PEPTIDES AND BIOREGULATION

Khavinson V.Kh., Malinin V.V.

St. Petersburg Institute of Bioregulation and Gerontology of the North-Western Branch of the Russian Academy of Medical Sciences, St. Petersburg, Russia

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The expansion of active human life span is one of the most important aims of modern gerontology and prophylactic medicine as a whole. Present-day development of gerontology not only promotes our understanding of the mechanisms of ageing, but also opens new possibilities for the creation of geroprotectors, which are physiologically adequate for humans. Multipronged studies of the mechanisms of effect of peptides showed, that this class of compounds enables the most adequate response to these requirements. Recent genome level studies of peptides activity substantiate the classical data on the normalizing influence of peptides on age-related hormonal-metabolic and immune alterations.

The authors of the article develop a new concept giving a comprehensive view on evolutionary and biological role of peptides in the organism. Peptides exert a wide range of physiological effects, manifested in the regulation of the expression of certain genes and restoration of their structure, these effects being aimed at supporting homeostasis and holding back genetically predetermined ageing.

Preventing premature ageing and age-related pathology for the purpose of expanding life span and preserving active longevity of humans is one of the priority tasks of present-day biology and medicine.

Ageing is characterized by an intricate complex of molecular-genetic and biochemical alterations, which are accompanied by disordered peptidergic system of organism functions regulation. In terms of morpho-functional equivalents ageing may be defined as involution of organs and tissues, first of all of those related to the main regulatory systems - nervous, endocrine and immune. The study of processes underlying age-related involution of organs and tissues revealed a low level of physiologically active peptide substances production in these organs and tissues, which prompted a conclusion on the importance of peptides in the regulation of the mechanisms of ageing. The system of peptides is universal for neuroimmunoendocrine interactions. Alongside with that, peptide regulation of physiological functions of the organism involves tissue specific peptides, which support cellular homeostasis. Peptide bioregulators exist in different cells and tissues, are generated in the process of limited proteolysis, reveal a wide range of biological effects and coordinate the development and functions of multicellular systems. Being parts of a multilevel hierarchy, the mechanisms of peptide regulation of homeostasis perform one common task, consisting in the coordination of biosynthesis in organism cells by affecting gene expression (Khavinson, Malinin, 2005).

Due to the close interconnection of immune functions and ageing, the study and design of medications for correcting stress-induced immune deficiencies and preventing premature ageing are of utmost importance.

Present-day development of medicine is characterized by significant achievements in the design of peptide immunomodulators, in the study of their clinical efficac y and in the substantiation of the expedience of their use in the complex treatment of different diseases and pathologies.

We have proposed a concept of peptide thymomimetic regulation of protective and restorative functions of the organism, based on small peptides, which are involved in the proliferation and differentiation of T-lymphocytes. Our concept enables new approaches to the design of peptide medications revealing thymomimetic and immunomodulating effects. It was revealed, that natural and synthetic peptide thymomimetics play an important role in the regulation of cellular immunity, as well as of inflammatory and regenerative processes. Theoretically and practically important data prompted a conclusion that peptide thymomimetics originate not only from the thymus, but also from other cells, which produce such peptides in the process of limited proteolysis using predecessor proteins (cytokines, growth and thymic factors, immunoglobulins and other proteins) within close proximity of T-lymphocyte receptors. This enables the organism to perform thymomimetic regulation in damaged tissues without direct dependence on thymus functions. This supports the idea of a universal system of bioregulation, which is based on tissue specific oligopeptides, selectively transmitting the information, which is vital for supporting cellular homeostasis, by means of interaction between immune, nervous and other systems cells.

Presently we possess pathophysiological data pointing out the expedience of using peptide thymo-