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CENTRIFUGAL MICROFLUIDIC PLATFORMS FOR MOLECULAR DIAGNOSTICS

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Background. We present a microfluidic Lab-on-a-Chip platform for integration and automation of diagnostic and biochemical protocols, including nucleic acid analysis and immunoassays.

Methods. Laboratory processes are automated in disposable microstructured polymer test carriers. These labs-on-a-chip are processed and readout in centrifugal devices. Centrifugal processing of nucleic acid applications is realized on the commercially available Rotor-Gene platform.

Results. Fourteen real time PCR reactions are performed in parallel in microstructured foil substrates. The detection of < 10 copies of the antibiotics resistance marker Exf A is demonstrated in a foil featuring pre- and main amplification. Isothermal amplification

of DNA by recombinase polymerase amplification (RPA) has also been demonstrated in our lab-on-a-chip system. Automated parallel testing of 30 samples with sensitivities < 20 copies and time-to-result of 20 min is achieved. Furthermore, a polymer cartridge for immunoassays is shown for the quantification of estradiol and IL8 with sensitivities down to 125 pg/mL. 24 assays can

be processed in parallel. The immunoassay cartridge can be complemented with a blood plasma separation module for sample preparation extracting 4 µL blood plasma out of 10 µL whole blood with a CV of 6 %. Furthermore, an automated DNA extraction

is developed, allowing to extract DNA out of a bacterial sample with a yield comparable to the laboratory reference method.

Conclusions. The development of a microfluidic platform for manifold applications in the field of diagnostics and biochemistry is shown and a successful implementation of assays for DNA and protein analysis as well as sample preparation is demonstrated.