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Immunomodulatory effect of NF-κB and Nrf2 by R-Phycoerythrin: A Natural Anti-Inflammatory and Cytoprotective Agent

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Marine red algae are well-known for their bioactive compounds that offer immense potential in nutraceuticals and pharmaceutical applications. Geledium micropterum, red marine macro algae, is recognized for its considerable attention due to the pigment Phycoerythrin (R-PE) extensively studied for its therapeutic and biomedical applications. The current study focused to explore the immunomodulatory potential of the pigment with the key inflammatory markers on RAW 264.7 murine macrophage cells. The current study investigated the transcriptional relative gene expression of NF-κB and Nrf2 using qRT-PCR, and the results were normalized with β-actin which was kept as an internal standard. Briefly, cells treated with 40µg/ml and 80 µg/ml of R-PE was observed to exhibit a substantial downregulation of NF-κB gene expression in comparison to LPS group indicating a potential anti-inflammatory property of the R-PE fraction with a fold change of 0.24, which clearly indicates a dose-dependent inhibition of NF-κB activation. In contrast, an upregulation of Nrf2 gene was observed where, the cells treated with 40 and 80 µg/ml has displayed a significant up regulation of the Nrf2 gene expression with a fold change of 1.70. In summary, R-PE exhibits a dual modulatory function by suppressing oxidative stress–driven inflammatory responses through downregulation of NF-κB, while simultaneously enhancing cellular defense mechanisms through activation of Nrf2, underscoring its promise as a natural anti-inflammatory and cytoprotective compound.

Keywords: Inflammatory markers, phycoerythrin, RAW 264.7 murine macrophage cells, NF-κB and Nrf2 pathway

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