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Research Article

Evaluation of bacterial biosurfactant activities as an anticancer and antibiofilm agent

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Abstract
Rhamnolipids are glycolipid biosurfactants produced by *Pseudomonas* sp. that can be applied in many fields, such as medicine, pharmaceuticals, cosmetics and food processing. The rhamnolipid utilized in the present study was produced from *Pseudomonas aeruginosa* which was isolated from hydrocarbon-contaminated soil. Different rhamnolipid concentrations were evaluated as anticancer agents against cancer cell lines, including the Hela cell line and the L20B cell line, and as antibiofilm agents against four pathogenic bacteria, including *Escherichia coli*, *Bacillus cereus*, *Staphylococcus aureus* and *Klebsiella pneumoniae*. Results showed that the rhamnolipid inhibited the proliferation of the cervical cancer cell line (Hela) during exposure. The inhibitory effect of rhamnolipid against the Hela cell line increased with the increasing concentration of rhamnolipid. The 750 µg/ml concentration recorded a higher inhibitory effect, while the 50 µg/ml concentration recorded a lower inhibitory effect against the Hela cell line. Similarly, the concentration of 750 µg/ml recorded a higher inhibitory effect, while the concentration of 62.5 µg/ml recorded a lower inhibitory effect against the L20B cell line. The results exhibited the best rhamnolipid activity as an antibiofilm agent against pathogenic bacteria at a concentration of 1 mg/ml for *E. coli*, *B. cereus*, and *K. pneumoniae*, while exhibiting the best antibiofilm activity against *Staphylococcus aureus* at a concentration of 2 mg/ml when incubated with different concentrations of rhamnolipid. The rhamnolipid showed high effectiveness as antibiofilm and anticancer agent, which constitutes a promising agent for use against pathogenic bacteria to prevent the formation of biofilm and an alternative therapeutic agent as an anticancer.

Keywords: Anticancer, Antibiofilm, Rhamnolipid, Biosurfactant, *Pseudomonas*

INTRODUCTION

Numerous biosurfactant compounds have demonstrated antibacterial activity against various human pathogenic bacteria, which qualifies them as a strong alternative therapeutic agent instead of present antimicrobial agents (De Giani *et al.,* 2021; Alyousif *et al.,* 2023). Rhamnolipids are glycolipid biosurfactants produced by Pseudomonas species. They comprise a hydrophilic group that includes one or two L-rhamnose molecules, which are glycosidically linked to a hydrophobic group of one or two fatty acids (Rahimi *et al.,* 2019). Rhamnolipids can be applied in many fields, such as medicine, pharmaceuticals, cosmetics, food processing, bioremediation of pollutants and agriculture (Almansoory *et al.,* 2019; Jiang *et al.,* 2020). The potential medical application of rhamnolipids has increased during the past decade as a biofilm control agent and anticancer agent (Chong and Li, 2017; Fracchia *et al.,* 2019).

Cancer represents an extremely complex disease affecting millions of people worldwide. The treatment of cancer by chemotherapy is highly toxic, non-specific and non-selective. However, there is a need for the development of new anticancer drugs (Kaur and Verma, 2015). The Continuous discovery of compounds from natural sources, such as bacteria, is anticipated to yield a variety of and unexpected chemicals with fascinating biological features, such as anticancer activity (Janakiram *et al.,* 2015). Several types of microbial surfactants, such as lipopeptides and glycolipids, preferentially limit the spread of cancer cells and disintegrate cell membranes triggered by apoptosis (Gudiña