

## **Physical and Physiological Factors Governing the Growth, Detachment and Adhesion Properties of *Staphylococcus aureus* Biofilms and Eroding Planktonic Cells in Hydrodynamic Conditions**

Patrick Ymele-Leki

*Staphylococcus aureus* is a leading pandemic public health threat with fatal repercussions in community and healthcare settings. In bloodstream-related infections, *S. aureus* pathogenicity likely correlates to its adaptive properties and its ability to proliferate and spread in two distinct states, either as planktonic or as sessile cultures. Free-floating planktonic cells interact profusely with constitutive components of blood, attach to exposed linings of the host, and are responsible for acute infections. Conversely, adherent sessile cells grow within a biopolymer matrix called biofilm, evade the host immune defenses, and lead to chronic, persistent infections.

In this study, we sought to elucidate the phenotypical differences expressed by *S. aureus* biofilm-derived cells. We hypothesized that *S. aureus* planktonic cells would demonstrate different adhesion properties depending on the age of the biofilm from which they originated. Using a parallel plate flow chamber and phase-contrast videomicroscopy, adhesion assays on immobilized protein substrates were performed with *S. aureus* planktonic cells collected at different stages of biofilm development. Experimental results reveal that the adhesion properties of eroding planktonic cells differ considerably from the properties of the shake flask grown population used to initiate biofilm development. These results also indicate that, once a mature biofilm has developed onto the surface, eroding planktonic cells express invariant adhesion properties regardless of the age of the biofilm from which they originate. Ultimately, understanding the phenotypical properties of *S. aureus* biofilms and associated planktonic cells may have important clinical implications pertaining to the prevention and annihilation of chronic staphylococcal infections.