
Preface

Aging is an almost universal process within biological systems, one which leads to a decline in functional capacity, disease onset, and eventually death. There has been much interest in recent years to elucidate the molecular mechanisms that underlie the aging process. Many theories have been proposed since the last century that aim to explain the causes of aging. There is no one theory that completely satisfies the phenotype of aging, but genetics and environmental factors play an important role in the etiology of age-related pathologies and the aging process. However, there is still much to be learned about the aging process which has been termed one of the last great frontiers in biology. Demographic changes worldwide are leading to increased average life expectancies within our populations. These changes in population characteristics will impact upon the economies of the supporting society, with increasing healthcare and infrastructural costs arising from the prevalence of age-related pathologies and other physical disabilities associated with advancing years. Many researchers worldwide are working in the attempt to identify key cellular processes through which it might one day be possible to slow down the aging process and thus increase the health span of humans.

Numerous research projects—from the cellular through to tissue, organ, and whole organism studies—are currently underway to investigate the multifactorial aging process. In *Aging Methods and Protocols* we present a number of protocols, described by recognized experts in their field, which are being/ have been used to further our understanding of aging processes. The aim of the editors here has been to provide a flavor of recent research advances in as many areas of biological gerontology as space permitted in this single volume. The editors regret that exigent circumstances may have caused under- or even nonrepresentation of a number of equally exciting aging research areas.

The editors were delighted that Professor BL Strehler, who needs no introduction to those familiar with the field of biological gerontology, agreed to contribute an introductory chapter to this text entitled *Understanding Aging*. Over several decades, he has himself made, and continues to make, a significant contribution to our understanding of the molecular, chemical, and biological processes that contribute to aging. The editors encourage all readers to obtain a copy of the long-awaited third edition of Professor Strehler's book *Time, Cells and Aging*, for further in-

sights into the landmark findings within aging research. A big thank you for your inspiration and support Bernie!

The remainder of the volume is dedicated to the presentation of detailed protocols that have been/are being used in aging research. We begin by presenting protocols for the study of factors associated with cell senescence and cell death.

It has been proposed that alterations in the body's ability to metabolize xenobiotics and/or to defend itself or respond to biomolecule damage plays a critical role in the accumulation of damaged biomolecules in vivo as a function of age. A number of protocols that explore these aspects are presented. In addition, we have included a section on the identification and quantification of biomolecular damage (nucleic acid, protein, and lipid modifications are described) in vivo.

The idea that mutations within mitochondrial DNA might lead to mitochondrial dysfunction, and thus to cellular decline/death has received much attention in recent years. We have included a number of protocols designed to measure the morphological, functional, and characterization of the molecular changes that accumulate as a function of age within mitochondria.

The process of immunosenescence (age-related decline in the immune system) has been proposed to account for the increasing incidence of morbidity and mortality associated with infection, cancer, and possibly autoimmune phenomena with increasing age in humans. This volume includes a description of protocols that enable genetic and functional characteristics of immune cells and the immune system to be determined.

The final section of *Aging Methods and Protocols* presents two case studies. The first is on the role of dietary restriction in life span extension, to date the only recognized way through which life span (health span) can be extended in rodents and primates. The second is how we can establish and utilize transgenic animals for the elucidation of the molecular aspects of aging.

The editors wish to thank each of the contributors to this volume and hope that the readership find our work to be stimulating and informative for their own research interests.

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