

# Lab-on-a-Chip development – from idea to product

Concept, design, rapid prototyping and optimization for mass production, for the application in biomedical diagnostics, and in personalized medicine

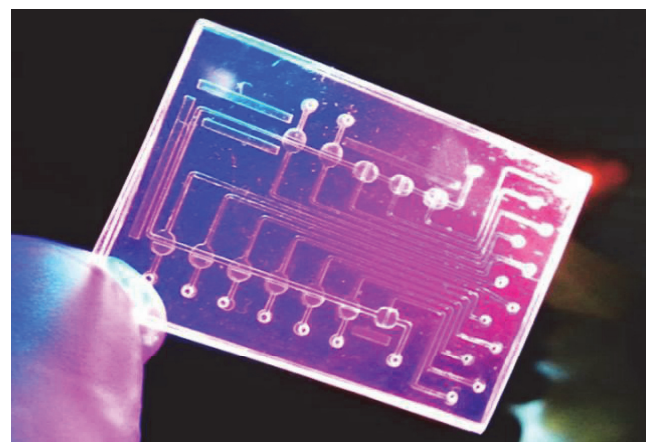
Curative health care nowadays relies on the forecasts of the effectiveness of medication. These are, however, often based on strongly levelling statistical means - conditions that fail to take into account individual factors, interactions and intolerances. In contrast, individualized approaches to biomedical diagnostics and precise therapy strategies, which also consider the physical parameters of specific individuals, promise significantly better chances for recovery from injuries and diseases. In addition, such strategies help preventing unintended side effects and resistances. Furthermore the administration of ineffective medication can also be drastically reduced.

Biomedical research nowadays relies on the time and cost-intensive cultivation of cells and on microscopic methods. Individualized diagnostics and medication, as well as pharmacological and biotechnical research and development require innovative systems for the analysis of cells, nutrients, metabolic products, and active pharmaceutical ingredients that are effective, safe and low-cost.

## CellChipGroup

The CellChipGroup around Prof. Peter Ertl at the Faculty of Technical Chemistry at the TU Wien develops automatized, highly integrated, miniaturized systems based on different chip technologies for biomedicine and personalized medicine.

These systems enable for example: comprehensive quality assurance of the cultivation of stem or immune cells, the wide application of organ-on-chip tests, and a multifaceted screening of pharmacological effectiveness in an individualized way. These innovative systems are significantly less expensive and more effective compared to any



Time-resolved Immunoassay-on-chip with integrated micro valves and micro pumps

other approaches currently in use in research, medicine and industry.

## Technologies

Highly integrated chips from soft and hard polymers, or glass/polymer hybrids are produced by applying the latest technologies from the specialized segments of micro processing, lithography, casting technique, hot stamping and micro injection molding.

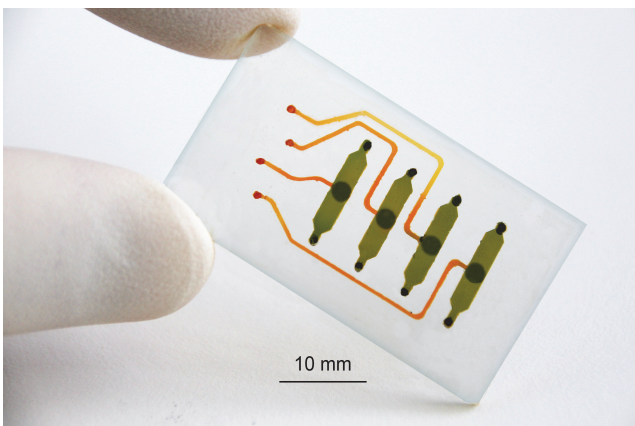
## Results

With the existing technologies and procedures developed by research teams at the TU Wien, microfluidic components, integrated chips and systems are creatively conceptualized, quickly designed and successfully produced as prototypes.

On a microfluidic chip of the size of approximately 1-5 cm<sup>2</sup>, sensors, actuators, valves, pumps, concentration generators, degassers and micro reaction chambers are realized. After a series of tests and optimizations, prototypes are then brought to mass production together with industry partners.

Examples of currently implemented technologies:

- automated migration/wound healing, proliferation, and potency assays
- living-cell arrays based on single cell, multi cell or 3D co-culture
- (implantable) sensors and diagnostic systems for biomedicine, e.g. blood analysis

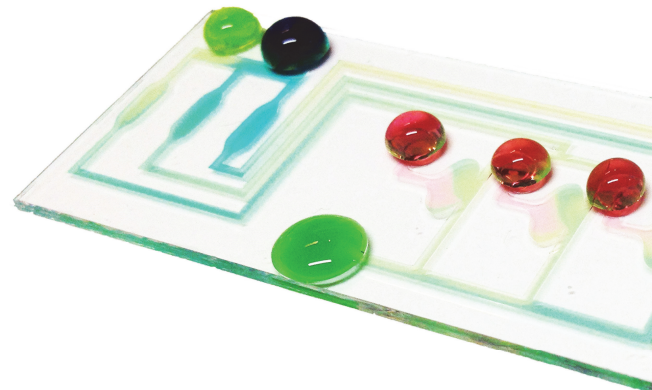


First wound healing biochip worldwide

## Benefits

The CellChipGroup at the TU Wien offers the necessary rapid prototyping technologies, as well as its experience in microfluidics, for the realization of precision medicine and personalized medicine. They realize innovative lab-on-chip-systems, which provably lead to significant cost reduction and time gains.

Areas of application for lab-on-chip-systems include:



3D-hydrogel cell culture/organoid microarray

- drug development and optimization
- multi-parametric cell analytics
- (nano) toxicology
- individualized choice of therapy and its optimization
- clinical diagnostics and point-of-care diagnostics

The CellChipGroup at TU Wien offers:

- feasibility studies and design optimization
- customized development of technologies
- comprehensive technology consulting
- specifically regarding the transfer to mass production
- consulting for decision-makers in medicine, pharmacology, research and development, and quality control
- training for end users in the handling of microfluidic and lab-on-chip systems

## Notes

### Contact

Univ. Prof. Dr. Peter Ertl  
 TU Wien – Faculty of Technical Chemistry  
 CellChipGroup  
 Tel: + 43 (1) 58801-163605  
 peter.ertl@tuwien.ac.at  
 www.ias.tuwien.ac.at/peterertl