

## ***Staphylococcus aureus* biofilms: Structures, antibiotic resistance, inhibition, and vaccines**

Raziey Parastan, Mohammad Kargar, Kavous Solhjoo, Farshid Kafilzade

### **Abstract**

Biofilm formation in *Staphylococcus aureus* causes an increase in antibiotics resistance in chronic diseases, including osteomyelitis, endocarditis, and wound infection. The *S. aureus* biofilm structure is composed of polysaccharide, protein, and external DNA. Bacterial cells in the biofilm compose of resistant persister cells and exhibit multidrug resistance. The emergence of multidrug resistant *S. aureus* strains is a health problem now. In the *S. aureus* biofilm state, susceptibility to antibiotics even vancomycin is reduced and eradication of bacteria is challenging. In the present review, we studied the structure of biofilm, antibiotic resistant in biofilm state, and biofilm prevention strategies in *S. aureus*. Infections due to *S. aureus* are expensive and susceptibility to antibiotics is reduced in biofilm state and several methods, including anti-biofilm agents and vaccine should be applied to treat diseases related to biofilm. For prevention and inhibition of biofilm, application of antiadhesion agents and vaccines based on biofilm genes is recommended. Multivalent vaccines based on biofilm genes, including clumping factor A, poly- $\beta$  (1-6)-*N*-acetylglucosamine, collagen adhesin, and fibronectin binding protein in *S. aureus* can be beneficial for preventing initial attachment and biofilm formation.