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MOLECULAR PHYSIOLOGY AND GENETICS

CLINICAL AND PHARMACOLOGICAL CLASSIFICATION OF SHORT PEPTIDES

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Abstract

The main source of peptides in the body is the enzymatic cleavage of proteins as it passes through the gastrointestinal tract, starting with the stomach and ending with the large intestine. Special additional forms that are used as food additives are: protein hydrolysates of various origins; separate fractions of peptides with different molecular weights; complexes of peptides with other nutrients and pharmacological nutrients.

Keywords: "Short" peptides, Peptide mimetics, Short peptides ACE inhibitors, Antimicrobial peptides (AMPs), Protein-peptide complexes.

The classification of the so-called of "short" peptides used in clinical and sports medicine is based on the physical and chemical profile (composition) of the peptide, amount and characteristics of amino acids in the chain, as well as the preferential direction of the metabolic action. If some of the compounds are already actively used in practice and have one or another level of evidence (from the highest "A" to the lowest "D"), then the other part is considered as promising due to the presence of theoretical premises and/or experimental positive results. However, in this edition we considered it necessary to include in the classification all available options, based on the rapid development of sports nutrition as a science and an integral part of clinical nutrition, as well as the growing interest of practitioners and trainers in new means of non-pharmacology of natural origin. In this case, only one variant of the introduction of short peptides into the body is considered oral (enteral), with the complete exclusion of the injection forms in accordance with the requirements of the Prohibited List WADA-2018.

Protein hydrolysates are a combination of short, medium and long peptides and free amino acids, combining nutritional and regulatory functions.

Peptide mimetics (thymalin, timogen, vilosen) are complexes of short peptides with a molecular weight from 600 to 6000 Da with a predominantly immunostimulatory, anti-inflammatory and regenerative effect.

Short peptides ACE inhibitors (angiotensin converting enzyme) components of milk protein hydrolyzate tripeptides (valine-proline-proline VPP, etc.), as well as a number of other short peptides of animal and plant origin that can block the action ACE and retard the conversion of angiotensin-1 to angiotensin-2, stabilizing blood pressure and other indicators of the state of the cardiovascular system (Kawagushi K. et al., 2012).

L-Glutamine Peptides:

- *L-glutamine dipeptides L-alanyl-L-glutamine, glycyl-L-glutamine* with a predominant effect on the integrative function of the intestine (local immunity, nutrient absorption, intestinal barrier) and anabolism of muscle tissue;

- *triand tetrapeptides whose structural component is the L-alanyl-L-glutamine bundle* (for example, peptide line IPH-AGAA) with a predominant effect on skeletal muscle function.

Tyrosine, cysteine, glycine dipeptides: glycyl-L-tyrosine, L-alanyl-L-tyrosine, L-alanyl-L-cysteine, which have a stabilizing effect on cell membranes and are part of many dipeptides along with L-glutamine (Furst P., 2000).

Glutathione and its analogs. Glutathione tripeptide γ -glutamyl-cysteinyl-glycine) is one of the most widely distributed intracellular peptides of the so-called polymodal action, which is involved in the transfer of amino acids through the cell membrane in redox and other processes in the cell. Short peptide glutathione is also among the most widely used peptides in sports nutrition products, despite the inconsistency of data on its efficacy in exogenous administration.

Antimicrobial peptides (AMPs) are produced by microorganism cells and microbiomes and have an antibacterial effect (Mahlpuu M. et al., 2016). Synthesized in all living organisms in ribosomes or outside the ribosomes. But because of their low stability, they are mainly used locally in dermatology and cosmetology, which is also to some extent consistent with the goals of sports medicine.

Neuropeptide dipeptides, whose efficacy when ingested, is determined not only by the ability to penetrate the intestinal barrier using the PEPT1 transport system, but also through the blood-brain barrier (BBB), using the PERT2 transport system. In the Russian Federation, drugs Dilept and Noopept, in the structure of which there are L-prolyl-L-tyrosine and L-prolyl-L-glycine dipeptides that provide the psychotropic properties of the compounds, belong to the neurogenic peptides (Seredenin SB et al., 2010; Gudasheva T.A., 2011).

Protein-peptide complexes, in which short peptides play the role of catalysts for the absorption of proteins cleaved after ingestion in the stomach and intestines to peptides and amino acids (synergism with the action of proteolytic enzymes) of and their utilization by tissues

(lines IPH-AGAA and SNL complexes diand tetrapeptides).

Amino acid chelates are special structural formulas of amino acids with metal ions in the form of chelates that can have the same effect as the amino acids themselves, but in much smaller doses, and also help prevent and reduce the manifestations of macro- and microelement deficiency in the body. This group includes, for example, chelate compounds of magnesium, iron, manganese, copper, etc. In the chelated amino acid compounds, metal cation acts as a bridge connecting the amino acids. Despite the absence of a specific peptide bond between amino acids, they with their specific features act as a single complex. In this sense, amino acid chelate compounds can be included in the general classification of short peptides, which also represent a single whole in the transport plan through the intestinal wall after ingestion, and in the process of metabolism in organs and tissues of the body.

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