

Plenary Lecture

MICROFLUIDICS AND NANOTECHNOLOGY: TOWARDS ADVANCED ORGAN-ON-A-CHIP SYSTEMS

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Summary: Cancer is a leading cause of morbidity and mortality worldwide. Early dissemination of cancer is difficult to detect by traditional imaging and pathological methods. While the presence of cancer material in body fluids is well known, current techniques for the isolation, analysis and characterization of these biomarkers are not efficient enough to be fully applied in clinical routine. Microfluidics presents numerous advantages for the handling of biological samples, as it provides careful control of fluids in the microscale. When it comes to biomarkers enrichment, microfluidics has demonstrated superior sensitivity and enhanced recovery compared to traditional methods. Nanobiosensors, on the other hand, offer efficient and multiplex characterization of biological entities from complex matrices, making lab-on-a-chip technologies ideal for field applications, enabling high throughput, portability, and automation in real settings. Furthermore, the development of biomimetic tumor models incorporating patient-derived material, might provide valuable information to assess the different stages of cancer, as well as to design personalised treatments. In this talk, we present our most recent work for integrated isolation and analysis of multiple circulating biomarkers, their incorporation in tumor models, and their validation in clinical settings.