“AntiAging” Project: Exploitation of Greek microbial diversity for the development of innovative cosmeceuticals and food supplements

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Greek ecosystems are a fertile yet under-explored ground for the study of Actinobacteria—renowned producers of bioactive compounds. By exploring this under-investigated biodiversity and chemodiversity of Greek actinobacterial strains, the “AntiAging” project aims to uncover potentially novel natural compounds with anti-aging activity that can be formulated as cosmeceutical and nutraceutical products. In total, 1000 isolates belonging to the Athens University Bacterial & Archaea Culture Collection (ATHUBA)—some originating from unique environments (caverns, volcanoes, thermal springs, etc.)—were studied. A customized in-house library of 2000 extracts was generated, all of which were investigated for potential anti-aging properties. An ultrasound-assisted extraction process was designed using solvents of increasing polarity and the extracts were further assessed via enzymatic and cell-based assays for their anti-elastase and anti-tyrosinase activities. Based on this bioassay-guided approach, the metabolic screening and compound annotation of the most promising isolates is conducted via a high-throughput dereplication method (UPLC-HRMS). This leads to a targeted isolation and identification of compounds using state-of-the-art chromatographic and spectroscopic techniques (HPLC-DAD-ELSD, UPLC-HRMS, NMR). A smaller yet significant number of extracts demonstrated >50% elastase inhibition activity, whereas a considerably larger number exhibited >50% tyrosinase inhibition activity. Interestingly, in some cases the bioactivity exceeded >80% in *in vitro* assays. The latter results show a hidden yet powerful potential of harnessing Greek microbial wealth in the context of the science of anti-aging.