Guest Article

Bioactive peptides- a hidden treasure in native protein

Chirag Maheshwari[1], Mahesh Kumar[2], Muzaffar Hasan[3], Nitin Kumar Garg[4]

[1, 3] Scientist, ICAR-CIAE, Bhopal.
[2] Scientist, ICAR-CAZRI, Jodhpur.
[4]Assistant Professor, Rajasthan Agricultural Research Institute, Durgapura, Jaipur.
***Email of corresponding author: cmchandak07@gmail.com**

Abstract

Proteins are serving as source of energy and amino acids that contribute to growth and maintenance of the body. Along with nutritional role, proteins are responsible for various physiochemical and sensory properties of foods, and may act as functional and health-promoting ingredients. Many of the physiological and functional properties of proteins are attributed to biologically active peptides which are often encrypted in the native sequence. Native protein serve as a precursor for bioactive peptides which can be produced from the protein precursor by digestive enzymes (gastrointestinal digestion), during food processing (ripening, fermentation, cooking), storage, or by invitro hydrolysis by proteolytic enzymes. Bioactive peptides are short specific peptides that can alter body functions or conditions and may ultimately influence health positively. Bioactive peptides mainly contain 3–20 amino acid units, but in some cases the size can be larger.

Bioactive peptides Sources

Bioactive peptides may be obtained from plants, animal or marine sources. Plant peptides, having molecular weight less than 10 kDa, can essentially be divided into two categories: bioactive peptides that are produced by selective action of peptidases on larger precursor proteins and degraded peptides that result from the activity of proteolytic enzymes during protein turnover. Bioactive peptides such as hypogin (peanut), angularin (adzuki bean), lunasin (soybean and barley) have been shown to have medicinal properties.

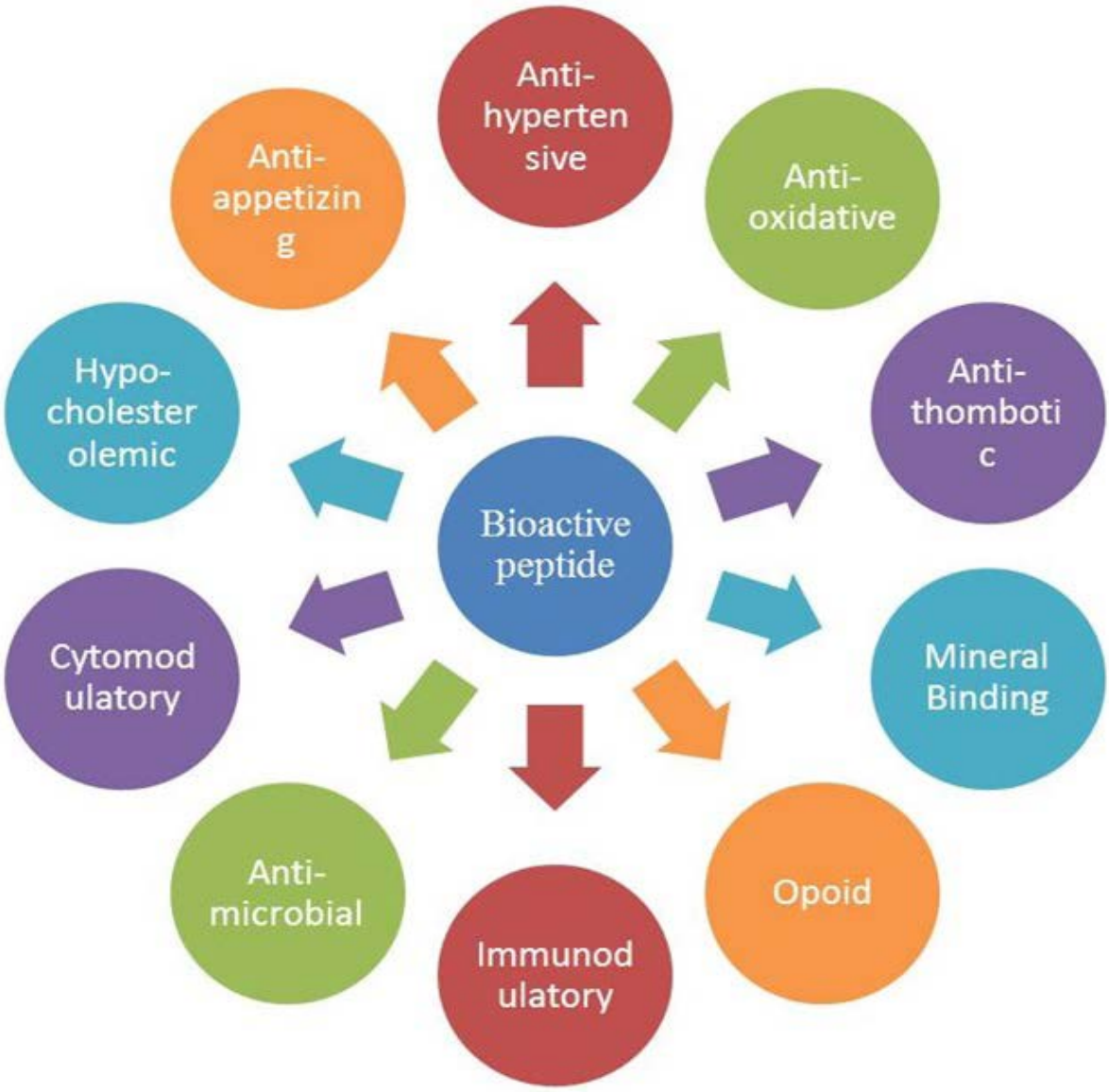
Plant peptides also include glutathions and protease inhibitors such as mustard trypsin inhibitors. Interestingly, most of the therapeutic peptides initially discovered were sourced from animal venoms and toxins. Recently research has focused on discovery of new bioactive peptides from animal sources. Moreover, bio functionalities and isolation procedures of previously discovered bioactive peptides are

well documented in the literature. Peptides from animal sources possess biological activities such as antihypertensive, antioxidant, antimicrobial and antiproliferative activity. Sources such as milk, egg and meat have been given special consideration due to their abundance in the human diet and documented biological activities.

Enzymatic digestion is one of the common methods to obtain peptides from protein hydrolysates of meat products. In addition to this, fermentation of meat products is an alternate method to generate bioactive peptides by proteolytic enzymes during microbial fermentation. The marine environment provides half of the total global biodiversity. Marine derived biologically active peptides are reported to have a range of functionalities including enzyme inhibition, mineral binding, immunomodulatory, antimicrobial, antioxidant, antithrombotic, hypocholesterolemic, and antihypertensive actions. Bioactive peptides and depsipeptides with functional properties have also been isolated from tunicates, sponges, soft corals, sea hares, nudibranchs, bryozoans, sea slugs, tunicates, sponges, mollusks and other marine organisms.

Bioactive peptides function

BP's plays a significant role in human health by affecting the digestive, endocrine, cardiovascular, immune, and nervous systems. BP's are considered the new generation of biologically active regulators; they can prevent oxidation and microbial degradation in foods and also improve the treatment of various



diseases and disorders, thus increasing the quality of life. They display hormone or drug-like activities and can be classified based on their mode of action as antimicrobial, anti-thrombotic, anti-hypertensive, opioid, immunomodulatory, mineral binding, and anti-oxidative.

Bioactive peptides mechanism of action

Oxidation reactions within the body during respiration in aerobic organisms; particularly vertebrates and humans can product free radicals, as well as air pollutants and tobacco oxidantscan be absorbed to blood circulation and exert adverse effects. In addition, UV radiation can stimulate the generation of a variety of oxidants. Oxidative damage plays a significantly pathological role in human diseases like cancer, emphysema, cirrhosis, atherosclerosis, and arthritis.

When the mechanism of antioxidant protection becomes unbalanced by factors such as aging, deterioration of physiological functions may occur, resulting in diseases and accelerating aging. Antioxidant food supplements or bioactive peptides may be used to help the human body and animals to reduce the oxidative damage. Proteins and peptides can inhibit lipid oxidation through multiple pathways including inactivation of reactive oxygen species, scavenging free radicals, chelation of pro-oxidative transition metals, reduction of hydro peroxides, and contribute to the endogenous antioxidant capacity of foods.

Antioxidant activity of protein can be increased by their hydrolysis; peptides have substantially higher antioxidant activity than intact proteins. Dyslipidemia, characterized by the presence of one or more than one abnormal serum lipid concentration (total cholesterol-TC, LDL-C, triglycerides and HDL-C), is a prime risk factor for cardiovascular diseases (CVD). Atherosclerosis is a vascular chronic inflammation in the arterial wall that can lead to clinical manifestations including myocardial infarction, peripheral arterial disease and stroke. The mechanisms considered responsible for the hypocholesterolaemic activity of soy foods and its bioactive peptide involve stimulation of the secretion of bile acids, changes for cholesterol metabolism in the liver, hormonal effects and regulation of cholesterol receptors. Bio-functional activity of bioactive peptide in vitro does not always imply an effect *in vivo*. Even if it does, it is very difficult toestablish a direct relationship between in vitro and in vivo activity.This is mainly due to the bioavailability of the bioactive peptides,to exert a potential effect after oral ingestion, peptide have to reachthe target in an active form. Therefore, they need to remain activeduring digestion by human proteases and be transported throughthe intestinal wall into the blood.

References:

1. Shahidi, F., &Zhong, Y. (2008). Bioactive peptides. Journal of AOAC International, 91, 914 931.

2. Redwan, E.-R. M. (2009). Animal-derived pharmaceutical proteins. Journal of Immunoassay and Immunochemistry, 30, 262-290.

3. Kim, S.-K., &Wijesekara, I. (2010). Development and biological activities of marinederived-bioactive peptides: a review. Journal of Functional Foods, 2, 1-9.