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Bioactivity Screening of Microalgae for Antioxidant, Anti-Inflammatory, Anticancer, Anti-Diabetes, and Antibacterial Activities

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Marine microalgae are considered a potentially new and valuable source of biologically active molecules for applications in the food industry as well as in the pharmaceutical, nutraceutical, and cosmetic sectors. They can be easily cultured, have short generation times and enable an environmentally-friendly approach to drug discovery by overcoming problems associated with the over-utilization of marine resources and the use of destructive collection practices. In this study, 21 diatoms, 7 dinoflagellates, and 4 flagellate species were grown in three different culturing conditions and the corresponding extracts were tested for possible antioxidant, anti-inflammatory, anticancer, anti-diabetes, antibacterial, and anti-biofilm activities. In addition, for three diatoms we also tested two different clones to disclose diversity in clone bioactivity. Six diatom species displayed specific anti-inflammatory, anticancer (blocking human melanoma cell proliferation), and anti-biofilm (against the bacteria *Staphylococcus epidermidis*) activities whereas, none of the other microalgae were bioactive against the conditions tested for. Furthermore, none of the 6 diatom species tested were toxic on normal human cells. Culturing conditions (i.e., nutrient starvation conditions) greatly influenced bioactivity of the majority of the clones/species tested. This study denotes the potential of diatoms as sources of promising bioactives for the treatment of human pathologies.

Keywords: drug discovery, marine biotechnology, nutrient starvation, clones, diatoms, anti-inflammatory, anticancer, anti-biofilm

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INTRODUCTION

Cancer, inflammation, and the evolution of antibiotic-resistant pathologies, together with other human diseases, are continuously stimulating the search for new bioactive molecules from natural sources. Unlike drug discovery on land, marine drug discovery is a relatively new field which began in the 1940s with the advent of scuba diving and new sampling technologies that allowed scientists to systematically probe the oceans for useful therapeutics. The number of potential compounds isolated from marine organisms now exceeds 28,000 with hundreds of new compounds being discovered every year (Blunt et al., 2015). However, despite the number of compounds