Molecular Gerontology

Research Status and Strategies

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PREFACE

Ageing is an important biological, social and emotional issue that affects almost all aspects of our lives. In recent times, there has been a significant increase in interest in research on the molecular and biochemical basis of ageing. This is not only due to a rapidly changing demography throughout the world in which the proportion of the elderly in the population is increasing progressively, but also due to the realisation that the process of ageing is the fundamental reason behind most of the major diseases, such as cardiovascular and cerebrovascular diseases, cancer, cataracts, insulin-independent diabetes, muscular atrophy, osteoarthritis, osteoporosis, senile dementia (for example, Alzheimer's disease), renal failure and retinopathy.

The aim of gerontological research is to achieve the ultimate goal of healthy old age and increased years of independence for older people. It is clear that if we want to know the aetiology of an age-related disease and if we want to find out preventive and curative measures to counter that disease, then we need to study the process of ageing itself. Furthermore, unravelling the fundamental mechanisms of ageing which ultimately lead to the development of a plethora of functional impairments and diseases is a pre-requisite for developing appropriate means of increasing mobility, activity, creativity, and independence in the elderly. Therefore, there is not only a need of undertaking more basic research in ageing, but also it is essential that biogerontology is properly taught to graduate and post-graduate students of biology, biotechnology, and medicine.

The aim of this book is to give an overview of molecular gerontological research in terms of its present status and future research strategies. The molecular gerontological perspectives covered in this book represent the latest and most topical areas of research, such as the stability of the nuclear and mitochondrial genomes, regulation of gene expression from DNA to RNA to functional proteins, molecular similarities and differences between ageing and cancer, and origin of various age-associated diseases. The issue of the genetic regulation of ageing and longevity is discussed in the framework of premature ageing syndromes and centenarians. The failure of homeostasis as the underlying principle of ageing is the basis of all discussion about various mechanisms of defence and repair, including altered responsiveness and constant remodelling of the immune system. Furthermore, advantages and disadvantages of some new technologies, such as transgenic organisms, and the use of various nutritional and chemical modulators of ageing and lifespan are evaluated. Suggestions are made for future research strategies in the field of molecular gerontology.

This book is the outcome of the collective effort of the participating groups in the European Commission's BioMed and Health Research Concerted Action Programme titled "Molecular gerontology: the identification of links between ageing and the onset of

age-related diseases” (BMH1 CT94 1710). The book is aimed at students and researchers as a text book on molecular aspects of ageing to be followed during any courses on biogerontology being offered in the universities and medical colleges throughout the world.

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