MEGHÍVÓ

Mesterséges megtermékenyítés sikerességét befolyásoló tápoldat-markerek vizsgálata című projekt

Prof. Dr. A. van den Berg:
From Lab-on-Chip to Organ-on-Chip

VAN DEN BERG, Albert (professor, head of research group) received his PhD at the University of Twente in 1988. From 1988-1993 he worked in Neuchatel, Switzerland, at the CSEM and the University (IMT) on miniaturized chemical sensors. From 1993 until 1999 he was research director Micro Total Analysis Systems(μTAS) at MESA, University of Twente. In 1998 he was appointed as part-time professor, in 2000 as full professor on Miniaturized Systems for (Bio)Chemical Analysis in the faculty of Electrical Engineering, embedded the MESA+ Institute for Nanotechnology. In 2002 he received the Simon Stevin Master award from the Dutch
Technical Science foundation (STW). In 2003 he was appointed as captain of the Nanofluidics Flagship within the national nanotechnology program Nanoned. He received an Advanced Research Grant from ERC in 2008. In 2009 he received the Spinoza prize for his achievements in lab-on-a-chip research. His current research interests focus on microanalysis systems and nanosensors, nanofluidics and single cells on chips, with applications in health care and
environment. He is member of the Royal Dutch Academy of Sciences (KNAW), the Dutch Health Council, board member of the Chemical and Biological Microsystems Society, member of the Dutch Chemical Society (KNCV) and deputy chair of the journal Lab on a Chip. He has co-authored over 180 papers (H=33) and over 10 patents, and has been involved in > 5 spin-off companies.

From Lab-on-Chip to Organ-on-Chip

In vitro models of biological tissues are indispensable tools for unraveling human physiology and pathogenesis. They usually consist of a single layer of a single cell type, which makes them robust and suitable for parallelized research. However, due to their simplicity, in vitro models are also less valid as true reflections of the complex biological tissues of the human body. Even though the realism of the models can be increased by including more cell types, this will inevitably lead to a decrease in robustness and throughput. The constant trade-off between realism and simplicity has led to an impasse in the development of new in vitro models. Organs-on-chips, a class of microengineered in vitro tissue models, have the potential to break the in vitro impasse. These models combine an artificially engineered, physiologically realistic cell culture microenvironment with the potential for parallelization and increased throughput. They are robust, because the engineered physiological, organ-level features such as tissue organization, geometry, soluble gradients and mechanical stimulation are well-defined and controlled. Moreover, their microfluidic properties and integrated sensors pave the way for high-throughput studies. In this review, we define the in vitro impasse, we explain why organs-on-chips have the potential to break the impasse and we formulate a view on the future of the field. We focus on the design philosophy of organs-on-chips, the integration of technology and biology and on how to connect to the potential end-users.

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