BIOMATERIALS

Forces in Biomolecular Systems SFB 863

Labs, Cells and Organs on a Chip

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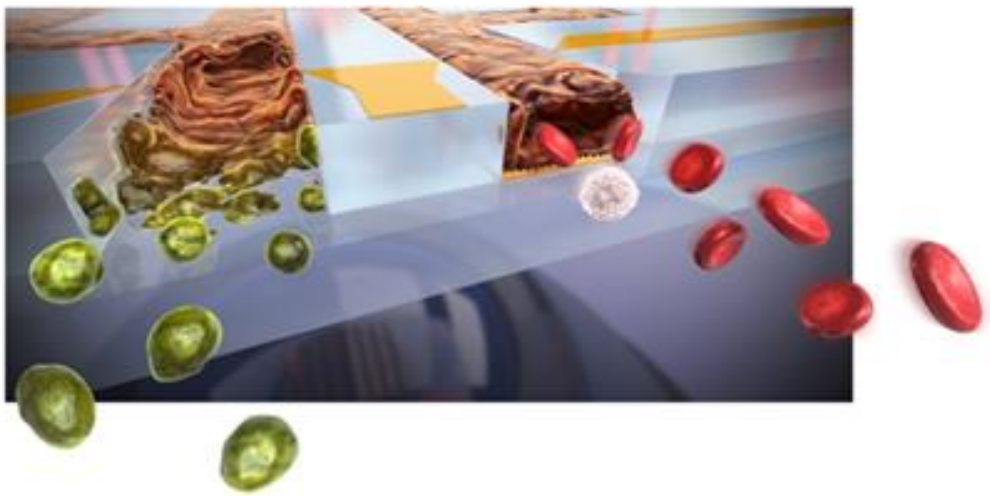
Abstract:

The recent rapid developments in microfluidics technologies has enabled the realization of miniaturized laboratories. These Labs-on-a-Chip will play an important role in future medicine, both in point-of-care devices for drug or biomarker monitoring, as well as in early diagnostic devices. We developed a pre-filled ready-to-use capillary electrophoresis platform for measuring ions in blood. It is used to monitor lithium in finger-prick blood of manic-depressive patients, but can also be used for measuring calcium in blood for prevention of milk fever, or for measuring creatinine in blood or sodium in urine for early detection of ESRD. Microfluidics can also be exploited to manipulate and experiment with cells on chip. We have developed a microsystem for sperm analysis and selection for artificial insemination, where we can electrically detect and sort healthy sperm cells. Using microdevices we have been able to electroporate and transfect genes into individual cells, and a microdroplet platform was used for encapsulation of single cells in microdroplets, ordering of these microdroplets and 1:1 fusion of these droplets to form hybridomas. We believe this is a very powerful new tool that can be used for high-throughput single cell experimentation. Apart from diagnostic and cell manipulation devices, microfluidic devices are increasingly used to realise advance disease and organ-models, as illustrated by the blood-brain barrier chip and a blood vessel on a chip to study atherosclerosis.



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Room PH 127

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