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Introduction

Anti-Aging Medicine: The Hype and Reality—I

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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 report based on that hearing 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 that 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).

Anti-aging medicine as conducted by some clinicians at anti-aging or longevity clinics usually includes a combination of a battery of tests intended to measure biological age, suggested dietary modifications, exercise instruction, and the introduction of a suite of hormones and nutritional supplements. 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. In spite of numerous claims to the contrary, there is no empirical evidence to support the claim that aging in humans can be 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 scientists 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 and the following 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 believe will be of interest, some manuscripts being published were submitted in response to a general call for manuscripts. All of the manuscripts submitted first went through an internal review by the guest editors, and then they had to pass through a second tier of traditional external peer review secured independently by the editor of journal, Jim Smith. The extra-rigorous review process used in this case has led to what we believe are 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 this first issue, entitled “Anti-Aging Medicine: The Hype and Reality—I,” authors address three main topics: 1) *Anti-Aging Medicine: The History*; 2) a section devoted to *Debates* between scientists about whether aging is a disease and the societal implications of modifying the biological rate of aging; and 3) a section entitled *Aging: The Reality* in which various researchers discuss in general what is currently known about aging, its measurement, and the extreme tail of the human survival distribution.

In the history of anti-aging medicine presented in the first section of this issue, Dr. Carole Haber demonstrates that the notion of anti-aging medicine did not begin with the modern purveyors as they often claim. Rather, it has a long history with some of the most prominent efforts to modulate aging and its consequences dating back to the 16th century. Dr. Haber documents how the modern anti-aging movement reveals a deep-seated contempt of older people that also demeans the very process of growing old. In the second

article in this section, Dr. Robert Binstock chronicles the history of the war on anti-aging medicine by scientists, documenting both the 3000-year-old history of the anti-aging movement and efforts to discredit the false or misleading claims emanating from those selling these kinds of products. Dr. Binstock goes on to discuss how the war of words that has heated up in recent years is in part, a battle for turf, and that such efforts may in fact backfire as anti-aging practitioners are being provided another platform to get their views to the general public. Dr. Stephen Post then weighs in with the argument that the effort to extend duration of life, known as *prolongevity*, is currently evaluated using two main conceptual themes—*natural law* (suggesting that *prolongevity* may not be desirable) and *egalitarianism* (Why pursue *prolongevity* when there are so many other problems of inequality in the world?). Dr. Post makes the case that *prolongevity* can be supported as long as the goal is to primarily postpone the infirmities associated with growing older. In the final essay in this group, Dr. Ladislav Robert describes the French transition from basic research, to clinical gerontology, to the modern rise of anti-aging medicine. Dr. Robert makes the case that many health professionals in France may be attracted to anti-aging medicine because of financial advantages associated with administering substances that require neither insurance nor proof of efficacy.

The second section of this issue is devoted to ongoing debates in the field of aging. The debates in these issues are designed to encourage a form of point/counterpoint dialogue between two scientists on a particular topic as if the reader is listening in on a personal conversation. The first debate between Dr. Robin Holliday and Dr. Leonard Hayflick is devoted to the age-old question of whether aging is a disease. The second debate between Dr. Gregory Stock and Dr. Daniel Callahan is devoted to what societal implications might follow from successful efforts to modify the biological rate of aging in humans, and whether such interventions should even be pursued.

In the third section of this issue, four scientists address varying aspects of the reality of biological aging. In the first article by Dr. Robert Butler and coauthors, the long-term effort to identify biomarkers of aging is presented. Among the many conclusions in this manuscript, the authors suggest that there is no scientific basis for claims that it is currently possible to measure or modify biomarkers of aging, and that practitioners of anti-aging medicine should be distinguished from mainstream clinicians who are concerned with health promotion and disease prevention. In the second article, Dr. Robin Holliday summarizes the various theories, causes, and mechanisms of aging, the evolution of an aging phenotype, and he discusses the genetic contribution to senescent processes. In the end, Dr. Holliday concludes that the claims of extreme longevity on the horizon by proponents of anti-aging medicine do not meet the test of reality. Such gains, even if they could occur, would likely be accompanied by other biological attributes that many people would find undesirable. In the third paper, Dr. Leonard Hayflick explains why the term “anti-aging” makes no sense in the absence of measures of biological aging or in light of the fact that aging is a fundamental property of all living things. Dr. Hayflick goes on to explain why it is important to understand the clear

distinction between the biological forces that influence duration of life (*longevity determination*), and those that influence aging itself. In the end, Dr. Hayflick concludes that “anti-aging medicine” should be considered the second oldest profession. The final manuscript in this section is by Dr. L. Stephen Coles on the topic of the epidemiology of supercentenarians. Dr. Coles is one of a handful of scientists with experience in studying this scarce and highly selected population, and in this manuscript he provides a description of how these individuals are identified, verified, and eventually evaluated by clinicians. By revealing the supercentenarian phenotype, Dr. Coles provides the reader with a glimpse into the lives of the extreme outliers of human longevity.

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