Identification, Cloning and Recombinant Expression of Novel Bioactive Peptides from Coral: Clues to Potential New Therapeutics for Human

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Invertebrates, unlike their counterparts, vertebrates, have no adaptive immunity for protection and hence can only rely on biochemical based innate protection to defend themselves against predators and infectious diseases. These defense mechanisms include the secretion of anti-microbial peptides, proteases and proteinase inhibitors. Hence, we hypothesized that invertebrates, such as corals, could potentially be producing biochemical agents that are of medicinal value in modern medicine. We analyzed the transcriptome profile of Palythoa Caribaeorum by RNA-seq analysis and found two novel peptides (PcKSPI-1 and PcKSPI-2) that contain the highly conserved Kazal domain, which was previously reported to inhibit serine proteases. We then have performed functional tests including serine proteases inhibition, antimicrobial activity, and cellular cytotoxicity, on these peptides. The results showed that the peptides could inhibit serine proteases trypsin and elastase as well as bacterial growth, with low toxicities to cardiomyoblasts. As such, we isolated, PCR amplified and cloned the genes encoding the peptide of interest. We have successfully expressed the gene in E.coli cells and used GST-purification methodology to purify the recombinant peptides which exhibited strong antimicrobial activities to selected bacterial strains. In conclusion, not only have we demonstrated the potential medical values of PcKSPI-1 and PcKSPI-2 from Palythoa Caribaeorum, we have also produced and purified mass amount of functional peptides using modern biotechnology, in an environmentally friendly way.

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