**Title: Bioactivities of ethanol extract from the Antarctic freshwater microalga, *Chloromonas* sp.**

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**Abstract**

Cancer is the principal cause of human death and occurs through highly complex processes that involve the multiple coordinated mechanisms of tumorigenesis. A number of studies have indicated that the microalgae extracts showed anticancer activity in a variety of human cancer cells and can provide a new insight in the development of novel anti-cancer therapy. Here, in order to investigate molecular mechanisms of anticancer activity in the Antarctic freshwater microalga, *Chloromonas* sp., we prepared ethanol extract of *Chloromonas* sp. (ETCH) and performed several *in vitro* assays using human normal keratinocyte (HaCaT) and different types of cancer cells including cervical, melanoma, and breast cancer cells (HeLa, A375 and Hs578T, respectively). We revealed that ETCH caused significant cell growth inhibition and apoptosis of cancer cells in a dose-dependent manner, whereas it showed no anti-proliferation to normal cells. In addition, ETCH had a significant inhibitory effect on cell invasion without the cytotoxic effect. Furthermore, ETCH-induced apoptosis was mediated by increase in pro-apoptotic proteins including cleaved caspase-3 and p53, and by decrease in anti-apoptotic protein, Bcl-2 in ETCH-treated cancer cells. Taken together, this work firstly explored the antioxidant and anticancer activities of an Antarctic freshwater microalga, and ETCH could be a potential therapeutic candidate in the treatment of human cancer.

Keywords: cancer, *Chloromonas* sp, anticancer activity, anti-cancer therapy