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Nano-based biosensor for detection of bilharzia

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Bilharzia is one of the neglected tropical diseases (NTDs), a group of chronic disabling infections affecting more than a billion people worldwide, mainly in Africa and mostly the poor. In Kenya, these NTDs affects more than 50% of the population fueling the vicious circle of poverty and stigma that leaves people unable to work, go to school, or participate in family and community life. Highly sensitive detection and accurate analysis is essential for the early detection, treatment, and management of these diseases. Current methods of detection rely on microscopic detection which is tedious, unreliable and suffers poor sensitivity. In this work, a nano-based immunosensor for early detection which rely on nano-immunological response between antibodies against bilharzia conjugated to nanoparticles and bilharzia antigen will be reported. The conjugation of the antibodies with nanoparticles combines the unique properties of the nanoparticles with the specific and selective recognition ability of the antibodies to antigens. The hybrid product has improved cellular uptake as well as the major intracellular stability and may show versatility and specificity with improved analytical signal important for rapid, sensitive and real-time point of care diagnosis. The work will report the use of screen printed electrodes for a potential development of a nano-device for point-of-care diagnostic of bilharzia.

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Microflow actuation impact on miniaturization of laboratory unit operations: Two study cases from downstream processing and point-of-care diagnostics

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Extraction and filtration comprise major part of existing key operations in many recovery processes for biological materials throughout red biotech and sample preparation in point-of-need diagnostic devices. Advances in miniaturization allow for process intensification and on demand dissipation of unique technical solutions, which will revolutionize pharma and healthcare, as we know them. This seminar will focus on the means of control and actuation of fluid flows in microfluidics for purification of drug encapsulating liposomes and sample preparation from complex fluid. The first part of the presentation will touch upon continuous liposome synthesis and purification on bench-top scale. A train of microfluidic devices is presented that facilitates tailored synthesis of liposome vesicles for drug delivery applications. In the second part of the seminar a mechanism for intrinsic flow control on a rotating disc will be shown. Novel valve technology enables built-in actuation and release of reagents in consecutive, programmable manner with predefined controllable timing. This technology is used for the extraction of RNA from samples of whole blood that are spiked with *E.coli* or MCF-7 cells, breast cancer cell line, to mimic patient samples. At final, diagnostics strategy is discussed using those purified samples. These examples demonstrate advances of flow actuation and miniaturization of laboratory unit operations for recovery of biological samples.

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