A microfluidic device for monitoring cell migration in 2D environment

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Directed cell migration and invasion is a phenomenon that is closely related with physiological processes like wound healing, tissue growth or tumor malignancy. In cancer, actively migrating cells can detach from the primary tumor, penetrate into the blood stream and subsequently form metastases in distant parts of the body which may significantly reduce the patient's chance of survival. The rate of migration speed of different cell types therefore provide a valuable information on the potential malignancy.

To address these needs, we have developed a microfluidic device for testing the rate of migration in large population of cells. The device was fabricated by standard soft-lithography technique and direct molding of polydimethylsiloxane on a SU-8 negative master mold. The device consists of two reservoirs connected by a 10 µm high channel that is barred by arrays of micropillars with decreasing spacing. One reservoir is filled by cells suspended in serum-free medium and the other by medium with 10% fetal bovine serum generating a nutrient gradient that induces active migration through the pillar arrays. The migration process was monitored using an inverted microscope at 37°C, 5% CO_2 and 90% humidity. Such device could potentially find its use in personalized cancer therapy but it can be used for studying other cell migration related processes as well.

The research was supported by the Grant Agency of the Czech Republic, project no. 17-01995s (at the IAC ASCR, v.v.i.) and by the Institute of Analytical Chemistry of the CAS under the Institutional Research Plan RVO: 68081715.