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PARODONTITIS CHIP – INTEGRATED REALTIME PCR DEVICE

The Parodontitis Chip project is aimed at developing a fully integrated diagnostics platform both for the fast processing and the subsequent analysis of pathogens in complex samples. This innovative technology consists of a compact microfluidic disk and a combined purification module. Steps such as isolating pathogenic nucleic acids, selectively amplifying DNA sequences, and their specific detection are integrated to establish an easy-to-use setup for the end-user.

Features

- Consists of a simple plastic disk
- Lyophilized reagents on-board
- Application specific disks with target PCR primers on-board
- Realtime analysis via integrated optical set-up for the quantification of targets
- Fast amplification due to space-resolved PCR

Method

The initial lab-on-chip device will allow the detection and characterization of 11 bacteria relevant to the pathogenesis of periodontitis in a parallel format. In addition, the establishment of a simple detection unit will enable the monitoring of reaction kinetics.

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Therefore a quantification of the pathogen, as well as a determination of the total bacterial count can be realized. The Parodontitis Chip project will allow for the creation of a simple molecular diagnostic test platform that can easily be adapted to various problems in the field of medical, environmental, or food analysis. Simplified lab-on-chip devices having an extremely simple structure and non-contact detection units provide significant time and cost savings for the user.

Potential applications

Periodontitis is an inflammatory disease of the gums that, if left untreated, can lead to tooth loss. In Germany alone it is predicted that nearly 12 million people are affected by periodontitis.

The main trigger for periodontal disease is bacterial plaque which can lead to a reduction of the dental bone tissue. The postulated systematic relationship between periodontal disease caused by bacterial pathogens and cardiovascular damage has been studied extensively. It can result in particularly serious diseases such as heart attacks and strokes.

MicroDiagnostics Unit

In the following areas partners from Industry or academia can find support from experienced and reliable people:

- Development of integrated lab-on-chip devices
- Assay development
- Rare cell diagnostic
- Nucleic acid isolation and purification strategies
- Functionalization of surfaces in the nanometer scale
- Sensor development
- Test strip development
- DNA origami techniques for drug delivery or systematic surface modification