

NEWS RELEASE

Niagen Bioscience Announces a Newly Published Analysis of Past Clinical Studies Demonstrating Niagen® (Patented Nicotinamide Riboside, NR) Supplementation Improved a Muscle-Specific Marker of Biological Aging

2026-07-28

New epigenetic findings show Niagen NR reduces muscle biological aging and supports healthy muscle function

LOS ANGELES--(BUSINESS WIRE)-- **Niagen Bioscience, Inc.** (NASDAQ: NAGE), the global authority on NAD+ (nicotinamide adenine dinucleotide) with a focus on the science of healthy aging, today announced the publication of a new peer-reviewed analysis of past clinical studies in **Aging Cell** examining the effects of Niagen® (patented nicotinamide riboside, NR) supplementation was associated with reduced muscle epigenetic age acceleration measured by the Muscle Epigenetic Age Test (MEAT) clock. In addition, changes in muscle mitochondrial DNA content correlated with changes in MEAT-derived epigenetic age acceleration, suggesting a potential relationship between mitochondrial adaptations and epigenetic clock measures.

"This is among the first human studies suggesting that Niagen NR supplementation may alter epigenetic aging in skeletal muscle, rather than simply increasing NAD+ or improving mitochondrial function," said Rob Fried, CEO of Niagen Bioscience. "It strengthens the idea that NAD+ restoration can influence biological aging pathways at the tissue level."

The study was led by first author Aino Heikkinen, doctoral researcher, and principal investigator Miina Ollikainen, PhD, Docent in Epigenetics, both of the Minerva Foundation Institute for Medical Research in Helsinki, Finland, in collaboration with Eija Pirinen, PhD, Associate Professor, University of Oulu, and University Researcher, University

of Helsinki, and a multi-institution research team spanning Finland, Denmark, and Australia. With a portion of the data generated through Niagen Bioscience's external **Niagen Research Program**, the study analyzed skeletal muscle and blood samples from three previously published, independent clinical studies, alongside new laboratory experiments in human muscle cells using seven distinct epigenetic clocks to assess epigenetic age acceleration (EAA), a molecular measure of biological aging.

“Our earlier work showed that Niagen NR can enhance muscle mitochondrial health, and this study shows that these benefits may extend to the epigenetic level,” said Dr. Eija Pirinen, University of Helsinki and University of Oulu, and a senior author on the study. “It is a meaningful step toward understanding how NAD⁺ restoration may influence molecular markers of aging in human skeletal muscle; however, additional research must be conducted.”

The Connection Between NAD⁺ and Skeletal Muscle

Skeletal muscle is central to mobility, metabolic function, and quality of life, which changes significantly with age. Aging muscles tend to lose mitochondrial content and function, contributing to sarcopenia and frailty. NAD⁺ is a coenzyme essential to mitochondrial energy production and also serves as a required co-substrate for enzymes that regulate the epigenome, inflammation, and cellular repair. NAD⁺ levels decline with age (up to 65% between ages 30-70) in both muscle and skin, a decline linked to many of the functional changes associated with aging.

Both Niagen NR supplementation and exercise, including HIIT, have been shown in prior research to alter the NAD⁺ metabolome in skeletal muscle. Because NAD⁺ sits at the intersection of mitochondrial function and epigenetic regulation, researchers have long hypothesized that boosting NAD⁺ through supplementation, exercise, or both may influence not only cellular energy metabolism, but also biological or epigenetic aging.

Study Highlights

The analysis integrated skeletal muscle and blood samples from three previously conducted, independent clinical trials: a five-month, 1,000 mg/day Niagen NR supplementation twin study (**Lapatto et al., 2023**), and two independent 4–6 week supervised HIIT training studies (**Søgaard et al., 2017**; **Jacques et al., 2020**), along with in vitro experiments in primary human myotubes. To measure changes in epigenetic age acceleration, skeletal muscle and blood samples were assessed using seven established epigenetic clocks, including DunedinPACE, PCHorvath, PCHannum, PCPhenoAge, PCGrimAge, GrimAge2, and MEAT, a muscle-specific clock.

Key Findings

- A significant association was found between epigenetic age acceleration (EAA) and mitochondrial content following Niagen supplementation, providing new insight into the relationship between mitochondrial biology

and skeletal muscle aging. EAA measures how much older or younger a tissue appears biologically than would be expected based on its chronological age.

- Niagen NR supplementation for 5 months reduced muscle EAA by approximately 2.5 years after five months, as measured by the muscle-specific MEAT epigenetic clock, and significant reductions were also observed with the DunedinPACE and PCHannum clocks.
- The differing patterns observed across several epigenetic clocks support further research into how Niagen NR and HIIT influence skeletal-muscle epigenetic aging, including studies designed to evaluate them together. One possibility is that HIIT-associated inflammation and transient muscle damage may work against certain epigenetic aging signals in ways Niagen NR does not, suggesting the two could offer complementary rather than redundant benefits. Notably, in one clock, HIIT outperformed Niagen NR, reinforcing that future research is needed.
- Following Niagen NR supplementation, six of seven skeletal muscle epigenetic clocks showed changes consistent with lower EAA, with statistically significant reductions observed in the MEAT, DunedinPACE, and PCHannum clocks. Three clocks showed significantly lower epigenetic age acceleration after supplementation in blood. One skeletal muscle clock, PCGrimAge, observed an increase in EAA. These results demonstrate that no single test tells the whole story.
- In vitro, Niagen NR increased NAD⁺ levels in human myotubes (muscle cells) by 1.52-fold versus control-treated cells, though no significant changes in epigenetic aging markers or mitochondrial DNA quantity (mtDNAq) were observed in this cell model, suggesting the muscle-level benefits seen in people may depend on whole-body factors that a simple cell model cannot fully capture.

Relevance

As one of the first studies to compare Niagen NR and exercise's effects on epigenetic aging across multiple biological clocks and tissue types, this research deepens the scientific case that Niagen NR supplementation may influence skeletal muscle epigenetic aging biomarkers and support healthy muscle aging, while underscoring that, like exercise, its effects are nuanced and still being defined through ongoing research.

For more information on the research behind Niagen, visit www.niagenbioscience.com.

About Niagen Bioscience

Niagen Bioscience, Inc. (NASDAQ: NAGE) is the global authority in healthy aging and NAD⁺ (nicotinamide adenine dinucleotide) science. As a trusted pioneer of NAD⁺ discoveries, Niagen Bioscience™ is dedicated to advancing healthspan through precision science and innovative NAD⁺-boosting solutions.

The Niagen Bioscience team, composed of world-renowned scientists, works with independent investigators from

esteemed universities and research institutions around the globe to uncover the full potential of NAD+. A vital coenzyme found in every cell of the human body, NAD+ declines with age and exposure to everyday lifestyle stressors. NAD+ depletion is a key contributor to age-related changes in health and vitality.

Distinguished by state-of-the-art laboratories, rigorous scientific and quality protocols, and collaborations with leading research institutions worldwide, Niagen Bioscience sets the gold standard for research, quality, and innovation. There's a better way to age.

At the heart of its clinically proven product portfolio is Niagen® (patented nicotinamide riboside, or NR), the most efficient, well-researched, and high-quality NAD+ booster available. Niagen powers the Company's consumer supplement, Tru Niagen®, the number one NAD+ boosting oral supplement in the United States† (available at www.truniagen.com), and Niagen™ Plus, featuring pharmaceutical-grade intravenous (IV) and injectable Niagen products (www.niagenplus.com). Pharmaceutical-grade Niagen IV and injections are compounded and distributed by U.S. FDA-registered 503B outsourcing facilities and are available exclusively at clinics with a prescription. NAD Pharmaceuticals Corp., the Company's wholly owned subsidiary focused on developing therapies for accelerated aging and rare genetic diseases, is conducting research on NB4168, a differentiated molecule.

Niagen Bioscience's robust patent portfolio protects NR and other NAD+ precursors. Niagen Bioscience maintains a website at www.niagenbioscience.com, where copies of press releases, news, and financial information are regularly published.

† Based on revenue per largest U.S. e-commerce marketplace (Jan. 2025 – Dec. 2025)

Forward-Looking Statements:

This release contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, and Section 21E of the Securities Exchange Act of 1934. Statements that are not a description of historical facts constitute forward-looking statements and may often, but not always, be identified by the use of such words as "expects," "anticipates," "intends," "estimates," "plans," "potential," "possible," "probable," "believes," "seeks," "may," "will," "should," "could," "predicts," "projects," "continue," "would" or the negative of such terms or other similar expressions. These include, without limitation, statements regarding the potential for Niagen® (nicotinamide riboside, NR) supplementation to influence epigenetic aging, mitochondrial content, or other markers of biological aging in skeletal muscle or other tissues, and the potential implications of the published analysis described in this release.

Forward-looking statements are based on current expectations and assumptions and are subject to risks and uncertainties that could cause actual results to differ materially from those described. These risks and uncertainties

include, but are not limited to: that the findings described in this release are derived from a secondary and largely correlational analysis of samples from previously conducted, independent studies, are preliminary in nature, and may not be confirmed, replicated, or borne out by future or appropriately designed research; and the risks and uncertainties associated with our business and financial condition in general, described in our filings with the Securities and Exchange Commission (SEC), including, without limitation, our most recent Annual Report on Form 10-K and Quarterly Report on Form 10-Q as filed with the SEC.

Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date hereof, and actual results may differ materially from those suggested by these forward-looking statements. All forward-looking statements are qualified in their entirety by this cautionary statement and Niagen Bioscience undertakes no obligation to revise or update this release to reflect events or circumstances after the date hereof.

Niagen Bioscience Media Contact:

Kendall Knysch, Senior Director of Media Relations & Partnerships

310.405.5227

kendall.knysch@niagenbio.com

Niagen Bioscience Investor Relations Contact:

Valter Pinto, Managing Director

KCSA Strategic Communications

212.896.1254

Niagen@kcsa.com

Source: Niagen Bioscience, Inc