

Bioactive Peptides as Pharmacologic Agents for Metabolic Syndrome

Dr. Charles D Shively*

Chief Executive Healthcare Officer, St. Petersburg, Florida, USA

***Corresponding Author:** Dr. Charles D Shively, Chief Executive Healthcare Officer, St. Petersburg, Florida, USA.

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By definition a bioactive compound is a compound that has an effect on a living organism or tissue/cell. One large category of bioactive compounds are bioactive peptides. Organic in nature, they are formed by amino acids which join together through covalent bonds (amide or peptide bonds). These bioactive peptides are encrypted in the structure of parent proteins and can be released in-vitro and in-vivo as active secondary metabolites through cleavage of the larger prepropeptides.. Once active, these peptides may act as regulatory compounds with hormone or drug like activity. They eventually modulate various physiological functions through binding interactions to specific receptors on target cells leading to inducement of the physiological response.

As reported in the literature, over 3500 different bioactive peptides have been identified and isolated from 707 proteins and are found in all areas of nature. Sources for these bioactive peptides can include plants, marine organisms, dairy products and single sources such as soybeans, honey, mushrooms, peas, chickpeas and many others including alcohol (grapes). These bioactive peptides and their protein sources are itemized in the well-known BIOPEP database. This database has been compiled by the Chair (Department) of Food Biochemistry, University of Warmia and Mazury in Olsztyn, Poland and is attributed to researchers Jerzy Dziuba, Piotr Minkiewicz, Anna Iwaniak and others in the Department of Food Biochemistry.

Research to date has defined many special understandings of the therapeutic potential of bioactive proteins. These findings include profiles of potential biological activity of the protein, frequency of the occurrence of bioactive fragment in the protein and the potential bioactive function of the protein derived bioactive peptide.

Each protein may offer different combinations of bioactive peptides depending upon the frequency of the occurrence of bioactive fragments (usually 7-9 amino acids in the specific protein sequence) and the manner in which the protein is processed to create the bioactive peptide. Typically this cleavage process can be induced through gastric digestion, fermentation, enzymatic action or protein hydrolysis techniques.

The functional properties from various bioactive peptides, their protein source and how they are processed can translate to very specific physiological effects: Opiate (both agonist and antagonist), antithrombotic or anti-hypertension activity (including anti-oxidative and hypocholesterolemic), immuno-modulation (antimicrobial and cytomodulatory), and mineral utilization (binding and anti-appetizing) properties.

For example during gastrointestinal digestion or food processing, the different sized bioactive peptides are absorbed at the intestinal level and upon reaching the blood stream may be split into smaller fragments by the action of intracellular and serum peptidases. Once they reach the target organs they are often able to decrease...through their modulation... the risk of obesity, atherogenesis, arterial hypertension and type 2 diabetes...all components of metabolic syndrome.

In the case of obesity, most researchers and clinicians realize that satiety is important in regulating food intake and offers health significance in the control of obesity and type 2 diabetes. Foods that contain protein (soy and whey for example) provide a satiating effect and can lead to appetite suppression through ingestion per se, the bioactive peptides present, the release of amino acids (predom-

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inantly branched-chain amino acids like L-leucine) and the combined action of these components. Specially formulated protein-based nutraceuticals or functional foods can support this obesity and diabetes control by offering as many as a dozen amino acids including L-leucine, L-tyrosine, L-methionine, L-cystine, L-lysine, L-threonine, L-tryptophan, L- isoleucine, L-valine, L-histidine, L-arginine and L-phenylalanine.

Importantly, modulation of physiologic responses induced by bioactive peptides can lead to the support, prevention and treatment of the worldwide public health metabolic syndrome problem and its complications from high blood pressure, high blood sugar, excess body fat around the waist and abnormal cholesterol and triglyceride levels.

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