Introduction

Anti-Aging Medicine: The Hype and the Reality—Part II

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In the past 3 years, a large number of articles, letters, and editorials have been published in prominent scientific journals devoted to issues associated with the modern rise of an old concept known as anti-aging medicine (1–10). The topic of anti-aging medicine has become so popular that, in the view of one gerontologist, it has risen to a level where today it is considered one of the top 10 topics in the field of aging (11). These scientific discussions have, in turn, led to considerable coverage by the print, radio, and television media.

Preceding this coverage of anti-aging medicine was a public hearing held in the United States Senate on September 10, 2001, entitled “Swindlers, Hucksters and Snake Oil Salesmen: The Hype and Hope of Marketing Anti-Aging Products to Seniors.” The General Accounting Office subsequently published a related report in which it was concluded that the time had come to enforce existing laws designed to protect the public from potentially dangerous anti-aging products currently on the market, that criminals in the anti-aging industry must be brought to justice, and consumers who suffer from age-related health conditions should know that they may be at risk of physical and economic harm from some anti-aging and alternative health products (12).

A notion of anti-aging medicine as currently promoted by some clinicians at anti-aging or longevity clinics usually includes a combination of traditional preventive medicine procedures, a battery of tests intended to measure biological age, suggested dietary modifications, exercise instruction, the introduction of a suite of hormones and nutritional supplements, and a heavy dose of exaggeration. The underlying premise is that if physiological parameters that are believed to measure biological age can be modified so that they resemble levels present at younger ages, then it is believed that aging has been reversed and length and quality of life extended. Nevertheless, and in spite of numerous claims to the contrary, there is no empirical evidence to support the claim that aging in humans has been modified by any means (9,12), nor is there evidence that it is possible to measure biological age (13), or that anti-aging products extend the duration of life.

The irony is that, in recent years, researchers have begun to piece together important elements of the puzzle of aging, leading some to argue that it is only a matter of time before interventions are developed that modulate the rate of aging in humans (14–17). Some scientists argue that the inevitable demographics of a rapidly aging population combined with an increased life expectancy warrants a significant increase of financial resources and acceleration of scientific efforts to develop aging interventions (14,15,17). Others suggest that if they are successful, interventions that modify the biological rate of aging in humans would change the fabric of human society—leading to questions about whether such interventions should be pursued (18,19).

In this issue and the previous issue of the Journal of Gerontology: Biological Sciences, scientists from a broad range of disciplines discuss various topics associated with the hype and reality behind anti-aging medicine. As guest editors of these back-to-back issues, it was our goal to secure a range of views from scientists in the field. It should be emphasized that, although we solicited manuscripts that would address numerous themes we believed would be of interest, some manuscripts being published were submitted in response to a general call for manuscripts. All of the manuscripts submitted went through an internal review by the guest editors, and they then had to pass through a second tier of traditional external peer review secured independently by the editor of this Journal, Jim Smith. The extra-rigorous review process used in this case has led to what we believe is a valuable and fascinating set of articles that explore the history and hype behind the modern rise of anti-aging medicine, ongoing scientific and public policy debates in the field, and the excitement that currently exists among many scientists who may very well be closing in on a more fundamental understanding of the processes of aging.


In the first section, Dr. Mitch Harman and Dr. Marc Blackman acknowledge that the use of recombinant human
growth hormone (rhGH) in nonelderly GH-deficient adults has been shown in the short term to improve body composition, lean body mass, physical functioning, and bone density, and that it may also reduce blood cholesterol. However, rhGH use is often accompanied by adverse and often intolerable side effects; clinically significant functional benefits have yet to be demonstrated in controlled clinical trials in older persons without pituitary disease; and there is no evidence to support claims being made by anti-aging practitioners that rhGH will prolong youth or extend life. In the second article in this section, Dr. Alan Dangour, Ms. Victoria Sibson, and Dr. Astrid Fletcher examine the scientific literature regarding the use of micronutrient supplementation among elderly people. The authors find that, while survey data indicate there may be a link between dietary micronutrient intake, blood micronutrient levels, and health outcomes, data from randomized controlled trials do not support the use of antioxidant, vitamin, or mineral supplements among healthy, well-nourished older populations.

In the second section of this special issue, Dr. Neil Reisman examines the medical and legal risks to be considered by anti-aging practitioners and their patients when offering, or considering the use of, a regimen of alleged anti-aging treatments. Dr. Reisman and his coauthors suggest that one of the greatest concerns is when patients are indiscriminately treated by age management practitioners with growth hormone, specially compounded medications that do not require Food and Drug Administration scrutiny, and nutritionally unsound and unnecessarily expensive concoctions, promising unproven results. Dr. Reisman concludes that some of these treatments are not only unnecessary but likely to be illegal. In the second article in this section, Dr. Tom Perls explores the anti-aging industry from the perspective of the United States Federal Food, Drug, and Cosmetic Act and its amendments, particularly as it pertains to dietary supplements and human growth hormone. Dr. Perls concludes that the time has come for Congress to reassess the wisdom of the current law regarding dietary supplements. In the case of growth hormone, Dr. Perls emphasizes that nonphysicians who distribute rhGH can be prosecuted as narcotic dealers under the Controlled Substances Act, and that even off-label administration of rhGH by physicians is not permissible because of the very narrowly defined circumstances under which its use is allowed under the law. In the third section on the future of aging interventions, Dr. Huber Warner begins by summarizing the current efforts by scientists to measure and modulate the biological rate of aging. Dr. Warner acknowledges that biomarkers of aging have long been sought by the gerontological research community in an effort to identify what causes the adverse phenotypes that accompany aging, and what can be done to prevent, reverse, or at least retard the development of these phenotypes. Although such efforts have failed, Dr. Warner indicates that the pursuit of a panel of biomarkers for rodents and primates should remain a priority. Dr. Warner goes on to suggest that there are a number of promising targets currently being evaluated in an effort to retard aging, such as the insulin-signaling pathway, stress response systems, developing interventions that reduce inflammation and infections, and interventions that in some way mimic caloric restriction and/or affect energy metabolism. In the second article, Dr. Robert Arking, Dr. Vassily Novoseltsev, and Dr. Janna Novoseltseva suggest that current debates about the future of human longevity rest on two premises: one is that duration of life is limited by fundamental biological forces that are related to a species’ life history such as reproduction, and the other is the suggestion that the history of limit theories have been proven wrong by observed trends in life expectancy. Dr. Arking proposes that there is a third way of looking at the forces that influence duration of life—one based on the premise that there exists an overlooked mammalian phenotype that gives rise to a delayed onset of senescence, and which may be induced by various interventions, including pharmaceuticals. In the third article in this section, Dr. Suresh Rattan summarizes the hypothesis that the process of hormesis, which should be thought of as mild stress-induced stimulation of maintenance and repair pathways resulting in beneficial effects for cells and whole organisms, may play a significant role in future anti-aging interventions. Dr. Rattan evaluates the literature on this topic, sets forth a series of hypotheses regarding the biological mechanism behind hormesis, and then suggests that, like exercise, hormesis may very well be involved as a biological amplifier of adaptive responses leading to improvement in overall cellular functions and performance.

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REFERENCES