Preventive effects of dietary marine organism-derived bioactive compounds against skin aging

THESIS ABSTRACT

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Skin aging, which is clinically characterized by wrinkling, roughness, dryness, and loss of luster, is an unavoidable physiological change introduced by both endogenous causes including free radical stress (intrinsic skin aging) and chronic exposure to environmental UV irradiation (photoaging). Due to the unfeasibility to provide immediate pharmacological intervention on aged skin, consumption of dietary supplements thus becomes a reasonable strategy for preventing skin aging in the long term. In this thesis, several different kinds of marine organism-derived bioactive compounds were focused on to evaluate their preventive effects on skin photoaging *in vivo* including sea cucumber (*Stichopus japonicus*) (Chapter 1) and fucoxanthin (Chapter 3). Meanwhile, *in vitro* study was conducted to elucidate the underlying mechanisms of anti-photoaging capacity of sea cucumber hydrolysate (Chapter 2).

Consequently, oral administration of sea cucumber and its hydrolysate effectively attenuated UVA-induced pathological changes in hairless mice including the impaired skin barrier function and accelerated wrinkle formation. Notably, the hydrolysate of sea cucumber exhibited a higher efficacy than that without hydrolysis. *In vitro* study using normal human dermal fibroblasts (NHDFs) was thereby conducted to elucidate the underlying mechanisms, where glycylproline (Gly-Pro), a predominant exopeptidase-resistant dipeptide derivative of sea cucumber hydrolysate, suppressed cellular generation of reactive oxygen species (ROS), mediating the MAPK- NF-κB signaling pathway in UVA-irradiated NHDFs.

With regard to fucoxanthin, oral administration of fucoxanthin at a concentration of 0.001% was sufficient for its metabolites to enter the circulatory system and accumulate into the skin, hence inhibited UVA-induced pathological changes via modulating synthesis of natural moisturizing factors (NMFs) and epidermal ceramides, desquamation, degradation of collagen fibers, and inflammation in dermis.

Moreover, senolytic capacity of marine organism-derived bioactive compounds to selectively eliminate the senescent cells was investigated by using senescent dermal fibroblast cell models (Chapter 4). In Chapter 5, further *in vivo* study using senescence-associated injury mouse model was conducted to validate the anti-chronological skin aging capacity of the promising candidate.

The data in this thesis indicate expectable applications of marine organism-derived bioactive compounds in nutraceuticals for skin care against both intrinsic and photoaging.