Marine Bioactive Peptides

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Bioactive peptides from marine organisms can benefit human health and nutrition, while being produced sustainably. This entry describes properties and features of over 250 peptides isolated from marine organisms, focusing on food sources also including algae, mollusks and vertebrates.

Keywords: marine fish ; marine mollusks ; algae ; marine bacteria ; peptide stability ; functional foods

1. Abstract

After years of research mainly focused on bioactive peptides from terrestrial animal and plant sources, marine organisms slowly emerge as a promising source of bioactive peptides. Their benefit compared to terrestrial sources is in their diversity and such diversity results in a higher number of peptides showing less examined activities, such as anticoagulant, antiaging, or anti-tuberculosis. Given the number of different activities as well as interactions with various compound types, marine peptides can be employed in numerous branches: medicine, cosmetics, food industry, etc. Also, the potential of using marine waste for the production of valuable peptides is not beneficial only from an economic standpoint, but to minimize the negative impact on food production to ecology.

2. Aim of this work:

Aim of this work was to compare and contrast structure(s) and effect(s) of marine-derived and animal-derived peptides, as well as discuss problems, such as extractability and complexity, that are specific to marine-derived bioactive peptides.

3. Introduction

Study of marine-derived bioactive peptides comes with its own set of challenges. Firstly, the extraction of peptides from marine plants is hindered by both presence of cell walls and their location (especially in the case of marine algae[1]). Additionally, the great diversity of marine life makes standardization of methods for peptide extraction difficult. Standard methods of peptide isolations that are using only one enzyme (such as alcalase[2][3], bromelain[4][5], etc.) or enzyme combination in which enzymes are present in a particular ratio[6][7][8] in the case of marine peptides. Furthermore, the problem of using whole hydrolyzate rather than purified peptides[9][10][11] makes assigning a specific effect to a given peptide difficult. Also, the composition of hydrolyzates varies greatly with processing condition, which makes it less suitable for application in pharmacy and medicine. Second, some structural characteristics, like the presence of unusual amino acid residues (such as bromotryptophan)[12], cyclic structures[13] and depsipeptides[14] are abundant in peptides of certain classes of organisms (like marine bacteria and sponges) and, given the relative low frequency of said characteristics in peptides of terrestrial animals and plants, comparison between marine and terrestrial analogs is hindered. Thirdly, certain activities, such as antituberculosis, antiaging, or anticoagulant effect[15] are less common in terrestrial counterparts, and mechanisms behind such actions are still being examined.

4. Results:

We found that 52.7% of the examined sequences contained at least one proline residue, which is similar to the results we previously obtained for animal-derived peptides[16]. This leads to the conclusion that proline plays a crucial role in the stability of peptides. Like in animal-derived peptides, marine-derived showed variation in amino acid type in peptides exhibiting different effects. Such findings could be explained by the involvement of specific amino acid residues in the mechanism by which peptide accomplishes its effect. However, direct comparison of the type of amino acid residues in peptides showing the same activity in terrestrial animal and marine organisms showed that there are significant differences. Two factors can contribute to these results: variety and complexity of marine life forms and difference in preferred mechanism of action.

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