DOI: 10.7860/JCDR/2017/28672.10753

Review Article

Biotechnology Section

Marine-Derived Bioactive Peptides with Pharmacological Activities- A Review

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ABSTRACT

Some nutritional factors are related to chronic disease. In response to increased concern regarding nutrition and health, the functional and nutraceuticals food markets have been developed. During food digestion, proteins are hydrolyzed and a wide range of peptides are formed. Some of these peptides have special structures which permit them to confer particular biological functions. Marine animals which involve more than half of the world biological varieties are a wide source of bioactive proteins and peptides. Marine derived peptides show various physiologic functions such as anti-oxidant, antimicrobial, anti-cancer, Angiotensin-1-Converting Enzyme (ACE) glucosidase and α-amylase inhibitory effects in vitro. Before application of marine bioactive peptides as nutraceuticals or functional food ingredients, their efficacy should be approved through pre-clinical animal and then clinical studies. The aim of this study was to review the studies conducted on the pharmacological effect of marine bioactive peptides in animal models and humans.

Keywords: Chronic disease, Pharmaceutical effect, Therapeutic properties

INTRODUCTION

Recent studies have shown a relation between nutritional factors and prevalence of some chronic disease [1]. In response to increased concern regarding nutrition and health, the functional food markets have been developed. The functional foods are those which provide body nutritional needs and also have health properties by regulating one or more physiological functions [2]. The world trade of functional foods has increased 6 percent in 5 recent years, and it is estimated to reach up to 54 billion dollars [3].

Marine animals that comprise about half of the world's biodiversity provided a wide spectrum of bioactive compounds which can be used in the production of functional foods [4]. Marine biologically active compounds include bioactive peptides, oligosaccharides, omega fatty acids, enzymes, minerals, pigments and bio-polymers [5].

Proteins are of most prominent nutritional compounds and excellent source of all essential amino acids. They are responsible for building, maintaining and repairing of body tissue and are one of the main energy sources. In addition, proteins in food affect sensory (texture, colour, taste and odour) and physico-chemical (solubility, viscosity, gel formation and emulsifying) [2]. Furthermore, some of proteins in nutritional regimens have biologic properties and improve the health of consumers. In this regard, it has been reported that fish protein can lower blood pressure and lipid and therefore decrease the risk of atherosclerosis and heart disease [3].

During food digestion, proteins are hydrolyzed and a wide range of peptides are formed. Some of these peptides have special structures which permit them to confer particular biological functions. These peptides have 2-20 amino acids and are released during hydrolysis process [6]. The released form of these peptides exhibits various physiologic functions such as immune stimulatory [7], anti-cancer [8], antimicrobial [9], anti-oxidant [10] and blood pressure, glucose and lipid lowering [6] activities due to their bioactive features.

Bioactive peptides are proteins synthesized in the cell in the form of large prepropeptides which are then cleaved and modified to give active products. They are obtained mainly from herbal and animal sources. Animal sources of bioactive peptides include milk, egg, red meat and marine animals [2]. Marine animals which involve more than half of the world biodiversity are a wide source of bioactive proteins and peptides [11]. There are increasing evidences that numerous peptides and protein hydrolysates derived from marine animals including fish, mollusks, crustaceans and fishery wastes (substandard meat, head, viscera, skin, fins and skeletons) can improve human health and prevent chronic diseases [2].

In general, bioactive peptides are obtained from whole protein molecules through enzymatic hydrolysis and fermentation. Digestion of protein by proteolytic enzymes and microbes during fermentation may increase their nutritional and pharmaceutical function [12]. Enzymatic hydrolysis is one of the most common methods used for the production of bioactive peptides. Enzymatic hydrolysis is carried out by employing autolytic process or commercial protease [13]. Various commercial proteases from plants, animals and microbial sources such as trypsin, chymotrypsin, pepsin, alcalase, papain, pronase and collagenase are used for the production of bioactive peptides. In addition, autolysis process by digestive or autolytic enzymes of animal can also be used for the production of bioactive compounds [14].

Pharmacologic effects of marine bioactive peptides in animal/and human models:

Until today, numerous studies have assessed the therapeutic properties of marine bioactive peptides in vitro and few studies have been performed over animal model or human [2]. The aim of the present study was an overview on the results of previous studies regarding therapeutic effects of marine bioactive peptides.

Hypotensive, hypolipidemic, hypocholesterolemic and anti-diabetic effects:

High blood pressure affects approximately 25% of adults today and is estimated to progress to 29% by 2025, a population of