ANTIMONIA

Differential diagnosis of viral versus bacterial pneumonia using a CD-shaped point-of-care (POC) platform

BACKGROUND

Pneumonia is the single largest infectious cause of death in children worldwide, resulting in approximately 16% of all deaths in children under five years. This deadly disease is most prevalent in low resourced and middle-income countries (LMICs) (South Asia and sub-Saharan Africa). Pneumonia can be caused by pathogens of different nature, mainly viruses and bacteria, and therein lies the challenge in diagnosis. The treatment of bacterial and viral pneumonia is different and involves the use of antibiotics and antiviral medication respectively. The differentiation between a viral and bacterial causative agent is essential to guide proper treatment. The prescription of antibiotics is meaningful only in the case of bacterial infection. Consequently, there are often the cases of misdiagnosis, leading to over-prescription of antibiotics and the widespread increase of antibiotic resistance, not to mention incorrect therapy and increased mortality. With bacterial pneumonia, the challenge lies in the time it takes to identify the type of bacteria causing the pneumonia in order to provide the correct antibiotic for the treatment. There is therefore a need to differentiate between viral and bacterial pneumonia to guide the patient treatment process for appropriate medication.

TECHNOLOGY DESCRIPTION

The Antimonia technology uses the combination of high sensitivity and specificity offered by nucleic acid amplification techniques with the inexpensive and robust applicability of Lateral Flow Assays (LFAs), by supplementing a fully automated microfluidic disk format (LabDisk) with an easy-to-use immunochromatographic LFA tests. The nucleic acid amplification is then monitored in real-time on the disk via fluorescence intensity, while the LFAs then provide the identity of specific protein markers for different organisms, including HIV (to identify those patients that are also HIV-positive, which exacerbates the burden of disease and management of treatment) via either a visual inspection or readout by a mobile device/app. The combination of LabDisk and LFAs offers a great advantage of diagnostic reliability and, enhances the detection of co-infections, including HIV.

VALUE PROPOSITION

Antimonia is a simple to use, reliable and robust point of care diagnostic system/solution for differential diagnosis of bacterial and viral pneumonia in less than 40 minutes. The technology provides a de-centralised patient management system by shifting from hospital to chair/bed-side diagnosis with minimum need for user intervention. It also has a personalised monitoring and a decision-making tool closely linked to the patient treatment management. The technology can also be customized to detect other pathogens (bacteria, viruses) depending on application requirements, or particular customer/end-user needs. This can lead to substantial cost-savings at several levels including prescription of less antibiotics to patients not indicated for treatment, providing more efficient treatments to patients suffering from pneumonia, offering better quality of life and most important, decreasing the number of infant deaths due to pneumonia.

CURRENT STATUS

A prototype has been built and validated in specific countries (Technology Readiness Level 6).

- The assay development stage for pneumonia detection and differentiation has been completed, the team is currently finalising the in-situ sample preparation and final detection of product.
- Technical feasibility of the LabDisk platform has been completed (the system is divided into two segments, one for automating the in-situ sample preparation, and one for automating the in-situ DNA/RNA amplification and detection).
- The diagnostic panel has been developed and 26 target pathogens screened, out of which: 4 bacteria, and 22 viruses, all responsible for respiratory infections.
- Biochemical components have been successfully integrated in the disk.
- A dedicated amplification module has been designed and microfluidically tested. It is expected that no further microfluidic engineering optimization is needed for this module.
- Merging of the DNA/RNA extraction and amplification module has been completed; microfluidic and biochemical tests of the "full sample-to-answer" disk in lab (are in final validations at Hahn-Schickard in Germany).
- Life Assay has secured two manufacturers for the technology.
- The lateral flow assays have demonstrated to work using a model organism and colloidal gold, however, Life Assay requires the incorporation of Nano-platinum particles in place of the colloidal gold. This study is underway.

INTELLECTUAL PROPERTY STATUS & PUBLICATIONS

Know-how (system integration and components assembly)

OPPORTUNITIES

Life Assay are seeking potential customers including NGOs active in Sub-Saharan Africa to assist with market entry in low resourced and middle-income countries.

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