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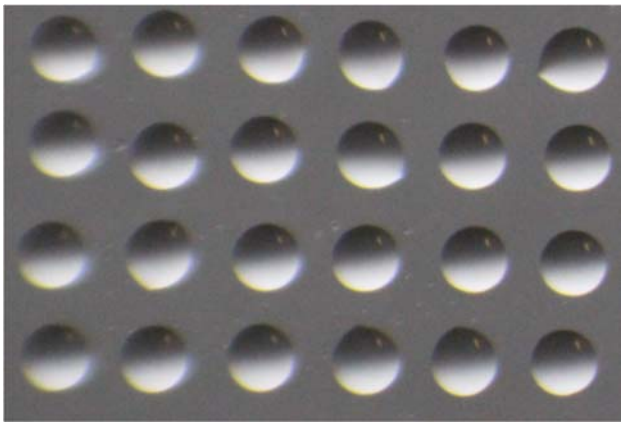
Projet « Aptaprint »

Phage display et SELEX pour cibler des biomarqueurs diagnostiques et miniaturisation par bio-printing



Diagnostic biosensor devices rely on antibodies, peptides and nucleic acids to capture biomarkers from complex body fluids, such as blood. Current commercial antibodies are expensive, because their development is a tedious process that requires animal experimentation. In addition to this, the chemistry available to attach these antibodies to the diagnostic devices is limited. Therefore efficient alternative routes are needed. Here, we will establish site directed evolution techniques to screen for single-chain fragment variable antibodies (scFv) and aptamers. These biomolecules will be used as baits to capture the biomarkers specific to the desired diagnostic applications. A second important objective of the present proposal will be to miniaturize the diagnostic devices through biomolecule printing on sensor like surfaces.

We will implement scFv antibody phage display and SELEX (systematic evolution of ligands by exponential enrichment) as a means to identify biomolecules targeting the biomarkers. Miniaturization will be performed using standard inkjet printers. Home-built professional inkjet printing, microdroplet ejection equipment and microstamping tools will be evaluated to anticipate the decrease of droplet dimension as well as the upscaling required for industrial production. The impact of environmental conditions on printing/drying, and the influence of microfluidic properties for miniaturization will be studied. Last, atomic force microscopy will be used for the analysis and optimization of the deposition in terms of reproducibility, precision, density distributions and aggregation of the micro-printed bio-molecules on sensor like substrates.

The project will focus on the following four objectives:

1. Development of site directed evolution techniques for screening scFv antibodies and aptamers targeting biomarkers of interest for the diagnostics biochips program.
2. Comparison of these two technologies from a diagnostic application point of view.
3. Improvement of the adhesion of capture molecules to sensor like surfaces by chemical conjugation.
4. Miniaturization (downscaling) of digital printing techniques for precise biomolecules printing on sensor- like surfaces (experimental performance analysis in terms of miniaturization and industrial up-scaling for highly miniaturized diagnostic devices).