MARINE-DERIVED OVOTHIOLS AND BIOENGINEERED DIATOMS: A SUSTAINABLE APPROACH TO ULTRAVIOLET PROTECTION

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Abstract

Excessive exposure to ultraviolet (UV) radiation induces skin damage, photoaging, and carcinogenesis (1). Nowadays, naturally derived photoprotective agents gained attention as eco-friendly alternatives to synthetic UV filters, which can negatively impact marine ecosystems. Among these, ovothiols, sulfur-containing histidine derivatives with a methyl group on position π of the imidazole ring, showed antioxidant and UV-absorbing properties (2). These compounds are naturally abundant in marine organisms, particularly in sea urchin eggs, mussels, corals, microalgae, and bacteria (3,4,5,6,7), and they exist in three different methylated forms: A, B and C. Recent research focused on synthesizing iso-ovothiols, chemical analogs of natural ovothiols, differing by methylation at the
tau position of the imidazole group. In this study, we focused on the development of an enzymatic-engineered system for the production of ovothiol B in diatoms (8). We optimized a purification strategy using Solid Phase Extraction technique and High-Resolution Cation Exchange Chromatography, followed by High-Performance Liquid Chromatography to obtain a purified ovothiol B for testing its photoprotective activities. Purified ovothiol B will be tested to evaluate its UV absorption capacity, photostability, and antioxidant properties on human dermal fibroblasts, essential for maintaining skin integrity. A comparative analysis between natural ovothiols and their synthetic iso-ovothiol analogs will provide insights into their relative efficacy. This study aims to contribute to the sustainable development of biocompatible sunscreens, offering an innovative approach to skin protection while minimizing the environmental impact of traditional UV filters. **Acknowledgments:** This work was funded by Next Generation EU, Mission 4 Component 1 CUP E53D23009970006.

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