

INTERNATIONAL MICROFLUIDICS CONGRESS

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International Conference on ADDICTION RESEARCH AND THERAPY

August 13-14, 2018
San Diego, USA

Universal lab-on-a-chip platform for culturing and investigation of microorganisms biological potential

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Universal microfluidic lab-on-a-chip platform integrated with precise microdispenser for culturing of microorganisms and investigation of their biological potential, i.e. different taxis effects, is shown. A key element of the platform is all-glass lab-on-a-chip, fabricated utilizing xurography and innovative method of low-temperature (80 °C) bonding. The chip (Fig. 1a) includes three microchambers in which cells are cultured and two back-side microchannels, ended with the 3D printed microdispenser for suppling of culture nourishment. The culture sample is OLED illuminated, which provides selective, precise and multi-colour emission spectra (Fig. 1b). Digital microscope observes the culture. Afterwards, acquired images are processed and analysed by the dedicated software (Fig. 1c), which enables to evaluate several time-dependant parameters of the culture, e.g.

population, mobility, movement trajectory (Fig. 1d). The platform has been successfully applied in long-term culturing of *Euglena gracilis*, *Euglena viridis*, *Lepadella patella* and bovine oocytes. Several interesting taxis reactions have been noticed. In detail - *Euglena gracilis* has revealed repeatable chemotaxis towards air, instead of N₂. Co-culturing of *Euglena viridis* and *Lepadella patella* has shown pronounced predator-prey relationship. Tests on sample irradiation have demonstrated that *Euglena gracilis* exhibits phototaxis towards red light (615 nm) but photophobic response to blue light (470 nm). Presented results confirm suitable operation of the platform, which suggests its further utility in investigation of other biological objects.

Biography

Agnieszka Podwin has completed MSc in Electronics from Wroclaw University of Science and Technology and joined a PhD program at the Faculty of Microsystem Electronics and Photonics in 2015. Her current research is basically focused on development of a new family of lab-on-a-chip "intelligent" platforms, being universal tools for culturing and observations of microbial objects. Special attention is given to investigation of behaviorism and biological potential of freshwater microorganisms and oocytes of farm animals. She is the leading author of several high-ranked publications in, e.g. Biomedical Microdevices, Journal of Micromechanics and Microengineering.

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