Cellular health: the next frontier of innovation for longevity?

Research into healthy longevity (healthspan) is now focusing on cells. What are the key components of cellular health, and which biological mechanisms are being targeted? An overview from Cell-Tech.

Rising life expectancy is bringing the management of chronic diseases and anti-ageing to the fore. It is no longer simply a question of 'living longer' (lifespan), but of 'living longer in good health' (healthspan). According to Euromonitor International, consumers are increasingly seeking solutions to help them maintain their energy levels, cognitive function, mobility, metabolic health and independence at every stage of life. Healthy ageing is no longer of interest solely to older people. "Prevention is becoming the norm at younger ages, and consumers want not only evidence, but evidence they can understand," explains Magda Starula, a consultant at the UK-based market research firm.

Against this backdrop, cellular health is the fastest-growing segment within the healthy ageing market. Interest in maintaining cellular function, metabolism and energy production is driving demand, as consumers seek ways to promote healthy ageing at a deeper biological level.

By 2025, at least one healthspan-related claim appeared on 50 per cent of all new dietary supplement products launched since July 2024 (Euromonitor International). The ingredients gaining ground in this area are NAD+ precursors, in particular nicotinamide riboside, CoQ10/ubiquinol, omega-3s, B vitamins, magnesium and resveratrol.

NAD+ AND ITS PRECURSORS: KEY TO CELLULAR HEALTH

NAD+ (nicotinamide adenine dinucleotide) is a coenzyme that enables cells to produce energy, repair DNA and maintain cellular health through hundreds of metabolic reactions. Its levels decline with age and are linked to the ageing process. In 2025, NAD+-based products accounted for over 10 per cent of new product launches (Euromonitor International). Clinical trials have shown that precursors such as nicotinamide riboside (NR) and nicotinamide mononucleotide (NMN) can safely and effectively increase NAD+ levels in the body. The number of products sold online associated with the term 'NAD+' increased more than fivefold across various categories of over-the-counter health products, rising from 321 in 2023 to 1,734 in 2025.

> ***« The rise of Cell-Tech is driven by scientific research, which enables us to develop new health solutions targeting cellular mechanisms. »***
>
> **Bruno Le Mer -** CEO of Ideactifs

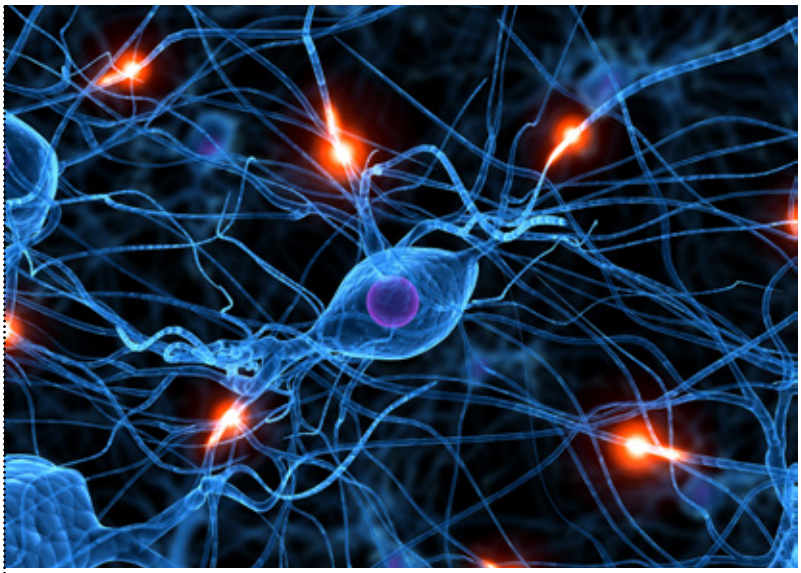
Niagen Bioscience is at the forefront of healthy ageing 'through NAD + science'. Its patented ingredient Niagen® (nicotinamide riboside), backed by 45 clinical studies, is a form of vitamin B3 that has become a benchmark amongst NAD+ precursors and is claimed to be the most efficiently converted into NAD+.

THE MITOCHONDRION, A KEY TARGET FOR CELL-TECH

Mitochondrial function is at the heart of many innovations relating to cellular mechanisms. Often referred to as the 'powerhouses' of cells, mitochondria are responsible for a large proportion of the ATP production required for biological processes and play a vital role in cellular health. Their function naturally declines with age, and supporting mitochondrial health can be a key strategy for promoting healthy ageing. Indeed, the dysfunction of these organelles is one of the Hallmarks of Ageing (12 markers of ageing identified in López-Otín et al., 2023). Ingredients marketed for mitochondrial health

target various pathways: support for the respiratory chain, the formation of new mitochondria, the removal of damaged mitochondria, and protection against oxidative stress. Directly supporting energy production by mitochondria was an approach adopted very early on by Kaneka Nutrients, a subsidiary of Kaneka Corporation. Thus, with Kaneka Q10®, which has been on the market since 1977, the company is one of the long-established manufacturers of pharmaceutical-grade coenzyme Q10. It remains the world's leading manufacturer of CoQ10 and is now also a leader in the development of ubiquinol ingredients (the bioactive and bioidentical form of CoQ10) with Kaneka Ubiquinol™. *"Kaneka Ubiquinol® acts through two major complementary mechanisms. Firstly, it plays a vital role as an electron carrier, thereby contributing to the production of ATP, the body's primary source of cellular energy. It also acts as a powerful antioxidant by neutralising free radicals where they are produced, particularly in the mitochondria and cell membranes. It is the most powerful antioxidant available on the market,"* explains Filip Van hulle, Managing Director of Kaneka Nutrients Europe. This long-established ingredient for energy and cardiovascular health is now evolving towards a focus on mitochondrial health and healthy ageing. A recent study (Acton et al., 2026) showed that a six-week course of Kaneka Ubiquinol®supplementation improved markers of mitochondrial efficiency in young, healthy men. "*These results suggest that Kaneka Ubiquinol®may promote more efficient mitochondrial energy production, even in people without apparent mitochondrial dysfunction,*" emphasises Filip Van hulle.

Another distinctive strategy adopted by Mitsubishi Gas Chemical (MGC) involves supporting mitochondrial biogenesis, the natural process of forming new mitochondria. The company has focused in particular on pyrroloquinoline quinone (PQQ), an antioxidant naturally present in trace amounts in fruit, vegetables and meat, and related to vitamins. Under the brand name MGCPQQ®, MGC has developed a natural source of PQQ in Japan using a proprietary fermentation process. *"A powerful compound that has received multiple certifications and approvals attesting to its safety, efficacy and high quality standards."* According to Atsushi Sugimoto, assistant manager at MGC, *"PQQ acts in particular on signalling pathways involving PGC-1α, a major regulator of mitochondrial biogenesis, but ly also of mitochondrial autophagy, known as mitophagy"*. Research suggests that MGCPQQ®may increase ATP production and help maintain



adequate levels of NAD+, both of which are essential for cellular energy and metabolic health. A recent animal study published in *Food & Function* (Odera et al., 2026) showed that dietary intake of PQQ throughout life significantly delayed age-related decline and prolonged healthy lifespan (improved neuromuscular function and higher levels of physical activity). Furthermore, Atsushi Sugimoto points out that *'animal and human studies of MGC also suggest potential synergistic effects with coenzyme Q10'.*

Preserving mitochondrial function can also rely on maintaining the quality of the mitochondria. The Swiss company Amazentis has adopted this approach by developing Mitopure®, based on urolithin A, which stimulates mitophagy – a selective process that enables the removal of damaged mitochondria, the efficiency of which declines with age. "*Urolithin A is the only known molecule capable of activating mitophagy that has demonstrated its safety and efficacy in rigorous, placebo-controlled human clinical trials focusing on mitochondrial health and muscle,*" explains Professor Johann Auwerx, scientific advisor at Amazentis. Urolithin A is a postbiotic produced by the gut microbiota from ellagitannins, compounds found in certain fruits such as pomegranates and red berries, as well as in nuts and tea. Mitopure® delivers a calibrated dose of urolithin A with a purity of over 98%. Protection against oxidative stress is another approach targeted by Bloomage Biotechnology (China) to preserve mitochondrial function, using MitoEGT™, which is based on L-ergothioneine. This sulphur-containing amino acid, with powerful antioxidant properties, is obtained from the diet. What sets it apart is that it has a specific, high-affinity transporter, OCTN1, which promotes its

$4.8

billion.
Global market for anti-ageing dietary supplements in 2025

(Grand View Research)

accumulation within cells. Ergothioneine can also penetrate the mitochondria most vulnerable to oxidative stress, where it neutralises reactive oxygen species (ROS) in a targeted manner. "*Preclinical experimental data are available on MitoEGT™regarding deep skin ageing, brain ageing and mitochondrial protection (cellular and animal studies), and corresponding articles have been published,*" explains Winni Zhang, Senior Manager of Global Technical Solutions at Bloomage Biotechnology.

AUTOPHAGY: CELLULAR CLEAN-UP

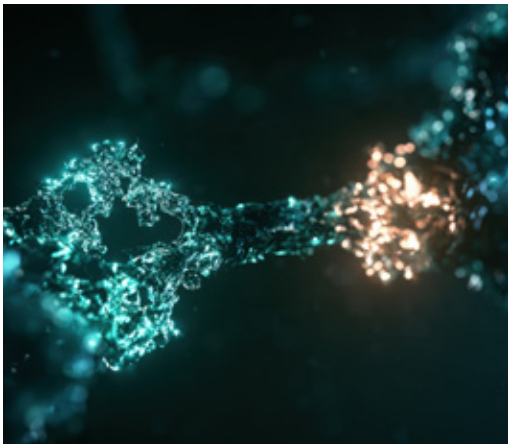
Autophagy enables the cell to break down and recycle certain components that are damaged or have become redundant, in order to maintain its homeostasis. Impaired autophagy is one of the Hallmarks of Ageing. Among the compounds best known for their effect on autophagy is spermidine, a polyamine naturally present in the cells of living organisms and in many foods. It has been extensively studied for its role in cellular cleansing via the activation of autophagy. A 2009 paper in *Nature Cell Biology* showed that spermidine induced autophagy in several models (yeast, fruit flies, nematodes and human cells), accompanied by changes in histone acetylation and increased expression of autophagy-related genes. The Austrian company Longevity Labs+, a spin-off from the University of Graz, has developed CelVio Complex®, a spermidine-rich wheat germ extract distributed in France by Ideactifs. It is "*the only spermidine on the market to have received Novel Food authorisation in Europe*", emphasises Bruno Le Mer, director of Ideactifs. He also points out that "*the ingredient has been the subject of human studies conducted by Longevity Labs+, particularly in the cognitive domain. These have shown benefits in relation to moderate cognitive decline or memory, and other research has highlighted a correlation between supplementation with CelVio Complex® and certain structural parameters of the brain (hippocampal volume and cortical thickness)*". Very recently, a review (Numaguchi et al., 2026) focusing on PQQ and spermidine analysed the various cellular mechanisms involved. PQQ is described there primarily as a mitochondrial and redox regulator, notably associated with mitochondrial biogenesis, and spermidine as a regulator of the cell -quality control via macroautophagy and proteostasis. According to the authors, these mechanisms converge on several common pathways of ageing, illustrating their interconnection.



DNA METHYLATION

Cell-Tech is also interested in the epigenetic mechanisms that modulate gene activity (without altering the DNA sequence). Epigenetic alterations are among the Hallmarks of Ageing. Among these mechanisms, DNA methylation depends on the availability of methyl groups and plays a role in regulating gene expression. SAMe (S-Adenosyl-L-Methionine) is one of the main sources of methyl groups in the body. Balchem developed and launched Optifolin+® in 2024, a formula that combines two nutrients involved in the metabolic pathways contributing to the formation of SAMe: L-5-MTHF (L-5-methyltetrahydrofolate) and choline (VitaCholine®). A recent study (Clément et al., 2026) has provided new mechanistic data on its biological activity and its potential benefits in the field of epigenetic health. Thus, in the human liver cell model used, Optifolin+® increased the intracellular concentration of SAMe by 71 per cent and increased the methylation of certain regions of DNA by up to 14-fold compared with control cells.

Gnosis by Lesaffre positions Quatrefolic®, its patented form of folate (5-MTHF), as a key factor in cellular health and healthy ageing, particularly through its role in methylation processes and homocysteine metabolism, the accumulation of which is associated with cellular oxidative stress. "*Quatrefolic® helps preserve DNA integrity and helps protect cells from oxidative stress,*" explains Emilie Puppinck, health marketing manager for the Vitality category. A clinical study involving 104 patients with high blood pressure showed that supplementation combining Quatrefolic® with vitamins B6 and B12 significantly lowered homocysteine levels, supporting longevity by preserving cellular function and the integrity of blood vessels (Mazza et al., 2016).



OTHER TARGETS: CELLULAR STRESS RESPONSE, TELOMERE SHORTENING

Cellular ageing is closely linked to oxidative stress and chronic inflammation, biological processes that contribute to cellular damage and genomic instability and, more broadly, to a decline in physiological resilience. At Vitafoods 2026, Ingood by Olga positioned Sulfodyne®– its sulforaphane-based ingredient derived from broccoli seeds (distributed in France by Becarre Natural) – as a means of activating the Nrf2 pathway, presented as a cornerstone of healthy ageing. Indeed, this protein is a transcription factor involved in regulating numerous genes associated with antioxidant defences, the cellular stress response and detoxification mechanisms. Sulfodyne® directly supplies sulforaphane in a free and stabilised form, unlike broccoli extracts, which provide a precursor, glucoraphanin. Bloomage Biotechnology also targets the cellular stress response with Bloomsas™, a salidroside obtained through fermentation. Research into this phenolic compound, found in various species of Rhodiola, highlights several cellular mechanisms associated with ageing, notably the modulation of the Nrf2 pathway, mitochondrial function and mitophagy (Liang et al., 2024). Preclinical data also suggest effects on cellular senescence, stress resistance and improved sporting performance.

Another key target of ageing is telomere shortening. These structures play a key role in protecting the ends of chromosomes and maintaining genomic stability. Omega-3 fatty acids, well known for their anti-inflammatory properties, are also the subject of extensive research into their effects on telomere length. A review published in *Nutrients* (Ogłuszka et al., 2022) reported that the majority of studies indicated a beneficial effect of omega-3 fatty acids on telomere length. These fatty acids are, in fact, among the ingredients gaining ground in the field of cellular health, according to Euromonitor International. dsm-Firmenich is developing innovations aimed at combating cellular ageing , and in particular the life's®Omega 60 range, derived from microalgae – the first commercial source to provide both highly concentrated EPA and DHA – which was used in the large-scale European clinical trial DO-HEALTH. Results from a study involving 777 participants aged over 70 who were followed for three years, published in *Nature Aging* in 2025 (Bischoff-Ferrari et al.), showed that supplementation with 1 g of these omega-3s slowed down several epigenetic clocks. An additive effect of vitamin D (Quali®-D) and physical exercise was observed on one of these clocks. The slowing of biological ageing ranged from 2.9 to 3.8 months over three years. •

LA LONGEVITE EN QUELQUES CHIFFRES

• Population mondiale de 60 ans et plus en 2030 : 1,4 milliard (Organisation mondiale de la santé)
• Marché mondial des compléments alimentaires anti-âge : 4,8 Md$ en 2025, avec une prévision de 9 Md$ en 2033 (TCAC de 8,5 %)
• Marché mondial des produits à base de NAD+ : 3,45 Md$ en 2026, avec une prévision 12,2 Md$ en 2033 (TCAC de 15,2 %).

(Grand View Research)

LONGEVITY IN FIGURES

• Global population aged 60 and over in 2030: 1.4 billion (WHO)
• Global market for anti-ageing dietary supplements: $4.8 billion in 2025, forecast to reach $9 billion in 2033 (CAGR of 8.5 per cent)
• Global market for NAD+-based products: $3.45 billion in 2026, forecast to reach $12.2 billion in 2033 (CAGR of 15.2 per cent).

(Grand View Research)