ABSTRACT

The aggregation of proteins and bacteria on implant surfaces is a critical concern in the biomedical field, especially with respect to the potential of biofilm formation on implant surfaces. This study aims to investigate the impact of surface roughness and wettability on the formation of biofilms on metallic implants. Titanium coupons were CoBlasted to add a skin of either alumina or PTFE and alumina to the surface as well as change the surface roughness. BioDep™ was then used to add chitosan or chitosan and vancomycin to some of these coupons. Non-contact profilometry was used to determine the sample's initial surface topography, and then contact angle testing was performed with both deionized water and diiodomethane to determine the sample's surface energy. Protein fouling with human serum albumin (HSA) was then performed to better mimic conditions found in vivo. Contact angle testing was performed on the protein-fouled samples with both deionized water and diiodomethane to determine the surface energy of these surfaces. Statistical analysis was performed between the two sets to see how much the proteins affected the surface hydrophobicity. Titanium samples coated with PTFE were found to be the most hydrophobic in both the plain and protein-fouled experiments, while blank titanium was found to be the most hydrophilic. These results show that both CoBlast™ and BioDep™ significantly affect surface wettability and topography, and the risks and benefits from these modifications must be taken into account when assessing biofilm resistance.