Adhesive properties of Staphylococcus epidermidis probed by atomic force microscopy

Mapping of the surface properties of Staphylococcus epidermidis and of biofilm forming bacteria in general is a key to understand their functions, particularly their adhesive properties. To gain a comprehensive view of the structural and chemical properties of S. epidermidis, four different strains (biofilm positive and biofilm negative strains) were analyzed using in situ atomic force microscopy (AFM). Force measurements performed using bare hydrophilic silicon nitride tips disclosed similar adhesive properties for each strain. However, use of hydrophobic tips showed that hydrophobic forces are not the driving forces for adhesion of the four strains. Rather, the observation of sawtooth force–distance patterns on the surface of biofilm positive strains documents the presence of modular proteins such as Aap that may mediate cell adhesion. Treatment of two biofilm positive strains with two chemical inhibitor compounds leads to a loss of adhesion, suggesting that AFM could be a valuable tool to screen for anti-adhesion molecules.

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