Measuring the bacterial interaction area to abiotic surfaces by single-cell force spectroscopy on tailored samples

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Bacteria adhere to virtually every surface and promote the formation of – desirable or unwanted - biofilms. Therefore, in many fields, like engineering, medicine, and biology, understanding bacterial adhesion is of great interest in order to support or inhibit the formation of biofilms. Consequently, there exist different models that describe the process of bacterial adhesion. In these models, besides apparent direct values, like the adhesion force and distance, also more indirect quantities, like the size of the interaction area between bacterial cell and surface, play an crucial role to understand the underlying mechanisms. We present a method to measure the radius of this circular interaction area for *Staphylococci* by taking advantage of the fact that the adhesion force of these cells differs strongly between surfaces with different surface energies [1]. The measurement is done by collecting multiple force/distance curves with single-cell AFM probes at a very sharp interface between hydrophilic silicon and a hydrophobic self assembling monolayer of silanes. The measured radii of the interaction area range from some tens of nanometers up to almost 300 nm depending on the exerted force trigger. These values also give new insights into the properties and distribution of surface molecules in the bacterial cell wall.

[1] N. Thewes, P. Loskill, P. Jung, H. Peisker, M. Bischoff, M. Herrmann, K. Jacobs, "Hydrophobic interaction governs unspecific adhesion of staphylococci: a single cell force spectroscopy study"; *Beilstein J. Nanotechnol.* 5 (2014) 1501