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# Lab-on-a-Chip based device for an optical detection of immobilized cells for food analytics

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## Introduction

There is a need for an on-site detection of pathogenic cells within reasonable time by unskilled staff. Due to minimal consumption of reagents, accelerated reaction rates, and completely automated and integrated processes, Lab-on-a-Chip technology represents an advanced method for the realization of pathogen analysis. This paper described an automated Lab-on-a-Chip based platform for the rapid and reliable detection of Salmonella out of a meat broth.

## Methods

Up to 4.5 mL of test sample are filtered through a chip-based membrane which is covalently linked with Salmonella specific antibodies. A second fluorescence-marked antibody allows optical detection of the membrane-bound pathogens. A set of valves, reservoirs for buffers and reaction solutions, pump and controller rules the fluidic and biochemical processes inside the chip. The labeled bacteria are identified and counted by applying a high resolution fluorescence camera system. A potential bacterial load is identified by a software-aided analysis of the fluorescent signals.

## Results

The fluidic platform consists of a chip holder and click-on fluidic interfaces facilitating a quick and easily chip replacement. Furthermore the platform assembled with the well attuned actuators, allows a precise progress through of the fluidic scheme provided by the analytic protocol. For the analysis of bacteria in a reasonable concentration the chip was designed with a macro-to-micro interface to enable the handling of up to 4.5mL sample volume. The complete assay inclusive different enrichment, washing and labeling steps can be performed within 20 minutes and a detection limit of  $10^3$  bacterial /ml can be achieved.

## Conclusion

A fully automated, robust and rapid on-site analysis of potential bacteria contaminating samples is urgently needed for health care reasons but also non-medical requirements. The described platform is a successfully tested tool meeting these specifications and veered toward a high-sensitive and cost-efficient diagnostic device.