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Disc-shaped Point-of-Care platform for infectious disease diagnosis (DiscoGnosis)

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Abstract: Infectious diseases are a huge threat, not only in developing countries, but globally. An estimated 220 million people get infected by malaria every year; 650.000 cases lead to death, 20% of which are within small children. The clinical symptom is mostly acute fever, but a reliable diagnosis is very difficult because in malaria-endemic areas there are several other diseases with the same symptom (*Salmonella typhi/paratyphi* bacteria or dengue and chikungunya viruses, all of which, like malaria, are transmitted by mosquitos). Within this context, DiscoGnosis aims to develop a platform for the detection of malaria and similar pathogenic diseases in a rapid, multiplexed, highly specific way at the point-of-need. Using centrifugal forces, a disc-shaped chip will handle the injected blood sample and distribute it among integrated microfluidic chambers for processing till the final detection step. Main technical objectives are: (i) Fully automated and integrated analysis from blood (“sample-to-answer”) where several unit operations are integrated on the disc for self-handling of fluid. All necessary (bio)chemical components will be pre-stored on the disc. (ii) Multiplexed detection, by means of quantum dots and magnetic beads acting as pathogen-specific identification codes in an array configuration on disc. (iii) Both nucleic acid and protein based analysis so as to achieve maximum reliability and cross-checked results and to monitor a broader diagnostic window of the diseases. (iv) Scalable fabrication technology based on the microthermoforming of polymer foils, in order to have a low-cost and high-throughput production of diagnostic kits. Clinical trials will be done in Africa for system validation.

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