Microfluidic devices for the diagnosis or treatment of cells

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Since its apparitions 20 years ago, the Microfluidic technologies spread in the domains of biology and medicine. In particular numerous devices have been proposed for the analysis and/or treatment of living cells at multi-scales, ranging from the single cell devices [2] [10] , cells microarrays [3] or in-flow cell sorters [6] , up to devices devoted to the reconstruction and monitoring of cell tissues [4] . Such approaches to study and monitor cells, take benefit from the miniaturization capabilities made possible by the use of clean-room technologies. Electrical or mechanical function, downscaled to the size of cells, give access to the dielectric [10] or mechanical properties of cells [9] , and renders possible the single cell treatment on a chip, like electroporation [2] , or cell fusion [5] , sometimes in a parallel manner [8] .

To achieve such capabilities, sensing functions must be integrated on the microfluidic device, to characterize the cell(s) mechanically, electrically or optically while they are flowing or trapped for treatment purpose.

We recently developed a microfluidic device mimicking the sequestration function of the spleen, based on the mechanical properties of red blood cells (RBC), that might be altered due to parasite infection [7] . Such device is capable to discriminate and sort cells (infected cells versus healthy cells) thanks to their mechanical properties. Besides, we develop device capable to discriminate and extract pathogens from blood, thanks to their dielectrical properties [1] .

Both approaches - mechanical or electrical sensing the flowing cells on a chip- might provide very promising tools for the diagnosis.

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