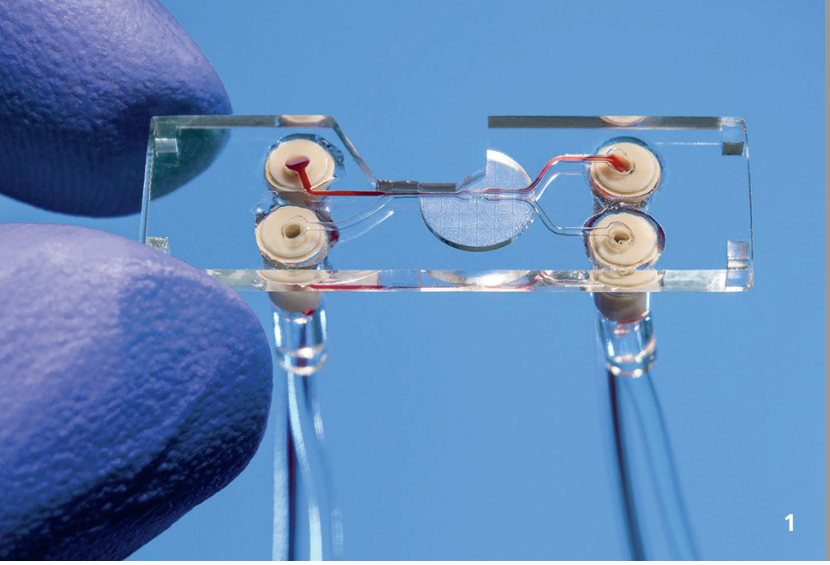

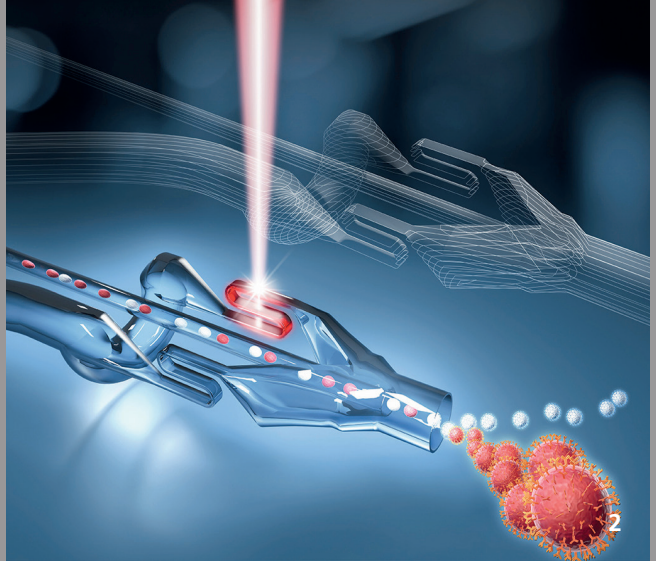

»ANALIGHTER« – LIGHT CONTROLLED µFACS FOR PERSONALIZED DIAGNOSTICS

Technology

Biomolecules and cells circulating in the blood carry diagnostic information, the analysis of which enables highly effective individual therapies. The Fraunhofer ILT has developed a microchip-based diagnostic device, µFACS, to tap this information. The »AnaLighter« analyzes and sorts clinically relevant biomolecules and cells in a blood test with light. This allows physicians to make early diagnoses and initiate highly effective individual therapies.

The technological core of the »AnaLighter« is based on an optically switchable microfluidic chip whose optical sensors and switches are connected to the chip via optical fibers. The biomolecules and cells to be analyzed by fluorescence are guided through a microfluidic channel and are focused hydrodynamically on a cross-section of 10 µm at the site of the measurement. Laser light from an optical fiber stimulates the analyte in the microchannel to fluoresce. Then, micro-optics collect the fluorescent light emitted by the analyte and guide it through optical fibers to the photodetector. This fiber-optic design allows a significant reduction in the installation space and increases the robustness of the µFACS.

Multiple wavelengths can be superimposed in a fiber and used for multi-spectral measurements. Currently, a system with 16 detection channels and 6 different excitation wavelengths is available. A special feature of the AnaLighter is its opto-fluidic switches with which cells at a fluidic branching can be sorted out by the action of IR laser light.

Multiplex Diagnostics

The spectrally separated detection channels of the AnaLighter can detect up to 16 different fluorescence-labeled marker molecules simultaneously. In annual routine checks carried out by a general practitioner, such a multiplex test could diagnose a large number of possible diseases at an early stage and, thus, prevent widespread diseases, such as cardiovascular disease.

Detecting Tumors Early

Tumor cells already circulate in the blood at a very early stage of cancer. Their detection can be used for the early diagnosis of cancer even before the disease causes symptoms or is detectable with imaging procedures. With the AnaLighter, circulating tumor cells can be detected, sorted and placed on the microfluidic chip for further clinical investigation. The isolated cells are then available so that a therapy tailored to the patient can be selected.

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1 Sorting chip for analyzing and isolating cells in a blood sample.

2 Principle of operation of the optofluidic switch.

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