Antibacterial surfaces via ultra-short pulse laser ablation

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Abstract

Ultra-short pulse laser ablation enables fabrication of high-resolution structures on almost all solid materials without negatively influencing their biocompatibility. Moreover, this technique is universal and can be used for the fabrication of structures for in-vitro and in-vivo studies and can be also integrated in the implant fabrication process as an additional step.

In this talk we present several approaches for the realization of surfaces with antibacterial properties by using ultra-short pulse laser ablation.

In the first approach we fabricated different micro-structures (Sharklet™-like, grooves and grids having similar dimensions) on common implant material titanium. Investigations on the biofilm formation of *Staphylococcus aureus* for up to 24 h revealed similarly reduced bacterial surface coverage on all investigated micro-structures compared to the smooth titanium surface. In this case no additional chemical modification of titanium was performed.

In the second approach we combined different structure designs with perfluoropolyether lubricants to obtain liquid-infused porous surfaces (SLIPS) on titanium. These surfaces showed extremely low contact angle hysteresis typical for liquid-infused materials and a strong and reliable repellency of human oral pathogen *Streptococcus oralis* biofilms. Toxicity tests supported that solely the surface's repellent properties are responsible for the strong antibacterial effect.

These both approaches are a promising basis towards the prevention of bacterial implant-associated infections without the use of antibiotics.

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