Staphylococcus epidermidis adhesion to modified polycarbonate surfaces: gold and SAMs coated

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Staphylococcus epidermidis is a coagulase-negative Staphylococcus (CNS) that often colonizes the skin and mucous membranes of the human body but that has lately emerged as the most frequently isolated pathogen in nosocomial sepsis and infections associated with the use of medical devices. This fact is mainly due to their ability to adhere and to form biofilms on biomaterials surfaces. Therefore, initial adhesion of bacteria to the biomaterial surface is thought to be the key step in the infection of indwelling medical devices and constitutes a challenge to the development of less adherent surfaces. In this work, specific modifications on polycarbonate outer layer were utilized as model surfaces for the study of the adhesion of *S. epidermidis*. The effect of gold coating on staphylococcal adhesion was assessed, as well as of subsequent coverage with different self-assembled monolayers (SAMs): two SAMs with a methyl terminal group and hydrophobic character and two hydrophilic SAMs with a carboxylic acid terminal group. Variations in the aliphatic chain length were also tested. In addition, a SAM formed by a calix-crown molecule was created to immobilize a specific protein (C-Reactive Protein) and its antibody. Bacteria and substrata hydrophobicity was determined by water contact angles formed on surfaces, through the sessile drop technique.

The results demonstrated that the extent of staphylococcal adhesion to methyl terminated SAMS was smaller in comparison to the number of cells adhered to the carboxyl acid terminated SAMs, demonstrating that methyl terminated SAMs constitute more suitable surfaces in preventing bacterial adhesion. The calix-crown molecule favours high levels of adhesion due to its non-specific bonding nature and geometrical configuration. However, when a specific protein is linked to calix-crown, bacterial adhesion occurs to a much lower extent.

In conclusion, the adhesion of *S. epidermidis* to polycarbonate modified surfaces is strongly determined by parameters such as the nature of the functional terminal group along with surface hidrophilicity. The results obtained in this work have a potential practical significance showing that the use of certain SAMs as surface modifiers may constitute a successful method in the reduction of bacterial adhesion to biomedical surfaces and, as a consequence, preventing biofilm formation.