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Accessible morphohistochemical labs-on-a-chip based on different counting chambers' grids: microfluidic morphodynamical workstations

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ABSTRACT

An accessible design of autonomous labs on the chip which do not require a special reader is developed. The proposed device uses hemocytometric counting chambers for determination of concentration of cells, isolated by a special device for cell sedimentation. A system of automated RF-identification of chambers in the long-term storage is proposed which provides new morphometric data at various stages of cultivation or biomonitoring. A new diffraction method of calculation and fingerprinting of cellular structures in varying environmental conditions is described. Experimental data on the pilot testing of Fuchs-Rosenthal, Buerker, Neubauer, Makler and Thoma chambers for the described technique is given. The applicability of these devices for coherent densitometric indication either of concentration dynamics in cell culture or suspension or morphogenetic processes in them for laminar conditions is shown. A self-learning program for cellular pattern recognition and relational cytophotometry based on lab on the chip with an object-micrometric calibration relative to the counting net is demonstrated. A hybrid in vitro / in silico method of morphogenesis monitoring in cell cultures is introduced.