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A microfluidics technique to evaluate *Staphylococcus aureus* adhesion to micropatterned silica surfaces

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Postoperative complications like poor osteointegration or bacterial adhesion to bone implants are the most common causes that lead to implant failure.

Micropatterned surfaces have been used to improve implant osteointegration as they have shown to promote enhanced cellular attachment, proliferation and differentiation. It is well established that modifying the surface topography of a biomaterial has a positive effect on regeneration.

However, a concern related to using implants with greater surface area and roughness is that bacterial adhesion might be increased.

This study intends to evaluate the bacterial adhesion of S. aureus to micropatterned silica surfaces, proposed to be applied as bioactive coatings for bioinert hard-ceramic implants.

A combined methodology of sol-gel and soft-lithography was used to produce SiO2 thin films with micropatterns in the shape of lines and pillars, with 10um of interspacing. Spin-coating was used to create flat SiO2 surfaces, to be used as controls. Materials were characterized by SEM, FTIR and contact angle.

For a more effective evaluation, bacterial adhesion will be assessed under different conditions through two distinct techniques: static and microfluidics. The technique of microfluidics has the advantage of simulating the biological phenomena with physiological flow velocities, being able to provide a more accurate quantification. The results from this method will be compared to the results obtained with the standard method, under static conditions. On both, the adherent bacteria will be quantified by colony forming units (CFU), Live/Dead Staining and SEM.

We expect with this study to perform a more precise evaluation of bacterial adhesion on microstructured silica thin films, which have previously shown to improve cell proliferation and osteogenic differentiation.