**Electrokinetic control of bacterial deposition and transport**

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The formation of biofilms is considered to be an efficient microbial adaptation to degrade surface-bound chemicals in environmental and technical systems. At the same time, microbial biofouling may also cause significant problems in medical and technical applications. It leads to biocorrosion, clogging of filters and membranes or affects human safety in water treatment processes. There is hence high interest in novel, tailor-made approaches controlling microbial adhesion as the initial step of biofilm formation.

We tested the hypothesis wether the shear force induced by an electroosmotic water flow (EOF) over a collector allows overcoming the attractive interaction energy of initial cell adhesion. Different to a parabolic profile of pressure driven hydraulic flows, the plug-shaped velocity profile is quasi planar and starts above the electrical double layer at a distance of a few nanometers and, hence, at a distance to the collector surface, where initial bacterial adhesion takes place.

By applying EOF of varying flow strengths (as induced by varying electric fields and ionic strength of the percolation buffer) we quantified the deposition of bacteria (e.g. Pseudomonas fluorescens Lp6a; Mycobacterium frederiksbergense LB501T) in percolation column experiments. Deposition data were discussed by the extended Derjaguin, Landau, Verwey, and Overbeek (XDLVO) theory of colloid stability and by clean bed filtration theory.

We found that the presence of DC may reduce bacterial surface coverage and initial adhesion efficiency of the cells by > 90 %. Based on the data we present a model to predict EOF-induced prevention of bacterial adhesion as based on XDLVO theory and the EOF-induced shear forces acting on a bacterium.

We propose that DC fields may be used to electrokinetically regulate the interaction of bacteria with collector surfaces and, hence, to prevent initial adhesion and biofouling in technical applications.