.D.**

Algae have thrived for billions of years in some of nature's harshest environments. Now, biotechnologists are exploring ways to adapt their cellular survival skills to help humanity flourish for a new era of wellness.





Throughout history, humans have shared an intrinsic bond with the sea. Water (H₂O), the most prevalent molecule in our bodies, is as vital to us as it is to the teeming life in the ocean. So, it comes as no surprise that scientists are looking to algae, nature's aquatic stalwarts, to decode their evolutionary secrets. This research enhances our understanding of human ageing, lifespan, and cell function, opening new pathways for optimising our cellular health, developing antioxidants, and creating nature-inspired skincare solutions.

UNDERSTANDING ALGAE

Algae are members of a group of mostly aquatic photosynthetic organisms inhabiting a huge variety of ecosystems³⁰. They are among the fastest-growing organisms on the planet and can range in size from microscopic to kelp reaching upwards of 60 m in length. Algae reside at the base of the food pyramid, acting as the primary food source and forming

the foundation for nearly all aquatic life, supporting ecosystems in our oceans. Their photosynthetic pigments are more varied than those of land plants, and their cells have features not found among plants and animals.

DID YOU KNOW

Scientists estimate photosynthesising algae produce around 70% of all atmospheric oxygen³¹.

³⁰ The Editors of Encyclopaedia Britannica. (2021, July 24). Algae summary. Encyclopaedia Britannica. <https://www.britannica.com/summary/algae> ³¹ Epstein, P. R., Ford, T. E., & Colwell, R. R. (1993). Health and climate change: Marine ecosystems. *The Lancet*, 342, 1216-1219.



ALGAE'S EVOLUTION

Algae precursors existed since the dawn of cellular life, approximately 4 billion years ago. They have endured and overcome some of the most formidable environmental challenges on our planet, including relentless UV light radiation, extreme temperatures, fluctuating salt levels, and more. Over time, they have developed intricate structures, pathways, and molecules to safeguard their existence and thrive in aquatic environments. More recently, scientists have discovered these molecules hold great potential for human benefit.

The Algae Advantage for Human Health

Algae have perfected cellular processes that offer invaluable insights for optimising human health. While perhaps appearing unrelated, algae and humans share a similarity in many of our cellular processes and structures. These similarities carry significant implications.

01 SHEDDING LIGHT ON THE POWER OF PHOTOSYNTHESIS

Algae are highly efficient in managing light energy. Through photosynthesis, they transform sunlight into carbon-rich biomass, establishing themselves as primary producers in aquatic food chains. This process splits water molecules, generating hydrogen ions and electrons, vital for life's metabolic processes. As we age, our bodies' efficiency in energy production and utilisation diminishes. Studying algae's photosynthetic process could lead to advances in human energy metabolism, in turn leading to increasing longevity and prevention of disease.

02 DEFENDING AGAINST LIGHT'S DARK SIDE

Algae have developed protective mechanisms to counter the harmful effects of light. Ultraviolet light and inefficient electron transport can cause oxidative stress, leading to cellular damage and accelerated ageing. Algae combat this by employing antioxidant systems that neutralise harmful free radicals while still harnessing light for energy. Ongoing research into these mechanisms is exploring strategies for safeguarding our cells against oxidative stress, slowing ageing, and preventing diseases.

DID YOU KNOW

Photosynthesis is the process of using light energy to split water. Photosynthetic cells contain special pigments that absorb light energy. Different pigments respond to different wavelengths of visible light.

03 REPAIR SYSTEMS: MENDING THE EVERYDAY WEAR AND TEAR

Algae don't just protect themselves from damage; they also repair it. They possess targeted repair systems to mend routine wear and tear, including protein pathways to restore damaged molecules, electron 'sinks' for excess electrons, and mechanisms to detect and repair or discard irreparably damaged cells. As ageing leads to cellular damage and dysfunction, understanding algae's repair systems can help develop strategies for preserving cellular health and slowing down the process of ageing.

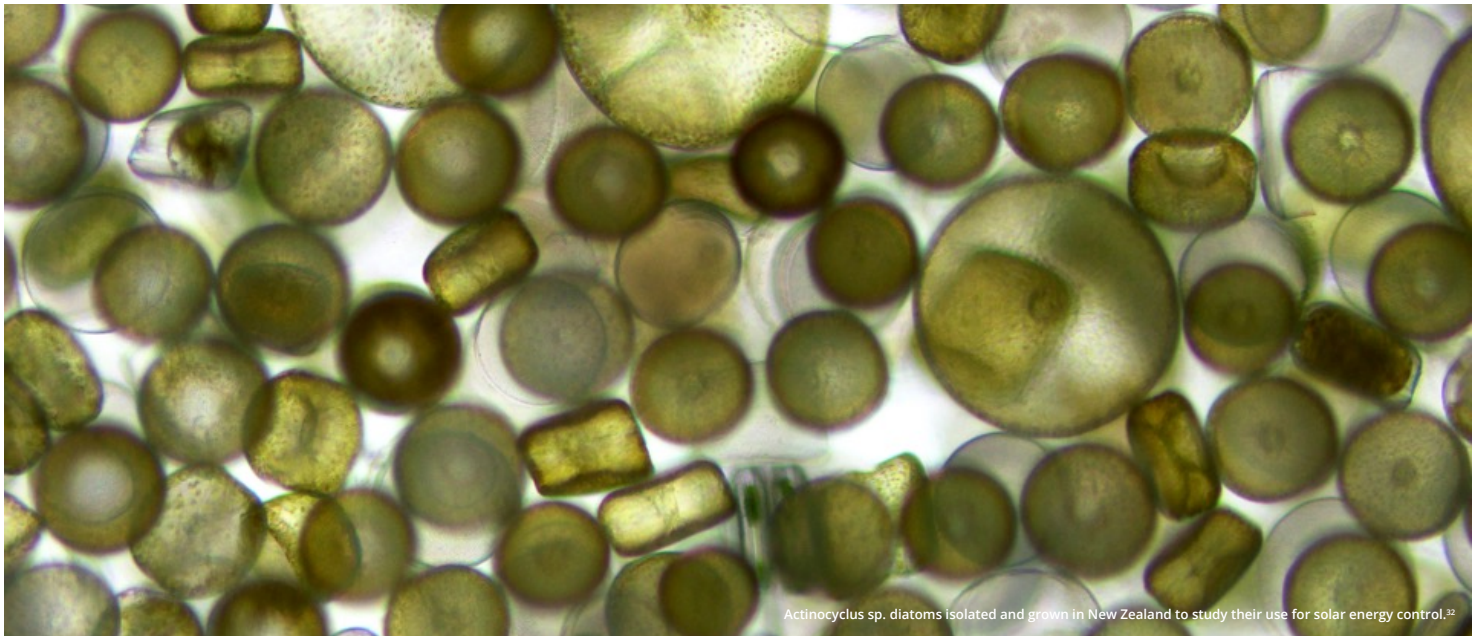
04 DIATOMS: NATURE'S BLUEPRINT FOR SOLAR PANELS

Diatoms, a group of algae, have evolved a unique light management strategy. Encased in silicate 'glasshouses', their tiny pores enable substance exchange and skilfully manipulate light through their nanostructure. These pores scatter light, focusing beneficial photosynthetically active radiation (PAR) onto their light-harvesting systems and deflecting harmful UV radiation. Studying diatoms can enhance our understanding of light energy management and light manipulation, including protection against harmful radiation and stressors. This has the potential to lead to advanced sunscreens, materials, and technologies, offering valuable applications for human health, complementing defence mechanisms, and repair systems.

DID YOU KNOW

The active ingredients in some chemical sunscreens can degrade in sunlight, leaving our skin vulnerable, and potentially generating free radicals that harm our skin. These chemical UV filters can even harm marine life and pollute our oceans.

The photosynthesis and self-repair mechanisms of algae may lead to eco-friendly sunscreens with superior UV protection and reduced environmental impacts.



Actinocyclus sp. diatoms isolated and grown in New Zealand to study their use for solar energy control.³²

NEXT STEPS IN WELLNESS RESEARCH

The potential applications for algae in skin care innovations are evolving every day.

Increasingly in skincare technology, scientists are turning to algae, whose inherent resilience and adaptability to extreme conditions help us to reimagine unprecedented solutions.

Harnessing the mechanisms of these marine organisms could lead to the development of highly efficient, eco-friendly skincare and sunscreens that not only offer superior protection against UV radiation but also reduce harmful environmental impacts associated with conventional UV blockers. The self-repair capabilities of algae may be used

to develop novel wound-healing products that actively promote skin regeneration. The antioxidant properties of some algal species may provide new treatments for wrinkles, age spots, and other signs of ageing. What's more, these research efforts have the potential to offer solutions with increased efficiency and lowered environmental impacts.



³² Image Credit: Rossella Nicolai, Veronica Beuzenberg, Mike Packer From project published by Jiazun Wu, Gerald J. Smith, Robert G. Buckley, Annette Koo, Veronica Beuzenberg, Michael A. Packer, Grant V.M. William 2023. High solar water droplet evaporation rates from Actinocyclus sp. diatom frustules decorated with silver nanoparticles Colloids and Surfaces A: Physicochemical and Engineering Aspects, Volume 675, 131970.

08

Rediscovering Our Roots:

The Rise of Botanicals in Wellness

by **Michael Henain**

An emerging trend is seeing the wellness industry re-explore its natural roots. A rise in clinical trials of natural compounds has re-ignited curiosity in the therapeutic potential of botanicals and their healing properties, paving the way for natural product-based drug discovery.





The health industry, much like fashion and other industries, operates in cycles. New products emerge based on wellness trends, driven by successful clinical studies, medical discoveries, or even consumer demands. If these products prove successful, often, multiple companies will respond and start to produce something similar.

Natural products have traditionally presented challenges for drug discovery and manufacturing, which contributed to a decline in their pursuit by the pharmaceutical industry from the 1990s onwards³³. Due to difficulties with trademarking natural ingredients, in addition to several technical barriers, our industry has a history of relying heavily on manufacturing pharmacological solutions for health issues. However recent research and technological developments have brought the industry back full circle, sparking a renewed interest in nature's most potent resources.

HUMANS ORIGINALLY USED NATURAL SOLUTIONS TO COMBAT AGEING AND CHRONIC ILLNESS

Ancient civilisations relied on a wide range of plants and herbs to treat anything from skin conditions and digestive issues to alleviating symptoms of the common cold. Now, clinical studies have proven that the natural compounds found in many of these ingredients have a much broader range of applications.

Today, the wellness industry is witnessing a revival of ancient wisdom through the re-adoption of natural remedies and botanicals.

This shift reflects a positive departure from synthetic drugs and a move towards a more holistic approach to health and wellness. It aligns with the growing consumer demand for comprehensive preventative solutions that support their wellness journeys, with a particular focus on ageing and longevity.

³³ Atanasov, A.G., Zotchev, S.B., Dirsch, V.M. et al. Natural products in drug discovery: advances and opportunities. *Nat Rev Drug Discov* 20, 200–216 (2021). <https://doi.org/10.1038/s41573-020-00114-z>

A Rediscovery of Botanicals

Botanicals are naturally occurring plant-derived substances known for their medicinal and therapeutic properties. They include roots, seeds, bark, leaves, flowers, and fruits. Each botanical contains unique active ingredients, serving as a natural pharmacy used by humans for centuries.

01 PHYTOCHEMICALS: THE POWER OF PLANT COMPOUNDS

At the heart of these beneficial botanicals lies a group of powerful compounds known as phytochemicals, which are nature's remarkable answer to maintaining our health and boosting antioxidant activity. Phytochemicals are the bioactive compounds found in plants that have beneficial effects on human health.

Phytochemicals are gaining recognition for their potential to augment health and vitality while offering a natural counterbalance to the impacts of ageing and disease. Two specific types of phytochemicals, phenolic acids, and flavonoids, possess significant antioxidant and anti-inflammatory properties, safeguarding the body from free radicals and oxidative stress. These compounds are potent sources of protection and play a vital role in the body's defence against some of our most common health challenges.

Phytochemicals are already finding their way into the consumer world. In the supplement industry, we're seeing many health and wellness brands incorporating them into capsules and powders. In the beauty industry, phytochemicals have started to appear in skincare and cosmetic products, where they are lauded for their antioxidant properties and their ability to protect the skin from environmental stressors.

02 TELOMERES: THE ROLE THEY PLAY IN BOTANICALS AND AGEING

Gotu Kola and Astragalus Root are two botanical ingredients with promising potential for telomere repair, offering anti-ageing properties and cellular rejuvenation. Telomeres are considered a biomarker for biological ageing, and their lengthening is believed to slow down the ageing process.

03 GOTU KOLA PLANT EXTRACT

Early studies suggest that Gotu Kola exhibits anti-ageing effects by enhancing telomerase activity and slowing down the ageing process. Gotu Kola has been used for centuries in India, China, and Indonesia and has a rich history of treating various conditions. It boosts mental clarity, aids wound healing, and addresses skin conditions like psoriasis. It's even been called 'the fountain of life' due to the legendary tale of an ancient Chinese herbalist who lived over 200 years after taking it.

04 ASTRAGALUS ROOT

Astragalus Root has the potential to protect and rejuvenate telomeres, potentially reversing the erosion caused by ageing and lifestyle. Clinical studies have shown variants of this root can lengthen shortened telomeres, extending the health span of mature or ageing mice without increasing cancer risk. By stimulating the telomerase enzyme, Astragalus Root offers a promising approach to slow down, and potentially reverse telomere erosion caused by ageing and lifestyle.

The Rise of Nutraceuticals

Nutraceuticals, a blend of 'nutrition' and 'pharmaceuticals', are gaining traction in the wellness industry. This trend stems from a growing awareness of the role nutrition plays in disease prevention. They encompass food-derived products with additional health benefits. As alternatives to conventional medicine, nutraceuticals offer a harmonious fusion of nutrition and healing. Their popularity reflects shifting paradigms in healthcare, prioritising prevention over treatment.



01 MYCOSPORINE-LIKE AMINO ACIDS (MAAS)

Mycosporine-like Amino Acids (MAAs) are a group of compounds derived from algae and other marine organisms. They possess potent antioxidant and photoprotective properties, which have been linked to a multitude of health benefits. Notably, MAAs are believed to protect the skin from harmful UV radiation, potentially reducing the risk of skin cancer and premature ageing.



03 CURCUMIN

Curcumin and omega-3 fatty acids have also been extensively studied for their anti-ageing effects. These natural compounds exhibit antioxidant, anti-inflammatory, and protective cellular properties, combating age-related diseases and promoting overall wellness. Scientific research continues to support Curcumin's potential to treat a wide range of conditions, including arthritis and heart disease.



02 RESVERATROL

Resveratrol, a naturally occurring polyphenol found in grapes, berries, and certain nuts, has garnered attention in the nutraceutical industry for its potential anti-inflammatory, anti-ageing, and antioxidant properties, underpinning its role in disease prevention and health promotion.



04 POMEGRANATE AND ARTICHOKE EXTRACTS

Pomegranate and artichoke extracts, rich in antioxidants and beneficial plant compounds, have been associated with a variety of health benefits. Research suggests that these extracts may help lower blood pressure, improve cholesterol levels, and even combat inflammation.



05 HYDROXYTYROSOL

Hydroxytyrosol, a phenolic compound primarily sourced from olives and extra virgin olive oil, is a notable player within the nutraceutical landscape. With robust antioxidant properties that surpass those of vitamin C, it serves as a significant protective agent against oxidative stress. Studies have linked hydroxytyrosol to an array of health benefits, ranging from cardiovascular protection to neurodegenerative disease prevention. Its potential to mitigate inflammation also highlights its role in promoting overall wellness, reinforcing the 'prevention over treatment' paradigm in healthcare. Thus, hydroxytyrosol not only underscores the therapeutic potential of natural compounds but also shapes the future of preventive health care strategies.

A BOTANICALS BREAKTHROUGH: INTEGRATING NATURAL REMEDIES INTO MODERN SOLUTIONS

Botanical ingredients hold significant implications for human longevity and wellbeing, and clinical research consistently validates the use of natural compounds and traditional botanicals for healthy ageing. As such, there is a need for the global health sector to bridge the gap between traditional and modern medicine. This could be done through increased collaboration between healthcare providers, industry partners and academic research institutions to develop evidence-based botanical solutions and optimised treatment outcomes.

By doing so, we will be able to leverage the power of plants to create better treatment protocols that incorporate traditional herbal remedies alongside modern medical treatments. This holistic approach to health and well-being can provide a powerful avenue for improving healthcare outcomes, while simultaneously meeting the global demand for safe, natural health solutions. As we continue to explore different approaches to wellness and longevity, botanical ingredients will remain an essential part of our journey towards a healthier future.



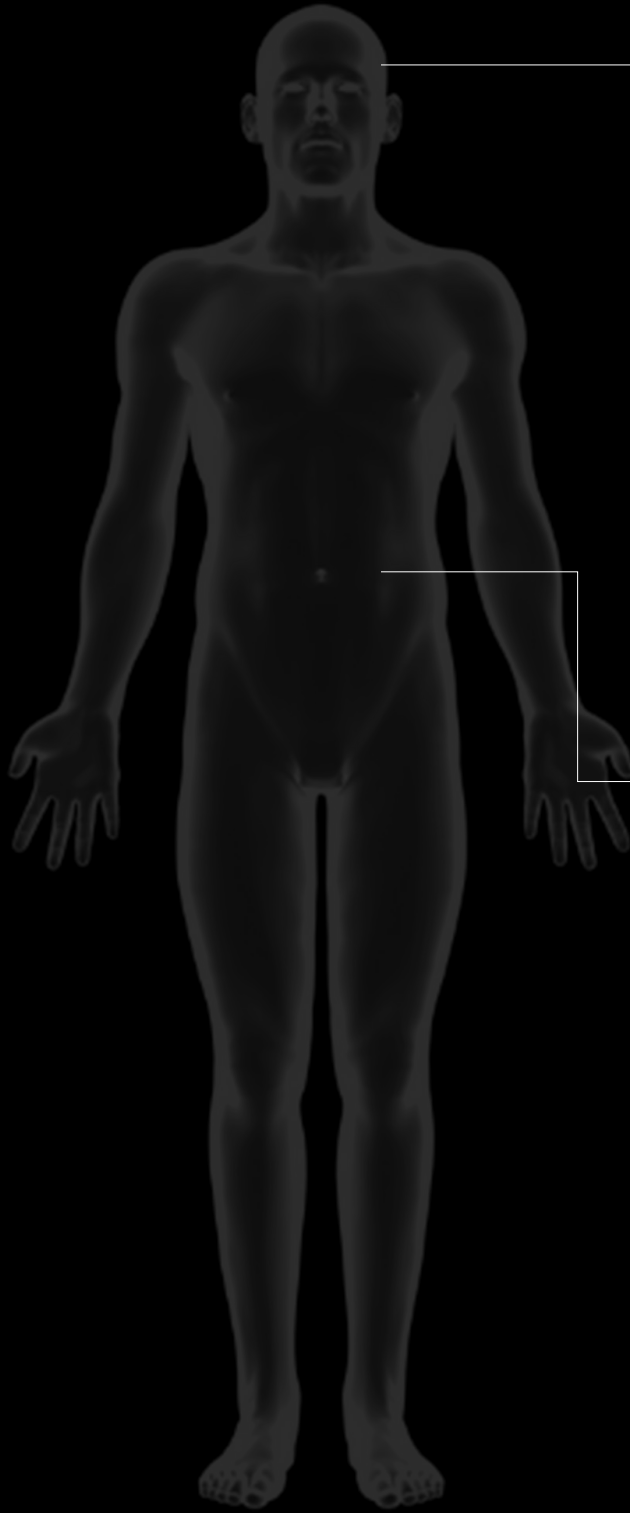
09

Eight Anti-Ageing Ingredients to Keep on Your Radar



We're each our own best judge of what's right for us.

In a world filled with wellness practices, products, and promises, it can be overwhelming to navigate health and wellbeing. As we shift focus to the practical aspects of anti-ageing innovations, our goal is to empower you with the insight needed to confidently navigate the wellness market. Recently, we asked our Advisory Board for their top picks of anti-ageing ingredients to watch out for in 2024. Below, you'll find an overview of their top choices and the reasons behind them.



01

COGNITIVE HEALTH | NOOTROPICS

Nootropics, often referred to as 'smart drugs', are substances that boost cognitive performance, enhancing functions such as memory, creativity, and even motivation, in healthy individuals.

BENEFITS

- **Can Support Memory**
- **Enhanced Creativity**
- **Increased Concentration**
- **Protection From Cognitive Decline**
- **Improved Sleep Patterns**
- **Regulates Response to Stress**
- **Boost Cellular Energy**
- **Increases Motivation by Modulating Dopamine and Serotonin**

02

MICROBIOME HEALTH | TRIBIOTICS

Tribiotics are a blend of prebiotics, probiotics, and postbiotics aimed at promoting optimal microbiome health by fostering a beneficial environment for gut bacteria, enhancing gut flora diversity, and promoting balanced gut health.

BENEFITS

- **Enhanced Digestive Health**
- **Improved Immunity**
- **Reduced Gastrointestinal Issues**
- **Healthy Balance of Gut Bacteria**
- **Enhanced Nutrient Absorption**
- **Mental Health Benefits**
- **Weight Management and Metabolism**
- **Reduced Inflammation**



03

CELLULAR HEALTH | 2-HOBA OR HOBAMINES

2-HOBA, also known as hobamine, is a potent molecule that has caught the industry's attention due to its demonstrated impact on cellular health. Found naturally in the buckwheat plant, this compound is renowned for its ability to protect cells from oxidative stress, promoting cellular longevity and vitality.

BENEFITS

- Promotes Cellular Longevity
- Fights Oxidative Stress
- Supports Cell Integrity and Function
- Enhances Cellular Energy Production
- Boosts Cellular Recovery and Repair
- Strengthens Immune Response
- Supports Brain Health
- Promotes Skin Health

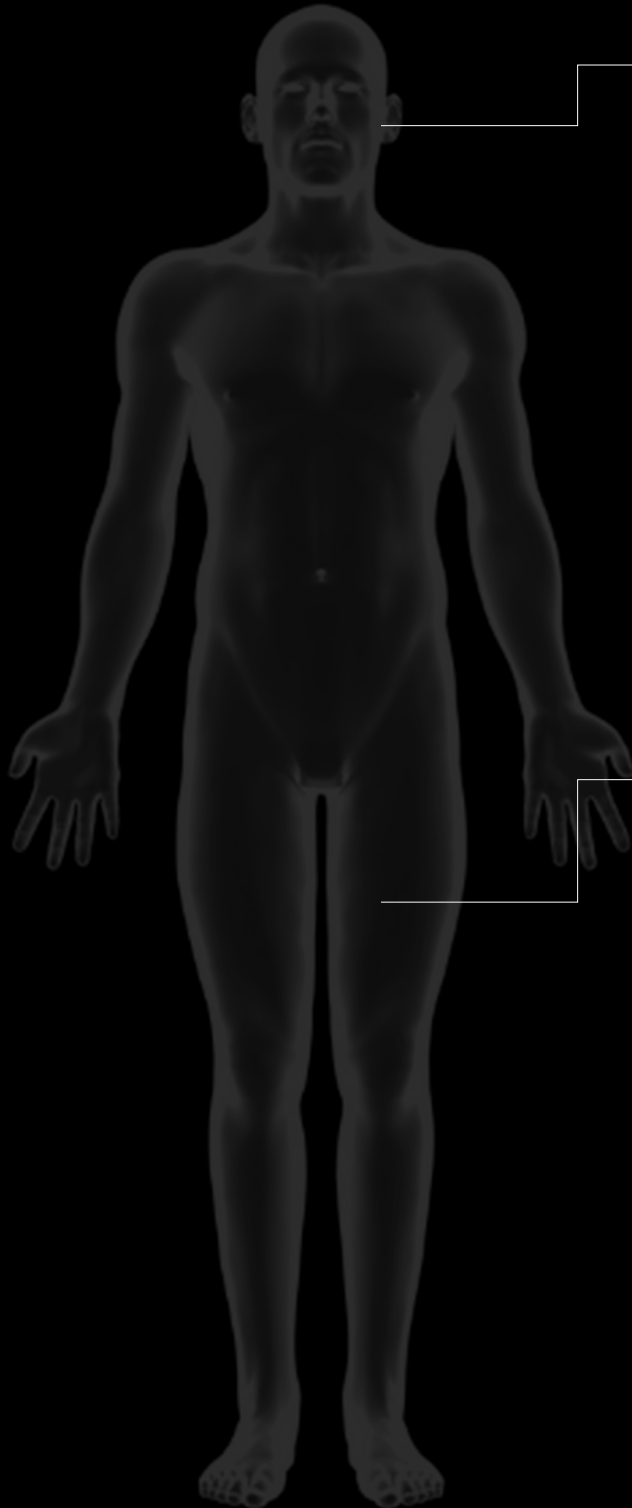
04

HEART HEALTH | BERGAMOT

Bergamot is a citrus fruit that is native to the Calabria region of Italy and is highly valued for its cardio-protective properties. Its extract, rich in flavonoids, has been shown to support heart health by maintaining healthy cholesterol levels and promoting balanced blood pressure.

BENEFITS

- Regulates Cholesterol
- Stabilises Blood Pressure
- Reduces Blood Sugar Levels
- Promotes Healthy Blood Vessels
- Anti-Inflammatory Properties
- Antioxidant Properties
- Assists in Weight Management
- Improves Digestive Health



05

SKIN HEALTH | FUCOIDAN

Fucoidan is found in some species of brown seaweed marine algae and has garnered significant attention across multiple health sectors. It has a host of health-promoting properties which make it a highly coveted ingredient in skincare products, including powerful antioxidant and anti-inflammatory capabilities, offering protection against harmful environmental aggressors, and promoting healthier, more radiant skin.

BENEFITS

- **Anti-Ageing Properties**
- **Moisture Retention**
- **Anti-Inflammatory**
- **Strengthens Skin Barrier**
- **Encourages Wound Healing**
- **Skin Detoxification and Clarity**
- **Improves Skin Texture**
- **Skin Brightening and Reduction of Hyperpigmentation**

06

WEIGHT MANAGEMENT | WHITE MULBERRY LEAF EXTRACT

Derived from the leaves of the White Mulberry tree, this extract contains various compounds that have been shown to support weight loss and overall metabolic health. Studies suggest its ability to inhibit the digestion of carbohydrates, reducing their conversion into glucose, and allowing the extract to maintain balanced blood sugar levels the extract can prolong feelings of fullness, helping to control appetite and reduce overeating.

BENEFITS

- **Carbohydrate Digestion Inhibition**
- **Balanced Blood Sugar Levels**
- **Reduced Fat Absorption**
- **Appetite Control**
- **Antioxidant Properties**
- **Improved Metabolic Health**
- **Lowered Cholesterol Levels**
- **Increased Energy Levels**



07

IMMUNITY | EGG YOLK EXTRACT

Egg yolk extract, a powerful derivative of egg yolk, is gaining recognition as a powerful immune booster. Packed with essential vitamins and nutrients to strengthen the immune system, it also contains antibodies that fight off pathogens and infections and help with disease prevention and the ageing process.

BENEFITS

- **Rich In Vitamins A, D, E, K, and B**
- **High In Essential Fatty Acids like Omega-3 And Omega-6**
- **Rich in Minerals like Zinc and Selenium**
- **Promotes Gut Health**
- **Boosts Heart Health**
- **Supports Eye Health**
- **Enhances Skin Health**
- **Strengthens Bones**

08

JOINTS AND MOBILITY | EGGSHELL MEMBRANE

Derived from the thin layer between an egg's shell and the egg white, eggshell membrane is being hailed for its unique composition rich in key joint-health promoting compounds including collagen, elastin, and glucosamine.

BENEFITS

- **Improved Joint Mobility**
- **Reduced Inflammation**
- **Collagen Production**
- **Faster Recovery Post-Injury**
- **Improved Flexibility**
- **Supports Bone Health**
- **Reduced Joint Degeneration**
- **Pain Relief**





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