**Lab-on-chip Systems Carrying Artificial Motors for Multiplexed and Multiparametric Biochemical Assays**

Incorporating artificial motors into microfluidic devices for multifunctional agent delivery represent a novel concept to control chemical reactions. Synergy of two innovative approaches, namely, autonomous artificial motors together with lab-on-chip systems resembles a new route towards highly efficient and specific biochemical tests. The ultimate goal of the project is to develop a novel biotechnological approach to perform immunoassays, relying on active involvement of artificial Janus motors into the microfluidic chip. Our activities will result in the realization of the miniaturized chip, where all the steps, typically performed manually in conventional bioprocessing, will be carried out by remotely controlled smart artificial machines.

During the immunoassay procedure, specially developed Janus motors will transport biological species in a controlled way in fluidic channels. This will allow us to perform biochemical reactions in a stepwise manner. Recent demonstrations rely on the use of **limited number of motors** (single particles than their ensemble) and **use of single parameter for the quantitative analysis** of bioassays. Despite several demonstrations where the biological molecules or cells were detected in liquid environment, the realization of a **microfluidic-based platform carrying artificial motors for multiplexed and multiparametric biochemical assays** still remains out of reach.

We focus on realization of **Janus motors based bioassays for detection of potentially dangerous pathogenic cells (**namely *E.c*oli and *S. aureus*) **using antibodies as receptors**. This includes the integration of functional Janus motors in a microfluidic chip together with medium containing cells/proteins and measurements of (a) a fluorescent/colorimetric signal as a response to the biorecognition between membrane proteins and antibodies and (b) statistical analysis of the mean velocity of the motors. Such innovative approach enables to perform chemical reactions on the **motor surface** and to avoid the need of fluid injection and washing steps in the procedure. This will help to decrease dramatically the diagnostics time, relevant for pharmaceutical and medical fields, and will decrease the costs of the full analysis. The design of the device involves the fabrication of multiple reaction chambers with diverse functionalities, representing the loading stations for the Janus motors, incubation chambers and detection windows.