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Lab on a Chip：A Key Platform for Biomedical Applications

Advances in technology have allowed chemical and biological processes to be integrated on a single platform. Adaptation of these approaches to Lab-on-a-Chip (or Microfluidics) formats is providing a new class of research tools for the investigation of biochemistry and life processes. In our lab, the various microfluidic chips fabricated in different materials with higher degree of complexity and functional units have been established, and these devices have been demonstrated for a wide range of biomedical applications. In this talk, an integrated immunoassay chip that incorporated into a series of normally-closed elastomeric microvalves will be presented. This device was able to realize flexible reagent delivery and control, and the various operations of immunoassay involving sampling, mixing, and washing steps can be performed on a single chip with reduced reagents and analysis time. Moreover, a microfluidic device integrating multiple drug concentration gradient generators and multiple cell culture arrays was set up for the screening of anti-cancer drugs. A set of functional microfluidic devices with the capacities to characterize metastasis in tumor cells and formyl peptide receptor (FPR) mediated intracellular signals in RBL-FPR cells were developed as well. In addition, a droplet-based microfluidic device integrating a droplet generator with a droplet trap array was built for organism-based drug screening. The device was able to encapsulate individual *Caenorhabditis elegans* into a parallel series of droplets, allowing the characterization of individual animal behavior in response to neurotoxin at single-animal resolution, demonstrating the potential of this platform for screening of anti-neurodegenerative disease drugs.

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