

# PEPTIDES and AGEING



Vladimir Kh. Khavinson

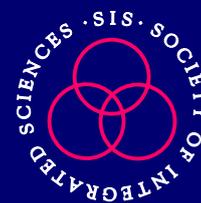
Director of the St.Petersburg Institute of Bioregulation and Gerontology of the North-Western Department of the Russian Academy of Medical Sciences, graduate of the Military Medical Academy of the Russian Federation, Vice-President of the Gerontological Society of the Russian Academy of Sciences, Associate Member of the Russian Academy of Medical Sciences, Professor, Doctor of Medical Sciences, Distinguished Inventor of the Russian Federation, Winner of the USSR Council of Ministers Prize, author of over 400 research publications, inventions and patents.

The objective of the book is to describe the main findings and concepts that have emerged during about three decades of studies of the role of biologically active peptides in ageing. Chapter 1 presents a brief introduction to the basics of peptide biology. There are emphasized those aspects of peptide biology, which are most relevant to the biology of ageing and to the clinical use of biologically active peptides. Chapter 2 is a review of the main experimental findings – from isolation of the first biologically active peptide preparations from the thymus and pineal gland in early 70-ies to the construction of small biologically active peptides with defined structures. Among the biological effects of the peptides the most notable refer to their ability to improve many immunological and endocrine functions undergoing a progressive impairment in the course of ageing and to increase the lifespan of mice, rats, and fruit flies in different experimental settings. These findings have provided the basis for the concept of tissue-specific effects of peptides obtained from respective body organs and for the peptide theory of ageing advocated by the author. The most recent findings suggest that the effects of the peptides under consideration are realized through changes in gene activity. Chapter 3 describes clinical effects of the complex peptide preparations and synthetic peptides, 6 of which are included into the State Pharmacopoeia of Russia. These therapeutics seems to ameliorate many pathological conditions typical of human ageing. In fact, clinical trials have shown that the two of the peptide preparations, Thy-malin and Epithalamin, are among few pharmaceuticals producing anti-ageing or geroprotective effect in humans. On the whole, the book may be useful for clinicians and biomedical researchers. It may suggest novel approaches to widespread clinical problems and provide challenges that can drive further research in the field of biologically active peptides and biology of ageing.

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## PEPTIDES and AGEING

SCANNING of the latest issues of periodicals specialised in ageing research may draw a gerontologist's attention to a number of publications that describe the effects of peptide preparations developed in Russia at the St.Petersburg Institute of Bioregulation and Gerontology. The authors claim that their products are able to render a whole range of effects generally believed to be beneficial for the inhibition of ageing and age-associated diseases. It is noteworthy that some of the preparations are included into the State Russian Pharmacopoeia and used in clinics for good as it comes out. Moreover, the authors report that some of the preparations increase the lifespan and slow down ageing rate in a bewilderingly broad range of experimental settings: from mature *Drosophila* flies whose larvae have been treated with an unprecedentedly low dose of the preparations to rats and mice treated lifelong.

AMONG other outcomes it has been reported that a synthetic tetrapeptide designed basing on amino acid composition of a mixture of peptides extracted from the pineal gland could restore melatonin production in old monkeys, reduce spontaneous and induced tumour incidence in rats and mice, enhance antioxidant defence in flies, rats, and humans, and slow down retinal degeneration in rats with Retinitis Pigmentosa. All this is a result of more than thirty years of research effort, which mostly remained concealed being reported in obscure Russian journals unavailable to the Western audience.

NOW, thanks to this book, for which this foreword has been written, the entire range of evidences that substantiate the advances achieved by the developers of the preparations in question is open to anyone. So, it is up to readers to decide whether they believe what they read or not. Of course, although the book fills many gaps evident from the first glance at scattered publications, it exposes other gaps not filled by research. It is only quite recently that the most advanced methods of modern biology including DNA-microarray have been used to get a better insight into mechanisms of action of the peptides described in this book. Hopefully, it will stimulate efforts to control the data expose, confirm the results obtained, regarding the biological and clinical activity of the peptide developed in St.Petersburg as well as to understand the mechanisms of action of these preparations.

**Professor Mario Passeri**

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FOREWORD • INTRODUCTION

CHAPTER I

**Aspects of peptide biology • General considerations • Regulatory peptides • Ageing and peptides**

CHAPTER II

**Experimental studies of the anti-ageing effects of peptide preparations • General characteristic of peptide preparations • Complex peptide preparations (Cytomedins) • Synthetic small peptides (Cytogens)**

**Effects of peptide preparations on ageing, longevity, and spontaneous carcinogenesis • Epithalamin, ageing rate, and lifespan • Effects of Epithalamin and Thymalin on lifespan and spontaneous carcinogenesis in rodents Epitalon, ageing rate, and lifespan • Effects of Epitalon, Thymogen, and Vilon on lifespan and spontaneous carcinogenesis in rodents**

**Effects of peptide preparations on the factors and correlates of ageing • Antioxidant defences • Effects of Epithalamin • Effects of Epitalon and Vilon • Immunity • Effects of Thymalin • Effects of Thymogen and Vilon • Comparative studies of immunomodulating activities of Thymalin, Thymogen, and Vilon • Carcinogenesis • Effects of Epithalamin and Thymalin on induced carcinogenesis in rodents • Effects of Epitalon, Thymogen, and Vilon on induced carcinogenesis in rodents • Tissue regeneration and degeneration. Tissue-specific effects of peptide preparations in tissue and cell cultures • Effects of peptide preparations on tissue regeneration in vivo • Effects of Epitalon on visual functions in Campbell rats with hereditary pigmented retinal degeneration • Neuroendocrine system • Neuroendocrine effects of Thymalin, Thymogen, and Vilon • Effects of Epithalamin on the reproductive system • Effects of Epithalamin and Epitalon on the pineal gland • Gene expression • Mitochondrial functions • Summary and conclusions**

CHAPTER III

**Clinical studies of peptide preparations**

• **Epithalamin** • Hereditary predisposition to age-associated diseases • Age-associated diseases • Premature senescence • Climacteric cardiomyopathy • Cancer after radio- or chemotherapy • Aspirin-induced asthma • Asthenic syndrome • **Thymalin**. Conditions after thymectomy • Age-associated diseases • Cancer after radio- or chemotherapy • **Thymogen** • Infectious diseases • Immune impairments • Other diseases • **Vilon**. Chronic inflammations and infections • Cancer after radiation therapy • **Cortexin** • Circulatory encephalopathies • **Retinalamin** • Retinalamin in eye disease treatment • Retinalamin in combination with other Cytomedin preparations in eye disease treatment • **Prostatilen** • Prostate adenoma • Prostatitis • Male sexual dysfunctions • **Summary and conclusions**

GENERAL DISCUSSION • REFERENCES