3D IMAGING OF BIOFILM ON IMPLANT SURFACES
BY DETECTION OF SCATTERED LIGHT USING
OPTICAL PROJECTION TOMOGRAPHY

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Biofilms are heterogeneous and dynamic communities of microorganisms attached to
surfaces. The understanding of their microscopic structure and function has advanced
greatly by the application of Confocal Scanning Laser Microscopy (CSLM) \cite{1}. However,
CSLM detects rather local than global structural properties of the biofilm and is therefore
not suitable to understand its ecological mechanisms \cite{2}. Current developments in biofilm
research aims for evaluation in the mesoscale which means the range between micro and
macroscale. Recently Optical Coherence Tomography (OCT) has been proposed to fill this
imaging gap \cite{3}. OCT is able to image biofilm growth label-free by detection of scattered
light from structures in different depths but needs extensive segmentation procedures to
discriminate between relevant structure-related signals and the background. Furthermore
broadband laser sources remain indispensable to switch to the microscale.

Here we present a new approach to visualize the three dimensional mesoscale struc-
ture of biofilm on implant surfaces by applying scattered light detection using a custom
Optical Projection Tomography (OPT) system \cite{4}. It is shown that OPT can easily distin-
guish between implant surface and biofilm by taking into account their spectral differing
scattering and absorption coefficients. In OPT continuous scaling from the meso to the
microscale can easily be performed by adjusting beam apertures. We propose OPT to be
a valuable tool for the structural and volumetric investigation of biofilm development at
different length scales.

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