

Anti-aging interventions need less hype and more clinical evidence



The aging field needs to develop reliable biomarkers of aging and a solid evidence base for the safety and efficacy of anti-aging treatments.

A central tenet of aging research is that common mechanisms contribute to pathology across many different types of age-related diseases and conditions – the so-called hallmarks of aging. Accordingly, anti-aging treatments should target these overarching drivers of aging, such as inflammation, cell senescence, epigenetic drift, inadequate autophagy and somatic mutation. Although there has been no shortage of potential targets for intervening in these varied processes, data supporting the clinical benefits of anti-aging treatments in humans remain sparse.

For example, although nicotinamide adenine dinucleotide (NAD⁺) has been shown in preclinical models to improve health span and is extensively promoted as a supplement and injectable treatment, clinical trials testing the effects of NAD⁺ supplementation in humans have not yet demonstrated strong disease-modifying effects. NAD⁺ supplementation has been proposed to counter the age-related decline in NAD⁺ levels, but a recent study found that blood NAD⁺ levels remain stable and do not decrease with aging¹, casting some doubt on the wisdom of NAD⁺ supplementation.

Currently, the risks and benefits of injectable peptides, intended to boost wellness and longevity and promoted by influencers on social media², are a topic of hot debate. For example, the peptide TB-500 is related to the naturally occurring peptide thymosin β 4, which is thought to have anti-inflammatory and pro-angiogenic properties. These peptides are not approved in the USA by the FDA (US Food and Drug Administration) but are sold in a gray market – they are labeled as being intended for research use, with unclear sources and quality control.

This situation could soon change. An FDA panel met on July 23 and 24 to consider whether to allow for compounding of seven

different peptides by specialized pharmacies, which would enable wellness and telehealth companies to market them. Although this measure should allow for better oversight of the sourcing and manufacture of the peptides, it remains unclear whether sufficient evidence for the safety and effectiveness of the peptides exists. In the run-up to the meeting, FDA staff had urged caution on the proposal, and FDA scientists pointed to potential risks³ of the peptides during the panel discussions.

By contrast, Robert F. Kennedy Jr, who oversees the FDA in his capacity as the Secretary of Health and Human Services, has expressed enthusiasm for such peptides. Adding to the controversy, the objectivity of the panel of outside experts appointed by Kennedy's office to make recommendations has been widely questioned⁴: six of the panel members sell peptides, and one is a compounding pharmacist. In a non-binding vote, the panel recommended that six of the seven peptides be made available for compounding, with the FDA to make a final decision in the next few weeks following the conclusion of the panel sessions.

The excessive claims being voiced in social media about peptides point to the need for rigorous clinical testing of pro-longevity treatments. But clinical validation of this type of therapy is anything but straightforward. While clinical trials can test the effects of treatment on age-related diseases over the course of a year or two, assessment of health span or lifespan over longer time frames is not practical to perform. What is needed are surrogate markers that can be used to objectively track biological aging.

Aging clocks are well positioned to serve as this type of biomarker, as they track the pace of aging in organs, tissues and cells. These clocks – which can be constructed using methodologies such as proteomics, metabolomics, transcriptomics and many types of imaging – could potentially be used to determine whether lifestyle factors or a pharmacological intervention can modulate the aging process. Alternatively, functional tests can be used to measure how different body systems are aging, such as tests to measure physical strength and exercise capacity.

Although an increased pace of aging based on such biomarkers has been associated with increased risk for a wide range of age-related diseases, studies testing the ability of aging biomarkers to respond to anti-aging interventions are still at an early stage. Determining which clocks or tests can reliably report on biological aging in different clinical contexts is an urgent research priority for the field. As a first step, prospective studies are needed to test whether and which clocks and tests respond appropriately to interventions expected to decrease biological aging.

One research initiative taking up the challenge of developing validated aging biomarkers is XPrize Healthspan, a US\$101 million, seven-year competition. The initiative initially aims to establish rigorous and transparent testing frameworks for measuring muscle, cognitive and immune function. On the basis of an understanding of how the readouts from such tests change over the course of healthy aging, the initiative then aims to identify therapies that can restore muscle, cognitive and immune function by a minimum of ten years in individuals aged 50 to 80 years.

Claims for life-extending elixirs go back to antiquity, and there is a whiff of this type of fantastical thinking in the current wellness culture that promotes untested longevity therapies. In this climate, the aging research field needs to be vigilant of unsupported or exaggerated claims, pushing for validated measures of biological aging and the rigorous testing of anti-aging treatments.

Published online: 11 August 2026

References

1. Trętowicz, M. M. et al. *Nat. Metab.* **8**, 1282–1290 (2026).
2. Cox, L. & Piatkowski, T. Influencers are promoting dangerous peptides on social media – and regulators are struggling to keep up. *The Conversation* <https://go.nature.com/4xisOC1> (2026).
3. Jewett, C. & Smith, D. G. F.D.A. panel's vote on peptides raises concerns about a prescribing boom. *The New York Times* <https://go.nature.com/4hbReO5> (2026).
4. Lawrence, L. & Todd, S. Longevity, wellness physicians named to panel advising FDA on peptides. *STAT+* <https://go.nature.com/3RHxjMk> (2026).