Research Article

Anti-Inflammatory Effects of a Methanol Extract from the Marine Sponge *Geodia cydonium* on the Human Breast Cancer MCF-7 Cell Line

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Many research groups are working to find new possible anti-inflammatory molecules, and marine sponges represent a rich source of biologically active compounds with pharmacological applications. In the present study, we tested different concentrations of the methanol extract from the marine sponge, *Geodia cydonium*, on normal human breast epithelial cells (MCF-10A) and human breast cancer cells (MCF-7). Our results show that this extract has no cytotoxic effects on both cell lines whereas it induces a decrease in levels of VEGF and five proinflammatory cytokines (CCL2, CXCL8, CXCL10, IFN-γ, and TNF-α) only in MCF-7 cells in a dose-dependent manner, thereby indicating an anti-inflammatory effect. Moreover, interactomic analysis suggests that all six cytokines are involved in a network and are connected with some HUB nodes such as NF-kB subunits and ESR1 (estrogen receptor 1). We also report a decrease in the expression of two NFKB1 and c-Rel subunits by RT-qPCR experiments only in MCF-7 cells after extract treatment, confirming NF-kB inactivation. These data highlight the potential of *G. cydonium* for future drug discovery against major diseases, such as breast cancer.

1. Introduction

Inflammation is a physiological process in response to acute tissue damage resulting from physical and ischemic injury, infection, exposure to toxins, chemical irritation, and/or other types of trauma. Many authors have suggested a correlation between chronic inflammation and cancer [1]. In fact, while inflammatory diseases increase the risk of developing many types of cancer, some nonsteroidal anti-inflammatory drugs reduce this risk for certain cancers (e.g., breast cancer) [2]. Interestingly, inflammation is involved in all three stages of tumor development, initiation, progression, and metastasis, where cytokines, chemokines, and growth factors play an important role in their evolution [3]. These are proteins that are expressed before and during the inflammatory process and play a key role during various disease stages so as to be considered as specific cancer markers as well as markers for various stages of the disease [2]. In general, the cytokinome is defined as the totality of these proteins and their interactions in and around cells [4]. Understanding the complex interaction network of cytokines in cancer patients should be very useful both to follow the evolution of cancer from its first steps and to define therapeutic strategies using innovative systems biology approaches. Several research groups are working to find new possible anti-inflammatory molecules [5]. Indeed, our laboratory has also recently evaluated the putative anti-inflammatory effects of different molecules such as sodium selenite, lipoic acid, and caffeic acid on cancer cell