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Tiny droplets to detect cancer biomarkers

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Droplet-based microfluidic has led to the development of highly powerful systems that represent a new paradigm in High-Throughput Screening where individual assays are compartmentalized within microdroplet microreactors. By combining a decrease of assay volume and an increase of throughput, this technology goes beyond the capacities of conventional screening systems. Droplets (in the pL to nL range) are produced as independent microreactors that can be further actuated and analyzed at rates of the order of 1000 droplets per seconds. Added to the flexibility and versatibility of platform designs, such progress in sub-nano liter droplet manipulation allows for a level of control that was hitherto impossible.

We will show how by combining microfluidic systems and clinical advances in molecular diagnostic we have developed an original method to perform millions of single molecule PCR in parallel to detect and quantify a minority of mutant sequences within a high quantity of non-mutated sequences in complex mixture of DNA with sensitivity unreachable by conventional procedures. Finally, to demonstrate the pertinence of our procedures to overcome the clinical oncology challenges, the results of 2 studies will be presented. When the first one addresses our ability to detect minoritary subclones in colorectal tumors and to understand the impact of these subclones on responses and survival of the patients treated by anti-EGFR therapies, the second one aims at demonstrated the possibility to circulating tumor DNA in plasma of patients with advanced colorectal cancers.

Biography

Taly Valerie conducts her research at the interface between chemistry, physics and biology. Since 2003, she has been working with Prof. Andrew Griffiths, first in the Medical Research Council in Cambridge (UK) and then in the ISIS (Strasbourg). She focuses her research on *in vitro* compartmentalization of biological and chemical reactions in emulsion droplets of few picoliters. She recently started the Translational Research and Microfluidics Group within the clinical oncology research unit headed by Prof. P. Laurent-Puig. Her research is dedicated to the clinical validation of droplet-based microfluidics for the non-invasive detection of Cancer biomarkers, the highlighting of new Cancer Biomarkers and the development of original tools and procedures for their detection with applications in personalized medicine, cancer recurrence detection and cancer diagnostics.

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