

JUVENESCENCE™

www.juvlabs.com



Company profile

Juvenescence



Juvenescence was founded with a mission to transform what aging means to the world. As the science around aging was starting to accelerate, Juvenescence saw an opportunity to further that science by encouraging collaboration between leading scientists, physicians and investors to create new therapies and products that they hope will empower people to look after their own health. Juvenescence presents a modality-agnostic portfolio of therapies developed by seasoned drug developers and augmented by machine learning.

Juvenescence plans to transform aging and has organised itself into four major divisions, each of which tackles the topic from a different scientific angle: JuvRx focuses on drug therapies; JuvRegeneration spotlights stem cell regeneration; JuvDataScience applies machine learning and AI; and JuvLife emphasises non-prescription IP protected therapies with clinical proof focused on disease prevention.

Juvenescence was founded by three scientist/investors with long-proven track records in healthcare market: Chairman, Jim Mellon, is a Trustee at the Buck Institute for Research on Aging and author of the book, *Juvenescence: Investing in the Age of Longevity* (2017); CEO, Dr Greg Bailey, is a serial bio-tech entrepreneur as Co-founder or director at Portage Biotech, Biohaven, Medivation, Ascent Healthcare Solutions and VirnetX Inc.; CMO, Dr Dec Doogan, has already had a long and successful career including SVP-WW Drug Development at Pfizer and as CEO of Amarin. The founders of Juvenescence have created an impressive \$26 billion of biopharma shareholder value in the past two decades. As CEO, Dr Greg Bailey has stated: “Juvenescence will be an innovative 21st century biotech company. We

will focus on disruptive technologies to prevent or delay age-related disease or to modify aging. We incorporate machine learning, social media and a direct relationship with our patients and consumers to empower and facilitate healthy long life.”

JuvLife is the division of Juvenescence that will focus on creating consumer products that are readily available to manage aging and enhance healthspan. Juvenescence anticipates that JuvLife will quickly become established as the trusted source for high quality, science-based, consumer products. These non-Rx products and functional foods are aimed at supporting individuals as they manage their own health and the onset of age-related conditions. “We are determined to become the trusted source for not only high-quality science-based products but helping everyone better understand aging and how to improve their healthspan and lifespan.”

JuvLife has announced that it will be launching its first major product, branded Metabolic Switch Ketone Ester Fuel, in 2021. Each serving of C6 Ketone Di-Ester naturally raises the level of ketones in the blood to quickly generate a state of ketosis that lasts for several hours. Metabolic Switch was invented by scientists at the Buck Institute for Research on Aging and developed in partnership with the team at Juvenescence. It will be available firstly as a chocolate-flavoured nitro beverage, but additional forms, flavours and variants of the product will also be made available as the product line expands. JuvLife is currently finalising clinical studies and other aspects of commercial scale up for Metabolic Switch, and the company expects GRAS approval of the product in 2021.



JuvLife has a world class team of supply chain experts with experience from numerous major consumer and healthcare companies. The team has built a unique supply chain eco-system of dedicated partners to help produce the proprietary active ingredient, C6 Ketone Di-Ester, as well as converting this bio-active into consumer finished product forms. Metabolic Switch will be produced at a GMP facility in the United States and available in 2, 3, 7 or 28 count packs of 75ml bottles from numerous channels including the Juvenescence website, www.juvlabs.com.

Metabolic Switch for Longevity: Target Hallmarks of Aging

Metabolic Switch provides a clinically proven and powerful means for consumers to access the power of ketosis. The main ketone body produced in ketosis is beta-hydroxybutyrate (BHB).

Butyrate is an interesting therapeutic molecule for aging as it serves as a histone deacetylase (HDAC) inhibitor and influences sirtuins expression, therefore protecting from contributors of aging and disease, such as oxidative stress and DNA damage, by influencing gene expression. As BHB contains butyrate, the hypothesis is that switching the body into ketosis will also act as an intervention to extend lifespan and healthspan.

Flagship Product Deep-Dive

Ketone Metabolic Switch: Product Description

The theory behind Metabolic Switch is that you simply ingest the product to recapitulate the health and lifespan impact of ketosis. However, using a C6 Ketone Di-ester to supply BHB is attributed to Drs Eric Verdin and John Newman, both of the Buck Institute for Research on Aging. This advances Metabolic Switch one step further than other current commercially available ketone drinks. These products raise BHB levels by rapidly detaching a molecule of BHB from another molecule called butanediol. Eric Verdin's use of

a C6 Ketone Di-ester is unique and means, once metabolic switch is consumed, it is broken down in the body into butanediol and a medium-chain fatty acid (also known as medium-chain triglycerides or MCTs) called caproic acid, or C6. In this way, the ketone drink stimulates the body to produce ketones through the process of ketogenesis ("genesis of ketones") in the liver.

Dr Brianna Stubbs, a researcher leading work on the development and testing of the exogenous ketone supplement, believes ketogenesis may be one of the ketone drink's most unique benefits. When our body goes through the process of producing ketones rather than "artificially" elevating them, certain transcriptional metabolic changes occur that are likely to have beneficial effects on health and lifespan. The process of ketogenesis likely provides more health-enhancing effects than just having ketones in one's blood, and "Metabolic Switch" gives your body this ability.

What is most exciting to Stubbs is that ketogenesis from C6 allows you to produce BHB and another ketone body – acetoacetate (AcAc) – in a ratio preferred for human biology. Because of this, Stubbs hypothesises that ketosis achieved by consuming Juvenescence's product will differentiate it from other commercially-available ketone esters.

Beyond the potential effects on health and lifespan, Juvenescence's flagship product causes the notable "metabolic switch"; your body will begin to generate a substantial amount of energy from fatty acids in mitochondria instead of glucose or carbohydrates through glycolysis, which Verdin likens to burning diesel vs a high-octane gas. This means exposing our bodies to less toxic metabolic by-products, which is fundamental to ensure healthy aging.



Metabolic Switch: Pre-clinical and clinical Studies

Published studies to date have focused on satisfying the industry requirements for determining the safety of a novel food ingredient.

The ketone ester has been studied for in vitro metabolism and in vivo pharmacokinetics in rodents. These studies found that the ketone ester was rapidly broken down and was effectively converted to ketone bodies in vivo. The ketone ester has been tested to confirm that there were no mutagenic effects in gold standard in vitro tests. No mutagenic effects were found. The ketone ester was tested in a gold standard subchronic

dosing study in rats. After 90 days of dosing, there were some adverse effects found at the highest dose level tested, so the mid-dose level was the 'No Adverse Effect Level', which will inform the recommended dose level for humans.

A clinical trial is currently underway (NCT04707989) to investigate the tolerability and safety of the ketone ester when healthy adults take it daily for 4 weeks. Once this has been completed, it will form part of the evidence that supports the launch of the ketone ester in a consumer food product, Metabolic Switch.

Metabolic Switch: Ingredients and Dosage

Ingredient	Scientific Evidence
C6 Ketone Di-ester (25g)	C6 Ketone Di-ester, once consumed, is broken down in the body into butanediol and a medium-chain fatty acid called caproic acid. This design means the product not only supplies you with readily available BHB but stimulates the liver to breakdown the caproic acid and produce further ketone bodies. Altogether, this process produces BHB and another ketone body - acetoacetate (AcAc) – in a ratio preferred for human biology.

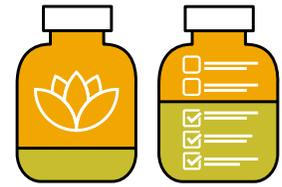
Metabolic Switch: Safety and Risks

As metabolic switch contains a novel food ingredient, it has been tested extensively in vitro and in animal models. The dose has been based on "No Adverse Effect" levels in rodents and the product is currently undergoing a clinical trial to assess tolerability and safety in humans. The outcome of this study is expected to further support the product, which is currently seeking GRAS approval. So far, there have been no major side

effects, however, because of the strength of the Metabolic Switch formulation, some consumers may benefit from initial usage at a "half-serving" level, which has also been shown to be a clinically effective level to achieve ketosis.

Metabolic Switch: Target Market

Juvenescence believes that the target market for metabolic switch will not be bound by their age but will be any "lifetime optimisers who embrace curiosity and delight in getting more out of a lifetime". Juvenescence hopes Metabolic Switch



will become the trusted partner of households with a busy lifestyle, those who are highly engaged in health and wellness and those who are proactively searching for products that will help them to age better.

Success factors

Team and reputation

- The Juvenescence model is to find an opportunity and build an incredible management team around it; notable team members include Jim Mellon, Dr Greg Bailey and Dr Declan Doogan. Advisory board panel members include Dr Michael Hufford, Dr João Pedro de Magalhães and Dr Aubrey de Grey;
- Juvenescence has a world-class team and is well-placed to explore aging, cell regeneration, and age-related diseases and conditions;
- Juvenescence has a very unique business model; the company is one of only a small number of midsize biotechs that are exclusively focused on modifying aging.

Intellectual property

- As a flagship product and first step into consumer products, Metabolic Switch differentiates from other longevity supplements by focusing on changing the metabolism to stimulate ketogenesis;
- Metabolic Switch will be competing with other commercially available ketone esters, but it has the edge due to its unique C6 formula, that will also stimulate liver ketogenesis. This will allow a ratio of BHB to AcAc preferred for human biology;
- As the first company to create a “metabolic switch” for aging, Juvenescence will need to deliver clear consumer-grade understanding to the customer that this is a product that can aid the aging process; explaining the metabolism and how it relates to aging is complex;

“Building a daily preventative health regimen with Metabolic Switch as a key component will support the goals of any consumer seeking to maintain a high level of metabolic health as they age.”

- The company has ensured strong and reliable data through conducting preclinical and clinical trials, to support the novel ingredient as GRAS. The data so far suggests that the product is safe and tolerable in humans. It will be interesting to see if JuvLife continue to test the product for effect on aging outcomes;
- The company have also suggested that it may launch JuvYou, an app that allows customers to input ketone levels, monitor blood sugar and receive recommendations on how and what time it is best to take Metabolic Switch; this personalised approach may enhance customer engagement but app-fatigue may be a risk;
- JuvLife has a second product launching next year that is based around autophagy: it hopes to improve cognition, boost immunity, aid cardiac health, skin, and hair: JuvLife have several deals underway for their product portfolio and aim to launch a product every year for the next four years.

Funding

- Juvenescence has raised over \$162 million in funding over four rounds and is currently raising \$150m in its C round, which hopefully, according to Bailey, will be a prelude to an IPO.

Juvenescence: success grid

Intellectual property: Information for this page is only available within the full report.	Team: Information for this page is only available within the full report.	Unique value proposition: Information for this page is only available within the full report.
Efficacy: Information for this page is only available within the full report.		Competitive advantage: Information for this page is only available within the full report.
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Inflection point: Information for this page is only available within the full report.		

■ = Positive progress ■ = Work-in-progress ■ = Needs attention



About us

The report has been produced by the Market Intelligence Unit of LongevityTechnology – the number one online destination for daily news on the growing longevity market.

As a brand of First Longevity Limited, we bring together innovators and investors to commercialise the companies that will form the longevity economy.

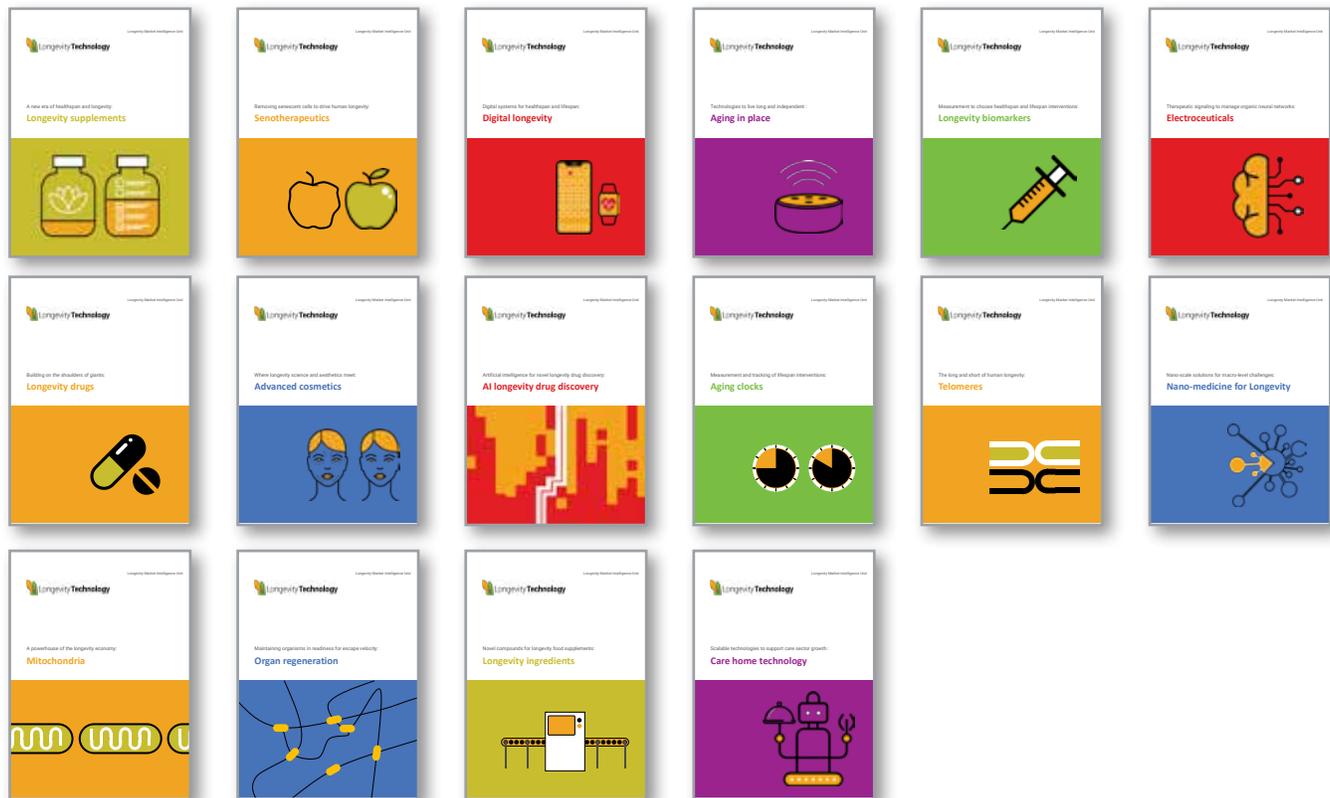
There are already 100+ rejuvenation biotechs working on unique therapies and building R&D pipelines to increase healthspan and lifespan.

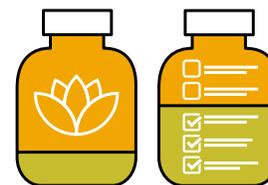
At the same time, all around the world, innovators are releasing nanobots, reprogramming nerve signals and applying AI to create exciting and scalable contributions to human longevity.

As a team we look beyond rejuvenation therapies to embrace other technologies that participate in the longevity investment category: agetech, xenotransplantation, biomarkers, AI, bioprinting, neuroceuticals, GRAS supplements ... over the coming period we will be publishing regular reports.

There are multiple technologies that contribute to the reduction of morbidity and the extension of lifespan: they will provide investors and innovators with both risks and returns. We're here to help analyse, report and educate.

You can find information about our next reports by visiting: <https://longevity.technology/product-category/analysis/>





**We bring together innovators
and investors to commercialise
the companies that will form
the longevity economy.**

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