Cubosome drug nanocarriers loaded with algae extract for Photodynamic Therapy in pancreatic cancer treatment

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Pancreatic cancer, an extremely deadly malignancy, presents significant challenges in treatment, mainly because of its complex tumor microenvironment, difficult to bypass for drug molecules. On the other hand, the marine environment is full of biomass rich in compounds that may act as such anticancer drugs. *Ulva rigida* is an example of an alga containing photoactive chlorophylls, which, when combined with photodynamic therapy (PDT) and nanotechnology, constitute a potentially effective drug for pancreatic cancer. The use of novel liquid-crystalline drug nanocarriers (cubosomes) allows the protection of encapsulated molecules against degradation in tumor microenvironment, as well as against aggregation related to low solubility of the extracted pigments due to their hydrophobic nature. In order to evaluate this idea, the pigments were extracted from *U. rigida* with green microwave-assisted extraction method, then encapsulated in cubosomes and studied in series of biological experiments for the assessment of their biocompatibility, and biological activity. The comparative physicochemical characteristics of two types of cubosome-based nanoformulations along in tests for the generation of Reactive Oxygen Species (ROS), MTT Cytotoxicity, Flow Cytometry and Bioimaging on pancreatic cancer cell lines (BxPC-3), will be presented in this work. Moreover, the presented results will demonstrate the effectiveness in PDT for pancreatic cancer of the obtained novel more biocompatible cubosome nanoformulations loaded with chlorophylls extracted in a green way from algae biomass. Bioimaging results show a particular advantage of the encapsulated drug compared to its pure form. We believe that our work will contribute to the development of science in the field of drug nanocarriers, treatment of pancreatic cancer, and the management of marine biomass.

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