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Induction of the antioxidant defense system using long-chain carotenoids extracted from extreme halophilic archaeon, Halovenus aranensis

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Abstract

The field of microbial pigments is an emerging area in natural products science. Carotenoids form a major class of such pigments and are found to be diversely synthesized by microorganisms that reside in hypersaline ecosystems to provide resistance against oxidative stress. Human cells can benefit from compounds such as carotenoids as antioxidant agents through either their capability to quench free radicals or their effect on promoting the antioxidant defense pathway. In this study, the antioxidant effectiveness of carotenoid extract from an extremely halophilic archaeon *Halovenus aranensis* strain EB27T has been evaluated using different approaches. Finally, the ability of the extracted pigment to induce the antioxidant defense pathway of human primary skin fibroblast cells was studied. *Hvn. aranensis* carotenoid extract exhibited strong effectiveness such that at 2 µg/ml, the carotenoid extract fully neutralized the oxidative stress of hydrogen peroxide at its EC50 based on MTT assay. Results from real-time PCR of relevant genes, luciferase bioreporter of oxidative stress, and the western blot analysis further confirmed the antioxidant capability of the carotenoids. It was also shown the carotenoid extract had more antioxidant activity compared to β-carotene the same concentration. Results suggest the carotenoid extract from this archaeon to have high potential for clinical and industrial applications. © 2021, The Author(s), under exclusive licence to Springer Nature Switzerland AG.

Author Keywords

Antioxidant defense system; Carotenoids; Halophilic archaeon; Oxidative stress

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