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Effects of Probiotic *Saccharomyces boulardii* Supernatant on Viability, Nano-Mechanical Properties of Cytoplasmic Membrane and Pro-Inflammatory Gene Expression in Human Gastric Cancer AGS Cells

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Abstract: Background: Gastric cancer has been recognized as the second most probable cause of death in humans from cancer diseases around the world. Postbiotics, supernatant, and metabolites from probiotic microorganisms have recently been used widely to prevent and treat cancer diseases in humans, without any undesirable side effects. This study explores the antiproliferative and antitumor activities of the probiotic *Saccharomyces cerevisiae* var. *boulardii* supernatant (SBS) against AGS cancer cells, a human gastric adenocarcinoma cell line. Methods: We evaluated cell growth inhibitory and mechanical properties of the cytoplasmic membrane and the downregulation of *survivin* and proinflammatory genes in AGS cells treated with SBS after 24 and 48 h. Results: SBS significantly inhibits the AGS cell growth, and the concentrations with IC_{50} values after 24 and 48 h treatments are measured as 2266 and 1956 µg/mL, respectively. Regarding the AFM images and Young's modulus analysis, SBS significantly induces morphological changes in the cytoplasmic membrane of the treated AGS cells. Expression of *survivin*, *NFκB*, and *IL-8* genes is significantly suppressed in AGS cells treated with SBS. Conclusions: Considering the antitumor activities of SBS on AGS cell line, it can be regarded as a prospective therapeutic and preventive strategy against human stomach cancer disease.

Keywords: *Saccharomyces boulardii*; postbiotic; anticancer properties; AGS cell line

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1. Introduction

Gastric cancer (GC) is known as one of the leading causes of death due to cancer and is the fifth most common cancer around the world. This chronic disease has recently been regarded as a major public health issue and a significant source of mortality, mostly in developed countries [1]. More than 950 000 new cases of GC are reported annually and it is also estimated that more than 720,000 patients die due to this cancer each year around the world. GC is also recognized as the third main contributor to the global burden of disability-adjusted life-years caused by cancer diseases, following lung and liver cancers [2]. Low-fiber diets, high salt intake, age, genetic factors, and Helicobacter pylori infection are the main known risk factors causing GC in humans [3]. The incidence rate of gastric adenocarcinoma is increasing sharply in both developed and developing countries. Various preventive and therapeutic strategies have been suggested and are being attempted against