



- 1 Cell seeding station for automated epidermis model production.
- 2 Tissue Factory – automated system for cell and tissue culture.

AUTOMATION OF CELL AND TISSUE CULTURES

Cell cultures are frequently used in pharmaceutical, cosmetic and bio-industry for component screening and toxicity and efficacy testing. A prerequisite for these processes are standardized cell culture procedures to ensure high quality results and reproducibility.

influence of this environmental alteration can affect cell behavior, depending on the used cell line, primary cells or kind of tissue equivalent, and may falsify test results. These disadvantages represent the motivation to develop automated systems for cell and tissue culture.

Fraunhofer Institute for Manufacturing Engineering and Automation IPA

Nobelstrasse 12
70569 Stuttgart | Germany

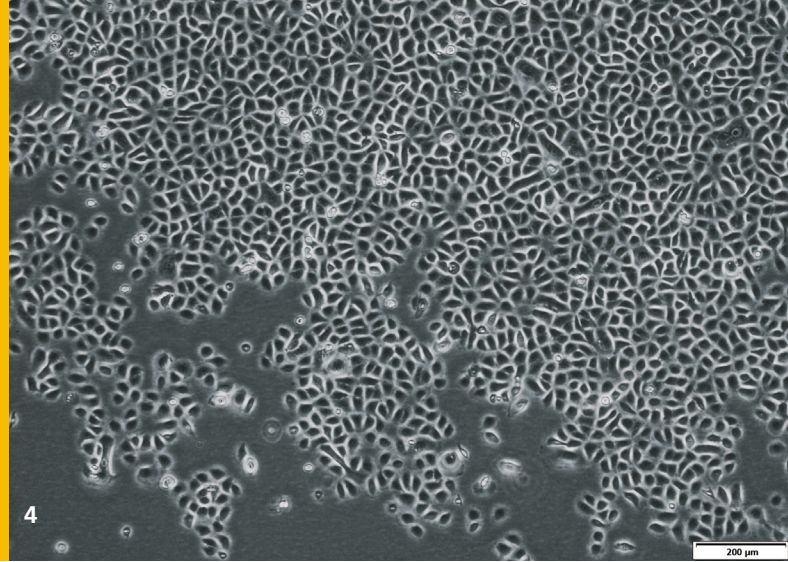
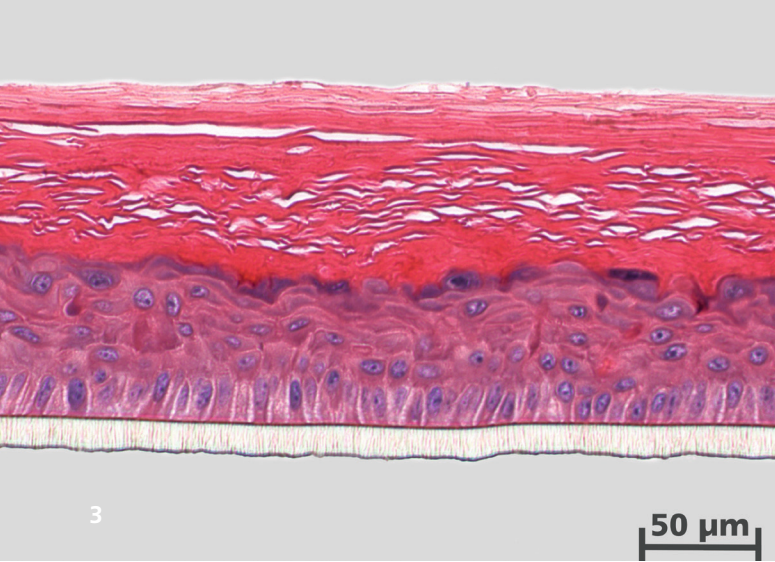
Contact
Dr. rer. nat. Andrea Traube
Phone +49 711 970-1241
andrea.traube@ipa.fraunhofer.de

www.ipa.fraunhofer.de

“Conventional” cell and tissue culture

Today, the culture of cells and tissues is usually performed manually. This causes high costs for manpower and is often associated with low reproducibility and scalability. Optical monitoring of the cell cultures is performed irregularly – due to working hours and weekend – and the validity is mainly influenced by the laboratory staff. All processing steps are performed outside the incubator. Thus, the cultures are exposed to alterations in temperature, pH-value and humidity. The

The main application for cell culture robots today is the expansion and culture of cell lines for screening purposes, mostly used in big pharma. The handling and culture conditions for cell lines are simple, the protocols are fixed. In contrast, the culture of primary cells obtained from human tissue is a more complex process, based on flexible protocols. The cells are more sensitive to shear stresses. Extensive quality controls, at least optical monitoring has to be performed to monitor undesirable differentiation and change in cell function. The automated cultivation of these cells is not a standardized process yet.



Automated cell and tissue culture

The automated production of cell and tissue cultures is more than the sum of the single disciplines biology and automation – and therefore bears an enormous potential for development. Integrating biological procedures into automated processes meet the requirements of industry: the establishment of faster and more effective production processes with high quality. Thus, cell and tissue cultures can be produced standardized in high throughput and without risk of contamination. Simultaneously the quality and comparability of the biological products can be enhanced. Additionally, with regard to standardization and safety assurance of the products, quality standards as GMP (Good Manufacturing Practice) and GLP (Good Laboratory Practice) has to be integrated in the automated systems.

The way to automate complex cell and tissue culture processes

The automated, reliable handling and processing of biological material, samples and products makes high demands on the applied process and automation technology. Reasons for this are the variable characteristics and material properties of these biological products, depending on the donor and changing from lot to lot. Furthermore, also the required environmental parameters take automation to its limits: high humidity (up to 100% rh), controlled and exact composition of the air, exact temperature and even a sterile and aseptic environment.

Our performance

We support you in developing automated solutions for cell and tissue cultures:

- Analysis of manual cell and tissue culture processes and process adaption to automation
- Planning, conception, draft and realization of automated cell and tissue culture solutions and system components up to the prototype
- Design layout of new developments and optimization of existing mechatronical systems

Your benefit

- You draw benefit from our experience in industrial cooperation and research work
- It will be your application we put the focus on when realizing automation – not the hardware

3 *H&E staining of an automated produced epidermis model.*

4 *Confluence measurement of keratinocyte culture.*