Towards the Clinical Use of Phytoplankton Carotenoid Pigments to Cure Cancer

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Beyond their major ecolphysiological functions, phytoplankton pigments exert biological and pharmacological activities in human cells that allow considering their clinical use to cure various pathologies. Although much of our knowledge relating to their cell pharmacology and bioactivity has come from in vitro studies in cell culture models, recent in vivo studies have validated the potential of phytoplankton carotenoid pigments to limit inflammation and metabolic disorders, retinal diseases, degenerative diseases, tumor progression, and hepatotoxicity. Aside from these promising results, additional studies are now required to precise their pharmacokinetics, pharmacological targets, and clinical efficacy in humans. The availability of highly purified pigments at rational costs will be a milestone to set up clinical trials and develop new therapies using microalgae pigments. This short paper focuses on the great potential of phytoplankton carotenoid pigments to prevent and cure cancers.

Marine and freshwater microalgae have evolved a wide range of pigments that belong to the chlorophylls, carotenoids and phycobiliproteins families. Extensive research has proved that microalgae pigments exert significant biological and pharmacological activities in human cells. Beyond their well-known antioxidant activity, used as a commercial argument to sell algae-based cosmetics and nutraceuticals, it is now clearly established that microalgae pigments have a great potential as health nutrients to prevent cancer, as biotechnological probes for cancer diagnosis and as anticancer drugs to trigger cancer cells apoptosis, prevent tumor angiogenesis, reduce the risk of metastasis, sensitize cancer cells to chemotherapy, destroy cancer cells by tumor phototherapy and filter UV to limit cancer cells initiation. Numerous studies aiming to identify antiproliferative molecules from microalgae extracts led to the isolation of carotenoids and to the demonstration of their high antiproliferative, cytostatic, cytotoxic, and/or pro-apoptotic activity in cancer cell cultures [1,2]. As an example, our research team performed the bioguided isolation of pigments from Dunaliella tertiolecta and found that violaxanthin was the most antiproliferative molecule contained in D7 dichloromethane extract [3]. We also recently reported the strong antiproliferative activity of zeaxanthin and β-cryptoxanthin in human invasive melanoma cells, after their bioguided isolation from Cyanophora paradoxa ethanolic extracts [4].

Besides the purification of antiproliferative pigments [5,6], additional studies established that multiple cellular and molecular processes are affected by microalgae carotenoids. It was first demonstrated that their antioxidant activity protects against ROS-induced DNA mutations, and tissue and animals studies confirmed that most carotenoids effectively reduce the inflammatory processes initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice initiated by carcinogenic agents, and thus prevent the risk of cancer initiation. As an example, adding peridinin in the dietary water of mice.