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Marine Processing Waste - In Search of Bioactive Molecules

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Marine organisms are increasingly being investigated as sources of bioactive molecules with therapeutic applications as nutraceuticals and pharmaceuticals. Marine organisms include sponges, tunicates, bryozoans, molluscs, bacteria, cyanobacteria, macroalgae and microalgae have produced a variety of bioactive molecules targeted to the treatment of a range of infectious and non-infectious diseases [1]. More than 650 new bioactive molecules have been isolated from marine organisms including phytoplankton, green, brown and red algae, sponges, coelenterates, bryozoans, tunicates, echinoderms and molluscs [2]. Extracts or bioactive molecules isolated from these organisms are known to include anti-bacterial, anti-viral, anthelmintic, anti-fungal, anti-hypertensive, anti-cancer and have immune modulatory properties. In particular, retrieval and characterisation of these bioactive molecules from marine processing waste contribute valuable information to the vast field of marine natural product discovery [3].

During marine processing, large amounts of viscera, primarily gonads and digestive tract, are discarded as by-products. This waste is comprised of polysaccharides, proteins, fatty acids, vitamin and minerals that provide a variety of health benefits and could potentially be used as ingredients in functional foods and nutraceuticals, and provide candidates for drug discovery and pharmaceutical development [4]. The successful isolation of bioactive molecules from processing wastes will not only provide new sources of ingredients and candidates for drug discovery, but will also help to find a use for processing wastes that are normally discarded as land fill, helping to reduce the burden on the environment whilst providing industry with ways to add value to their waste streams and decrease waste disposal expenses [5].

Characterisation of these processing waste has revealed bioactive molecules can be used in various industrial applications also for value added products [6]. However, characterisation of bioactive molecules is one of the biggest challenges for researchers in this field because of the structural complexity of e moieties. Therefore, in order to better investigate the structure and composition of these bioactive molecules, innovative cutting edge techniques are required. These will provide information about the types and relative amounts of atoms, the specific environments of atoms within a molecule, the purity and composition, detailed structural information about the molecule, including constitutional and conformational isomerisation. This information will help to further elucidate the mechanisms involved in various biological activities better defining these molecules as potential therapeutics.

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