

LIFT microscope for contact-free cell culture preparation

In personalized medicine, highly specific drugs are tested on autologous cell cultures of a patient for side effects as well as for their effect on customized therapies. For this purpose, so-called induced pluripotent stem cells (iPSC) are taken from the patient and can be differentiated into different tissue types for drug testing. To make such in vitro testing procedures with the patient's own cells economical and to transfer them to routine diagnostics, a laboratory has to grow, analyze and sort iPSC cultures automatically.

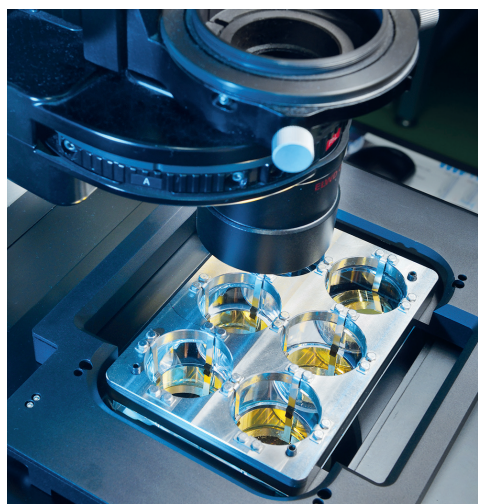
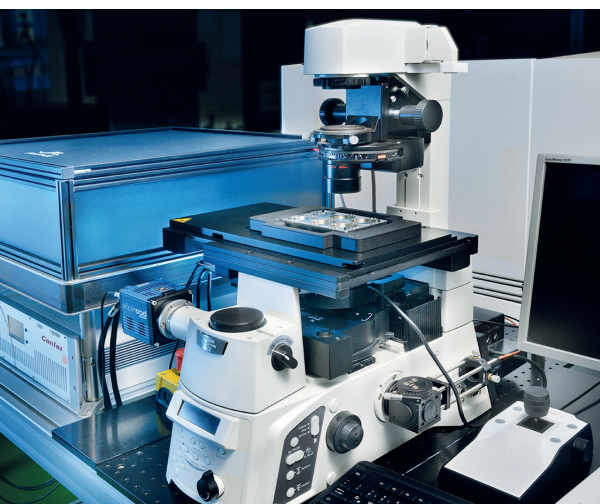
Combining cell recognition and LIFT in one system

In an inverted microscope with cell culture chamber, the project partners have combined high-speed microscopy software with an algorithm for automatic cell recognition (Fraunhofer IPT) and a module for laser-induced forward transfer (LIFT) developed at Fraunhofer ILT. With this system, it can sort cells gently, automatically and without contacting them. The LIFT process uses a MIR beam source with a wavelength of 2.94 μm , which has already been proven for the transfer of single cells and cell clusters from an aqueous environment. By combining cell detection and the LIFT process in one system, the partners can culture cells and selectively remove selected pluripotent stem cells from culture using laser-induced forward transfer without manual steps. A carrier substrate with cell culture medium accommodates the removed cells; there, the selected iPSC cells can be further cultured in a new culture for in vitro testing.

Versatile applications in everyday laboratory work

Thanks to its modular design, the transfer system serves a wide range of applications in everyday laboratory work. Existing cell analysis systems and microscopes can be expanded and individual work steps automated. Thanks to this reduction of manual work steps, laboratories will be able to produce in vitro test systems faster, more reliably and cheaply and, thus, conduct routine diagnostics in personalized medicine.

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*1 Microscope with integrated high-speed image recognition and laser-assisted cell separation.
2 Substrate holder for collecting and cultivating transferred cells in the multiwell cell culture vessel.*