

PRESS RELEASE

3D Cell Culture for better Skin Care

BRAIN AG and Mannheim University of Applied Sciences jointly develop 3D skin models for health care and cosmetics

- **Research collaboration in project M²Aind for new real-time and high-resolution screening technologies of 3D skin spheroids**
- **Mannheim University of Applied Sciences builds on expertise in 3D cell culture and advanced live cell imaging**
- **BRAIN contributes unique skin reporter cells, screening compound libraries and market knowledge**
- **Review article in *Journal of Cellular Biotechnology***

The M²Aind (Multimodal Analytics and Intelligent Sensorics for the Health Industries) research project is a Public-Private-Partnership project led by Mannheim University of Applied Sciences (MUAS, Hochschule Mannheim). M²Aind kicked off in January 2017 and is sponsored by the German Federal Ministry of Education and Research (BMBF). BRAIN has been an active partner of M²Aind from the start. Joint projects of BRAIN and MUAS include the development of a 3D skin model for better understanding of skin physiology with the aim to provide new insights for health care and cosmetic applications.

Improved 3D spheroid screening

Breakthroughs in 3D skin modeling are perceived as potential game changers for various market segments. Current research and development activities for new skin applications are still partly based



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on 2D cell culture. In such a setting, skin cells are cultivated in one layer in petri dishes before being exposed to selected compounds tested for potential skin applications. Conversely, human skin is organized three-dimensionally which sets quality limits for 2D screening methods. As a consequence, 3D cell culture technologies were developed as early as the 1950s and are successfully used in many laboratories around the world today. The multicellular setting of 3D models allows for a much better interaction of cells with each other and with the extracellular matrix. They are therefore much more representative of the *in vivo* environment of human skin. Even newer technologies focus on organizing the cells in spherical micro-tissues with the advantage of allowing better standardization and automatization for industrial applications.

Current challenges for the broader industrial use of 3D spheroids are rooted in limited methods available to analyze the fast biological processes that take place within the cell. The M²Aind project of MUAS and BRAIN seeks to overcome this limitation by developing new technologies that can visualize the molecular processes that are ongoing in the different skin layers in 3D spheroids in real-time and with high-resolution.

First review article

As a first project milestone, the research partners MUAS and BRAIN have now published a review article entitled “In Vitro Skin Three-Dimensional Models and Their Applications” in the *Journal of Cellular Biotechnology*. The article describes the composition as well as principal features and functions of human skin. It discusses the setup, prerequisites, advantages, and disadvantages of currently available in vitro 3D skin models and compares them in a comprehensive overview table. The key advantages of the new approach within the M²Aind projects are a more realistic understanding of the physiological behavior of skin cells and the discovery of superior small-molecule actives.

Potential future applications

Within M²Aind, researchers from MUAS are building on their special knowledge and infrastructure for 3D cell culture and analytics. Dr Rüdiger Rudolf, Professor of Biosensorics at MUAS and coordinator of the M²Aind impulse project M²OGA, says: “The review article also gives an outlook on prospective future developments, including the use and exploitation of novel human stem cell technologies for personalized diagnosis, therapy development, and regenerative medicine. The review serves as a guide for choosing appropriate cell models in skin pharmaceutical and cosmetics research and has helped the cooperation partners BRAIN and MUAS in further shaping common goals.”

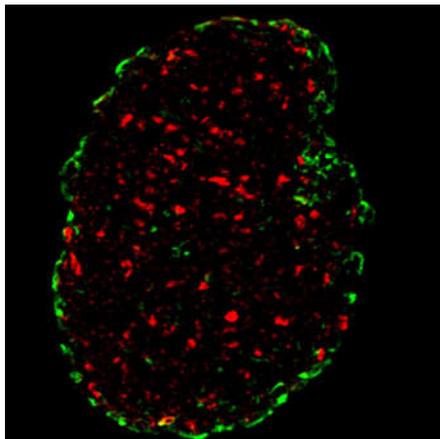
BRAIN has developed special expertise for engineering reporter cells in human skin for industrial applications. This knowledge plus knowledge of market-relevant application fields is now being transferred into M²Aind. Dr Torsten Ertongur-Fauth, Research Scientist & Project Manager at BRAIN, says: “3D spheroid models of the skin are great tools to understand how skin cells are coping with detrimental environmental influences, for example mechanical stress, UV radiation or pathogens. However, it is still challenging to visualize the molecular processes that are ongoing in the different keratinocyte layers in real-time and with high-resolution. So, we are very pleased to have the support of our partner MUAS to further develop our unique skin reporter cells into advanced 3D models that allow industrial screenings for new small-molecule actives.”

The timeframe for M²Aind is four years with the potential for additional four years upon positive mid-term evaluation. Currently 37 partners from industry and research are involved. The BMBF funding for the first four years period has been approved for EUR 6 Mio. (BMBF | FKZ 03FH81021A).

Further information



Journal of Cellular Biotechnology 3 (2017) 21-39: In Vitro Skin Three-Dimensional Models and Their Applications, DOI 10.3233/JCB-179004, IOS Press, <https://content.iospress.com/journals/journal-of-cellular-biotechnology/3/1>



Skin cells grown in 3D spheroids undergo differentiation. Human HaCaT skin cells were cultivated in 3D to form spheroids. 7 days later, they were sliced and stained for markers of basal (CK14, red) and more differentiated epidermal layers (CK10, green). The picture shows a confocal section demonstrating a stratification of cells in the spheroid culture (Image dimension 376 μm).

Photo: Mannheim University of Applied Sciences (M²Aind)

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About BRAIN

B.R.A.I.N. Biotechnology Research and Information Network AG (BRAIN AG; ISIN DE0005203947 / WKN 520394) is one of Europe's leading technology companies in the field of industrial biotechnology, the core discipline of Bioeconomy. As such, BRAIN identifies previously untapped, efficient enzymes, microbial producer organisms or natural substances from complex biological systems that can be put to industrial use. The innovative solutions and products developed by help of this „Toolbox of Nature“ are successfully applied in the chemistry, the cosmetics and the food industries. BRAIN's business model is based on two pillars – BioScience and BioIndustrial. The BioScience comprises its frequently exclusive collaboration business with industrial partners. BioIndustrial comprises the development and commercialization of BRAIN's own products and active product components. Further information is available at www.brain-biotech.de/en.

About M²Aind | MUAS, Hochschule Mannheim

The "M²Aind – Multimodal Analytics and Intelligent Sensorics for the Health Industries" research and innovation partnership led by Mannheim University of Applied Sciences (MUAS, Hochschule Mannheim) was selected by a high-powered group of experts in a fierce nationwide competition. Out of some 230 universities of applied sciences in Germany, more than 80 made a bid for the total of €100mn available for a maximum of eight years under the FH Impulse programme. During the first sponsoring phase, MUAS receives more than €6mn. In M²Aind, the university brings together 37 partners from big business as well as innovative small and medium-sized enterprises of the Rhein-Main-Neckar metropolitan area located at the interface between biomedicine, intelligent sensor technology, and information technology. The M²Aind partnership is focused on new products, services, and innovative technologies for the health industries. Further information is available at www.m2aind.hs-mannheim.de/partnerschaft-m2aind.html (German only).