great socio-economic challenge. It is estimated that there will be more than 30 million people over the age of 80 will be in the U.S. by 2050; about half of them will suffer from different forms of dementia, and at least 3 million of all adults will be diagnosed with Parkinson's disease.[5] The expected prevalence of age-associated conditions will have substantial consequences for future society, including increased financial and psychological burdens for families and greater pressure on government health care programs and entitlement budgets.[6,7] The demographic trend consisting of an increasing proportion of aged people in the populations of developed countries likely explains the dramatic increase in the interest of the lay public and country leaders in research in the field of biogerontology.[8]

1.2 Human Life Extension: Concerns and Considerations

Investigations aimed at human life extension have traditionally raised concerns that it can lead to the growth of the older population segment and, consequently, to the high prevalence of ageing-associated chronic pathologies. Numerous experimental studies have, however, demonstrated that life extension is usually accompanied by delayed or reduced morbidity, including cardiovascular disease, neurodegeneration, and tumors.[9] There is also increasing evidence from epidemiological studies, which is consistent with the findings from animal models. For example, centenarians, in particular those who live in so-called 'Blue Zones' (five regions in Europe, Latin America, Asia and the US with unusually high concentrations of centenarians), have been not only shown to exhibit exceptional longevity but also often remain free from disability and chronic diseases until very advanced age.[10]

The compression of morbidity has been the primary strategy in gerontology and geriatric research during the last few decades. This strategy claims that we may limit morbidity to a shorter period closer to the natural ending of life, thus reducing the burden of illness and disability by delaying the age at onset of major age-associated chronic disorders.[11] Geroscience, a novel branch of geriatric medicine, is centered on healthspan extension.[12] Extension of healthspan is a crucial component of achieving 'optimal longevity', defined as living long, but with good health and quality of life, including improved functioning, productivity and independence.[11] Attempts to increase healthspan are currently focused on slowing the basic biological processes accompanying aging, such as mitochondrial dysfunction, cellular senescence, age-related decline of stress resistance, dysregulated cellular energy sensing and growth pathways, impaired proteostasis, deteriorated stem cell function/bioavailability, as well as oxidative and inflammation stress.[13,14] All these processes interfere with the normal physiological cellular signaling pathways, demanding compensatory adjustments with aging to maintain homeostasis. At a certain age, however, these compensatory mechanisms become exhausted and different aspects of aging are manifested,