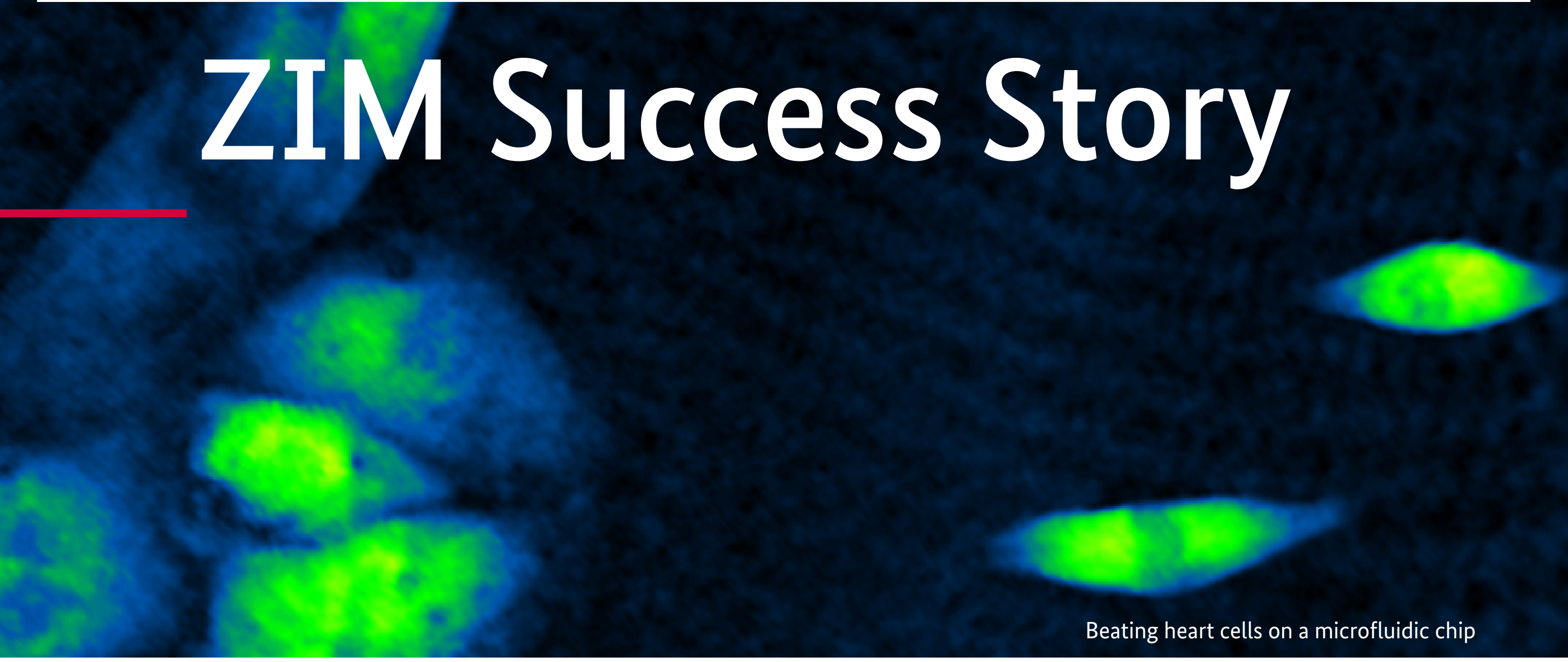
Federal Ministry
for Economic Affairs
and Climate Action

ZIM
Zentrales
Innovationsprogramm
Mittelstand

# ZIM Success Story



Beating heart cells on a microfluidic chip

## Laboratory Analytics in the Smallest of Spaces

*Lab-on-a-Chip technologies are being developed within the eponymous international ZIM Innovation Network. These technologies can help, for example, to improve medication dosage and reduce animal testing.*

“Lab-on-a-chip” denotes the bundling of several steps of traditional laboratory analytics on a glass or plastic chip measuring only a few square centimetres in size. The advantage: Only very small sample quantities are needed and tests can be carried out in an automated way and in a very small space. The network aims to develop lab-on-a-chip products that can overcome previous obstacles that prevented the implementation of its application, such as high costs or a lack of complete automation, and can thus replace laboratory testing.

### Products and innovations

Applications focus mainly on the medical field, specifically the development of new medicines, e.g. against cancer, or diagnostics for autoimmune diseases. Here, the binding behaviour between antigens and antibodies, especially the so-called cell specificity of the antibodies, plays a decisive role: the binding site of the antibody should match the target cell in the best possible way but not bind to other human cells in order to avoid potential side effects.

For further analysis, the target cell is kept in a microfluidic channel on the surface of a chip by means of mechanical „cell traps“. Then, the respective antibodies or drugs are pumped through this channel and detected as soon as they bind to the target cell.

This way, the quantity, size, and speed of the binding molecules can be determined. Thus, the method allows an early characterisation of the immuno-logical response of a cell to an active substance outside of the human body.

At the underlying level, which is the binding of active substances to individual target proteins of a cell, another innovation of the network comes into focus. Due to fluorescence correlation spectroscopy (FCS), it is possible to identify whether an active substance docks on to the target protein and is thus effective or not, even before entering the critical second clinical phase. Due to the complex and expensive measurement technology as well as the complexity of the implementation, this method has thus far mainly been used in fundamental research. However, the cooperation partners are working on the development

**Project information**

**Project duration:** 01/17 – 06/21

**Project form:** Innovation Networks

**Technology field:** Health Research and Medical Technology

**Contact**

NETZWERK FÜR LAB ON A CHIP TECHNOLOGIEN

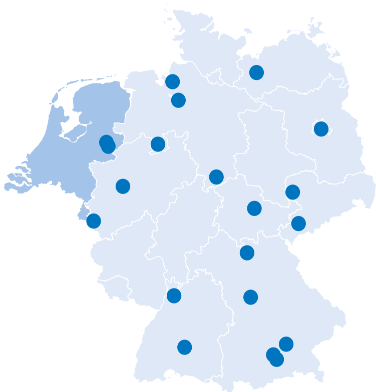
Dr Isabell Schwenkert | Dr Andreas Baar
innos GmbH
Am Goldgraben 11, 37073 Göttingen
Phone +49 551 49 601-0
E-mail: info@innos.global

**Current Network Partners**

- HNP Mikrosysteme GmbH, Schwerin
- 42 life sciences GmbH & Co. KG, Bremerhaven
- microfab Service GmbH, Bremen
- ibidi GmbH, Gräfelfing
- Dynamic Biosensors GmbH, Planegg
- miprolab GmbH, Göttingen
- Ionovation GmbH, Osnabrück
- inno-spec GmbH, Nuremberg
- BianoScience GmbH, Zwickau
- AMO GmbH, Aachen
- Sciomics GmbH, Heidelberg
- LightFab GmbH, Aachen
- Centre for Research Promotion in the Paediatrics GmbH, Essen
- PreciPoint GmbH, Freising
- Intana BioScience GmbH, Planegg
- BianoGMP GmbH, Gera
- IOM Leibniz Institute for Surface Modification e. V., Leipzig
- NMI Natural and Medical Sciences
- Institute at the University of Tübingen, Reutlingen
- Institute for Sensor and Actuator Technology ISAT, Coburg University of Applied Sciences
- PolyAn GmbH, Berlin
- IMSAS Institute for Microsensors, -actuators and -systems, University of Bremen

**Dutch Network Partners**

- Artecs B.V., Hengelo
- CE-Mate B.V., Enschede
- Tide Microfluidics B.V., Enschede
- Micronit Micro Technologies B.V., Enschede
- Saxion University of Applied Science, Enschede



of a user-friendly and cost-effective measurement and analysis platform for various FCS technologies. The future product „FCS-easy“ is meant to enable for the very first time the broad use of the method in pharmaceutical research.

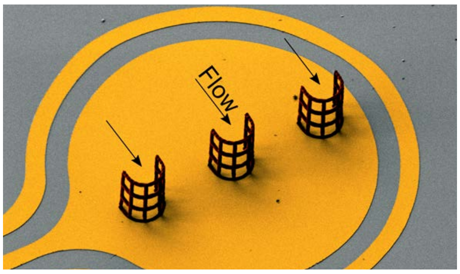
Another laboratory technology is the testing of drugs on living cells cultivated on a chip under conditions that are as similar as possible to the human body („organ-on-a-chip“).

This way, it is possible that heart cells in continuously perfused, micrometre-sized chambers start to beat and react to active substances by changing their beat frequency.

One of the networks’s SMEs cooperates on this topic in a project with the foreign coordinator of the network. The newly developed technologies have a high potential to significantly reduce animal testing and, in some cases, may replace it completely.

## Market and customers

Lab-on-a-chip technologies can be used in environmental toxicology, human and veterinary medicine or as an “on-the-go laboratory”




SEM image of 3 cell trapping structures 3D printed onto a measuring electrode. The opening is about 20 µm wide and the struts have a thickness of 1.8 µm.

(e.g. for expeditions and disaster relief). For the German partners, the international cooperation makes it easier to tap into the Dutch and European markets.

## The network

The network for lab-on-a-chip technologies started in 2017 and was internationalised after one year of cooperating with the Dutch network „Heart-on-a-Chip“. With 17 German and 4 Dutch SMEs, as well as 5 research institutions (4 German, one Dutch), it covers all stages of the value-added chain in the fields of point-of-care diagnostics, bio-marker development, organ-on-a-chip systems, cell analytics, and chip manufacturing. The partners have continued working together after the end of funding.

**About the Programme**

The Central Innovation Programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Climate Action provides funding for all technologies and sectors:

- Individual Projects
- Cooperation Projects
- Innovation Networks

and feasibility studies prior to R&D projects.

**Information and advice on Innovation Networks**
VDI/VDE Innovation + Technik GmbH
Phone +49 (0)30 310078-380
www.zim.de

**Imprint**

**Publisher**
Federal Ministry for Economic Affairs and Climate Action
Public Relations
11019 Berlin
www.bmwk.de

**Last update**
June 2023

**Design**
VDI/VDE Innovation + Technik GmbH, Berlin

**Image credits**
© Saxion University of Applied Sciences / University of Münster, BMTZ (p. 1); © Dynamic Biosensors GmbH / University of Bremen, IMSAS (p. 2)