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Self-powered-sensing solution: Detecting viral contamination in less than 5 min using a nanosensor array embedded in a mobile, self-powered biochip

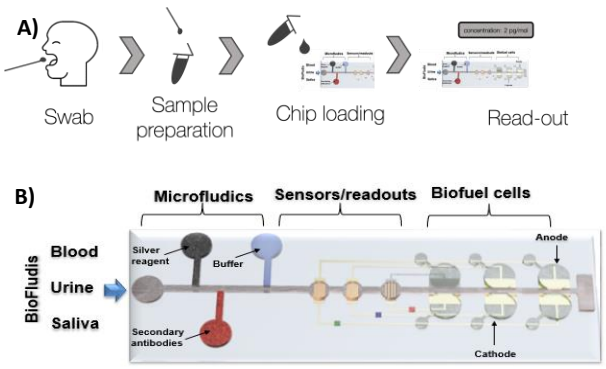
The latest pandemic outbreak of SARS-CoV-2 showed that fast and accurate diagnosis of infectious diseases is crucial in disease control. Lab-on-a-chip technology provide complex fluid handling, sample processing, signal amplification and detection on a single platform. Hence, the developed microfluidic sensing system can be used for infectious disease control in the future as well as point-of-care applications.

BACKGROUND

Latest experience with SARS-CoV-2 has shown, that fast and accurate diagnosis of infectious diseases remains a challenge during pandemic outbreaks. Due to the large number of potentially infected persons, healthcare facilities and capacities of diagnostic laboratories are quickly overburdened. Therefore, outpatient diagnosis is key in identifying cases that need immediate attention and if necessary, quarantine measures. In addition, third world countries are still struggling with a number of health care challenges including accurate diagnosis of e.g. infectious diseases and access to health care facilities.

Lab-on-a-chip technology using microfluidic devices is known for its ability to perform complex fluid handling, sample processing, signal amplification and detection, and is considered one suitable alternative to conduct on site diagnostics assays in point-of-care situation. The successful application of point-of-care devices is also reflected in the global market values, which accounted for USD 20.15 Billion in 2017 with a CAGR of 12.4 % and is expected to reach USD 57.85 Billion by 2026.

Innovative aspects



The developed microfluidic device consists of 4 parts: microfluidic channels, nanosensors, readout, and microbatteries for power generation. The novel nanobiosensing strategy allows rapid, reliable and accurate detection of viruses and biomarkers with ultra-high sensitivity in less than 5 minutes. With the additional integration of microbatteries, readout and display units, the biochip is ideally suited for on-site measurements and mobile diagnostic testing.

Benefits

- Ease of sample loading
- Integrated sample treatment and handling
- Low detection limit achieved by our nanobridge assay
- On-chip power supply and read out (display, wireless data transfer)
- High specificity

APPLICATIONS:
Clinical diagnostics
Viral contaminations
Remote locations
Portable diagnostics
Mobile diagnostics
Biomarker screening

DEVELOPMENT STATUS:
Alpha-Prototype
Assay evaluation

KEYWORDS:
Infection detection | disease control | Point of care diagnostics

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