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The Aging Biomarker Consortium represents a new era for aging research in China

The global population of older people is growing at an unprecedented rate, with the number of people over 65 years of age expected to reach 1.6 billion by 2050. Given that aging is a prominent risk factor for multiple chronic diseases, the increased prevalence of such diseases among older people poses a formidable global burden and a substantial healthcare challenge. Proactively addressing these challenges will require a comprehensive understanding of aging biomarkers for benchmarking healthy aging for accurate determination of the transition into a pathological state. Such knowledge is also critical for answering fundamental questions in aging research, including how to measure biological age, identify causes of accelerated aging and age-associated disorders, and develop strategies for aging interventions. In response to this need, we established the Aging Biomarker Consortium (ABC) (Fig. 1).

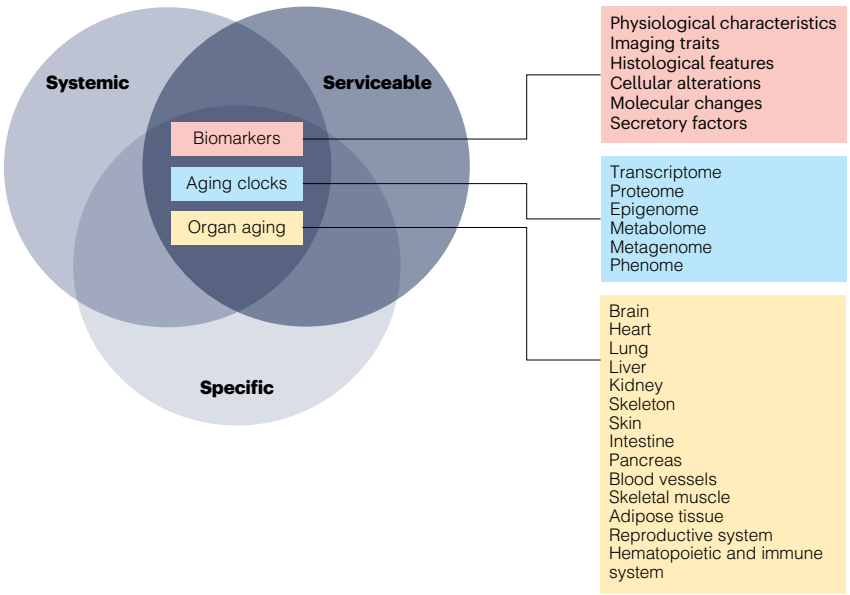

Fig. 1 | Mission and roadmap of the Aging Biomarker Consortium.

'Aging biomarkers' refers to scientifically measurable parameters of the aging process; these are age-related changes at cellular, organ and organismal levels that can be applied to predict the transition into a pathological state[1]. Biomarkers can be classified into six categories: physiological characteristics; imaging traits; histological features; cellular alterations; molecular changes; and secretory factors. These six categories provide a framework for mechanistic studies of the fundamental principles of aging that uncover cellular and molecular insights into regulatory networks that govern the aging process[1]. In addition to serving as biomarkers, some are often referred to as 'drivers of aging' and may hold potential as intervention targets for slowing down the aging process[2–5].

To qualify as a robust biological measurement of aging, a biomarker must have three essential characteristics: it must be specific (to the extent and rate of aging rather than pathological effects); it must be systemic (when combined, a group of biomarkers should reflect multi-dimensional changes in certain systems); and it must be serviceable (for translation into clinical practice). Primary resources for biomarkers at our disposal include behavioral, imaging and humoral data, all of which can be measured using minimally invasive procedures.

By providing a comprehensive repository of aging biomarkers and proposing standards for their measurement, the ABC is poised to make considerable contributions to aging research and clinical practice. Through collaborations among consortium members, the ABC aims to address the following critical topics in aging research: how reliable and valid aging biomarker systems can be constructed in population-based studies; how aging biomarkers can be used to understand the fundamental principles of aging; how biological aging risk information can be effectively analyzed; how the efficacy of aging interventions can be assessed with a collection of biomarkers; and how the influence of socioeconomic factors on individual aging can be evaluated while potential ethical issues are avoided.

It is worth noting that 'physical examination data' refers to unified standards irrespective of age groups and thus cannot accurately reflect age-dependent alterations in a person's health status. Aging itself is a major risk factor for health decline, so reliable biomarkers are needed to calculate a person's biological age. To address this issue, we are integrating multi-omics data, including (single-cell) transcriptome, proteome, epigenome, metabolome, metagenome and phenome data[6,7], to launch the Aging Index initiative aided by Artificial Intelligence, referred to as AI[2]. By leveraging these approaches, we will comprehensively analyze and screen a list of aging biomarkers and corresponding aging clocks in people undergoing natural aging and centenarians, as well as in patients experiencing accelerated aging. This will generate a collection of aging biomarkers, along with methods and techniques, that will better capture and reflect various physiological states. Ultimately, the ABC will establish an accurate biological-age-evaluation system for the Chinese population, which can serve as a foundation for future collaboration with other aging research consortia worldwide (such as the National Institute on Aging's Predictive Biomarkers Initiative and the European MARK-AGE study to establish biomarkers of human aging[8]).

Correspondence

The ABC's efforts to identify and characterize aging biomarkers and propose standards for their measurement have already provided a variety of resources for researchers and clinicians[1,3]. The ABC produced a consensus statement for a biomarker framework for brain aging based on the latest research results and practical experience of experts within the consortium[9]. The statement recommends biomarkers of brain aging, including behavioral functional markers, imaging markers and bodily fluid markers, that can be used to assess brain aging and can facilitate brain-aging-related research. The ABC plans to release a series of consensus statements on aging biomarkers for other organs, such as the heart, lung, liver and blood vessels. To better understand the mechanisms of aging and to develop effective treatments for age-related diseases, the ABC also promotes aging cohort studies that focus on specific organs or systems.

As the field of aging research advances, medical and social considerations arise, including philosophical concerns, scientific considerations, and ethical, social and economic issues, including animal welfare, individual privacy, participant's rights and the clinical protection of participants. The ABC will establish ethical standards within an accountable governance framework that is balanced, inclusive and tailored to the unique challenges of aging research[10]. Adherence to this framework will help promote responsible innovation and self-regulation and further advance research in this area, while also ensuring the protection of participants' rights and well-being.

Researchers around the world have collaborated to combat climate change and infectious diseases; we now need to join forces to address global aging. The ABC is a non-profit scientific research collaboration that fosters cross-disciplinary cooperation among experts from academia, clinics and industry in aging research and related disease treatments. As the Chinese philosopher Mencius said, we must honor all of our elderly with the same care that we give to our own parents ("老吾老以及人之老"). The consortium was initiated and established on a voluntary basis by its members, and the ABC cordially invites collaboration with entities that have advanced technology, equipment, capital and other resources. Together, we can create a platform that is open, domestically focused and globally advanced, promoting knowledge sharing and collaboration within the field of aging research.

By accelerating progress in the field of aging research through collaborations within and outside of China, the consortium intends to play a supporting role in aging research, building guidelines and standards for the study of aging biomarkers, holding multilateral conferences on aging research, and promoting a planned international key science program on aging research. The consortium seeks to build closer partnerships for health cooperation, connectivity, green development, openness, diversity and inclusiveness to advance the understanding of aging and to extend the healthspan of humans in a community of common health for mankind.

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Competing interests

The authors declare no competing interests.