Nominated for the CTI Swiss Medtech Award 2017

A breathing chip to replace animal testing

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
Commission for Technology and Innovation CTI
Innovation Promotion Agency

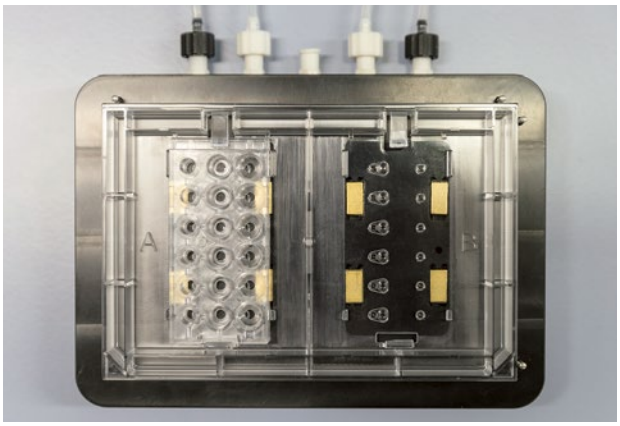
Developing better, less-expensive drugs with less animal testing: that is the ambitious goal of a project by the University of Bern and its spin-off AlveoliX – supported by the CTI – to look for ways to cultivate and test cells on a chip.

Even today, 130 years after the invention of the petri dish, cells are still cultured in a growth medium outside the organism. The major disadvantage of this process is that cells often lose their function in this environment because the conditions in the growth medium are not comparable with those in the human body. As a result, experiments using cell cultures in petri dishes are often inaccurate. This is why drug research often leads to high costs and low success rates.

"Even when they are tested on cell cultures and on animals, nine out of ten active substances fail when tested on humans in clinical trials for the first time, because they either do not have the desired effect or they have undesirable side-effects," says Prof. Olivier Guenat, biomedical engineer at the ARTORG Center for Biomedical Engineering Research at the University of Bern. With their lung-on-chip technology, Guenat and his colleague Dr Janick Stucki are aiming to replicate as closely as possible the conditions in lung cells in in-vitro applications, so that certain tests in the clinical trial phase can already be conducted in pre-clinical trials. A first simple prototype was developed with the support of the Gebert-Rüf Foundation, and is now being optimised in a CTI project for industrial production.

Extremely thin membrane

The chip is mounted on a plastic microtiter plate, as is the standard practice in the research and pharmaceutical sectors. On it are placed twelve chips developed at ARTORG, featuring a thin, elastic and porous membrane, on which the cells are cultivated. On one side of the membrane the seeded cells are exposed to air, and on the other is a growth



medium, resembling blood. A micro-diaphragm allows the cells to expand in rhythm with respiration; air is supplied via thin tubes.

"Our motto is to keep our product as close to the body as necessary, but also as simple as possible."

Olivier Guenat, Biomedical Engineer at the ARTORG Center for Biomedical Engineering Research of the University of Bern

"We are the only company in the world capable of reproducing the thin air-blood barrier including the three-dimensional expansion caused by respiratory movement," says Guenat. "Our motto is to keep our product as close to the body as necessary, but also as simple as possible." Although the chip is more complicated than microtiter plates, it is compatible with standard laboratory equipment.

Challenging validation process

Alongside developing a production-ready lung-on-chip, researchers are working on validating the product with the support of the Department of Pneumology at Bern University Hospital, as potential clients are interested in results. However, these will only be available in a few years' time. Nevertheless, AlveoliX AG – with the support of Creaholic SA – aims to launch a system on the market this year, which, in addition to the carrier plate with the chips, will include a ventilator and the necessary software. Guenat and his team see the lung-on-chip as a contribution to personalised medicine that is not limited to lung disease. Generally, it will be possible to simulate diseases and test drugs on the chip. This would make animal testing superfluous in many cases and also reduce the cost of pharmaceutical research.

Contacts

University of Bern
ARTORG Center
Prof. Olivier Guenat
Murtenstrasse 50
CH-3008 Bern

+41 (0)31 632 76 08
olivier.guenat@artorg.unibe.ch

AlveoliX AG
c/o ARTORG Center
Dr Janick Stucki
Murtenstrasse 50
CH-3008 Bern

+41 (0)31 632 76 09
janick.stucki@alveolix.com

Commission for Technology and Innovation CTI
Innovation Promotion Agency
Ingrid Nyfeler

+41 (0)58 464 19 85
life.sciences@kti.admin.ch

CTI – Start-up and Entrepreneurship, R&D Funding, KTT Support

The CTI is the Confederation's innovation promotion agency. It provides consultancy and networking services and financial resources to help turn scientific research into economic results. Making the Swiss economy strong. In 2018 the CTI will become Innosuisse – the Swiss Agency for Innovation Promotion. However, the task of promoting science-based innovation in the interests of business and society remains.

Commission for Technology and Innovation CTI
Innovation Promotion Agency
Einsteinstrasse 2
CH-3003 Bern

www.kti.admin.ch
www.innosuisse.ch