Effect of Saccharomyces cerevisiae supernatant on Staphylococcus aureus biofilm formation

Presenter Author: Navid Saidi
Email: n.saidi91@gmail.com

Corresponding Author: Horieh Saderi

Navid Saidi¹, Horieh Saderi², Parviz Owlia³, Seyed Mahmoud Amin Marashi⁴

1. Molecular Microbiology Research Center, Shahed University, Tehran, Iran
2. Molecular Microbiology Research Center, Shahed University, Tehran, Iran
3. Molecular Microbiology Research Center, Shahed University, Tehran, Iran
4. Department of Microbiology and Immunology, Alborz University of Medical Sciences, Karaj, Iran

Background and Aim: Biofilm is a community of microorganisms attached to each other on a surface, which is covered by extracellular polymeric matrix (EPM). Staphylococci are known as the most common infectious agents associated with biofilm and are among the most likely microbes infecting for medical devices, which are established inside the body during surgery. Most infections associated with Staphylococcus aureus biofilms are difficult to treat with antibiotics, and the S. aureus biofilm is considered as a reservoir of infection spread to other parts of the human body. The use of probiotics is one of the ways to prevent the formation or elimination of biofilms. In the present study, effect of Saccharomyces cerevisiae, probiotic yeast, was investigated on formation of S. aureus biofilm.

Methods: Indigenous S. cerevisiae was cultured in potato dextrose broth medium and centrifuged in 3000 g for 10 minutes after 24 hours of incubation. Supernatant was sterilized through 0.22-μm filter and extraction with ethyl acetate was carried out over 3 hours. For this purpose, the supernatant at a ratio of 5:1 was mixed with it and ethyl acetate was renewed every half hour. Then ethyl acetate was removed via rotary evaporator to obtain dried extract. The extract with a concentration of 327.68 mg/ml was prepared by adding the appropriate amount of methanol to dry matter, which was kept as a stock. Concentrations of 512, 1024 and 2048 μg/ml were prepared from the obtained stock, so that the methanol value was less than 1% in the final concentrations. Effects of the three concentrations of the extract were evaluated on biofilm formation of two standard strains of S. aureus, ATCC 29213 (methicillin-susceptible) and ATCC 33591 (methicillin-resistant), using microtiter plate assay in six replications.

Results: All three concentrations of S. cerevisiae supernatant extract were led to a significant reduction (P<0.001) in biofilm formation of both methicillin-resistant and susceptible S. aureus. This effect was partly dependent on the concentration for methicillin-resistant strain and significant difference (P<0.05) was found between concentration 2048 ?g/ml to 512 ?g/ml. There was no concentration dependence for methicillin-susceptible strain. Conclusion: In this study, the reduction in biofilm formation for methicillin-susceptible and resistant S. aureus was observed by S. cerevisiae supernatant. This finding can be taken into consideration in the treatment of S. aureus biofilm-associated infections.

Keywords: Staphylococcus aureus, biofilm, probiotic