

## **8b Plenary: Intergated Microfluidic System for Oral Diagnostics**

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Analysis of oral fluids has great potential in clinical diagnosis of oral and systemic diseases. Oral fluids, especially saliva, offer many advantages over other bodily fluids because they are easy to collect using noninvasive methods in both clinical and non-clinical settings. However, currently only a handful of devices exist for medical diagnostics based on analysis of oral fluids.

We are developing an automated hand-held device for detection of biomarkers in saliva. The device performs rapid microfluidic chip-based immunoassays (< 3 minutes) using saliva as a sample with low sample volume requirements (10 microliter) and appreciable sensitivity (nM-pM). The immunoassays are performed in a glass microchip whose channels contain crosslinked polyacrylamide gel, cast in situ by photopolymerization, to perform gel electrophoretic separation. The polymeric monoliths are cast in minutes and easily tailored to obtain desired pore-size (10 nm- 1 micron) and surface properties. To perform microchip immunoassays, sample is mixed with fluorescently-labeled antibody prior to separation of bound and unbound immune species by native polyacrylamide gel electrophoresis (PAGE) and detection by a laser-induced fluorescence detector. Microchip immunoassays developed are compatible with complex samples such as saliva and blood serum and were used to detect a wide range of analytes such as IL6, TNFa, CRP and tetanus IgG. To improve the detection limit, an integrated chip-based preconcentrator is used that typically provides a 100-fold concentration of analytes in a few minutes. The immunoassay chip is being integrated with miniaturized high-voltage power supplies and a laser-induced fluorescence detector towards developing a portable device.