

Proteins are the major players in the formation of *staphylococcus aureus* biofilms

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Short communication

The virulence capacity of *Staphylococcus aureus* increases many folds with the formation of biofilms and in this state it can cause persistent infections and they exhibit resistance to antibiotics and host immune system.¹ Biofilms comprises of either homogenous or mixed populations of microbes, that are formed initially as planktonic bacteria which reversibly attach to a surface irreversibly leading to the formation of small colonies on the surface. With the aid of quorum sensing and other signalling events such as phosphorylation, maturation and stabilization of biofilms occur. Thereafter, microbes inside the biofilm disperse with the help of surface proteins and releases bacteria residing on the top of biofilm structure and thus it spreads in the host.² These interactions of surface anchored proteins are both homophilic and heterophilic in nature which are largely through surfactant peptides one of the key players in the formation of biofilms and gives viscoelastic behaviour.^{3,4}

Adhesion is the primary step in the biofilm formation which is facilitated by the expression of microbial surface components which recognize adhesive matrix molecules (MSCRAMMs). These MSCRAMMs can bind to host extracellular matrix components^{5,6} and share a general signal sequence for secretion and as well as for anchoring to the cell wall.⁷ MSCRAMMs have to be introduced from the inner part of the bacteria followed by successive attachment to the bacterial surface, this process involves the sec pathway and the sortase thus playing a essential role in *S. aureus* pathogenesis.^{8,9}

Studies have shown that surface-anchored proteins promote biofilm formation in *S. aureus*, which includes IgG-binding protein Protein-A, Fibronectin binding protein-A (FnBA), surface-associated proteins SasC and SasG,^{6,10-13} and biofilm-associated protein Bap.¹⁴ Under low iron conditions secreted proteins Emp and Eap are implicated in biofilm formation.⁶ SpA and FnBA are directly associated with biofilm formation in all the growth conditions of *S. aureus* and constitute the major biofilm forming proteins. Further, SpA gene deletion experiments or blocking the Protein-A by adding human serum has shown biofilm formation was completely abolished indicating essential role played by Protein-A in the formation of biofilms.^{7,15-18} The involvement of proteins in general and SpA and FnBA in particular confirmed by the over expression of Rsp a transcription regulator and proteolytic enzyme⁶ in aerobic conditions where high oxidative conditions promote large catabolic activities and poor biofilm formation.

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Conflicts of interest

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