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Joint Event

Martin Heller, Robotics & Biomaterials 2018, Volume 29
DOI: 10.4066/biomedicalresearch-C6-016

International Conference on
Robotics and Automation
&
Biomaterials and Nanomaterials
October 22-23, 2018 | Frankfurt, Germany

Comparative assessment of various scaffolds for the construction of artificial tissues

Martin Heller
Johannes Gutenburg-Universiy of Mainz, Germany

In reconstructive surgery artificially generated soft tissue equivalents are a powerful alternative to commonly used autologous tissue transplants in order to cover bigger defects after tumor resection or after trauma. However, the generation of such tissue equivalents is complex and requires adequate cell compatible scaffolds for successful cell cultivation. In order to investigate the influence of various cell compatible matrices on cell viability and differences in cellular morphology in a complex co-culture of fibroblasts and epithelial cells, four naturally derived different collagen matrices were analyzed in a comparative study. From human buccal mucosa specimens, fibroblasts and epithelial cells were cultured separately. In a first step, primary fibroblasts were seeded on the four different collagen matrices BioGuide® (BG), BioGuidePro (BGP) and TissuFoil (TF) and small intestinal mucosa (SIS). The cellular morphology on seeded matrices was analyzed by confocal laser scan microscopy. The viability of the cells was quantified by MTT assay. For co-culture, the primary buccal epithelial cells were seeded on the opposite site of the fibroblasts covered matrices. After 18 days of cultivation microsections were analyzed using Masson-Goldner and immunohistochemical staining (Cytokeratin 13, Tenascin, Collagen IV). In a co-culture of fibroblasts and epithelial cells, BGP turned out to be the most suitable matrix. Fibroblasts growing on BGP revealed the greatest viability. Regarding mechanical characteristics such as shrinkage, degradability and handling, BGP proved to be the superior to the remaining matrices tested. Co-culture with epithelial cells resulted in epidermal stratification, a developing basement membrane. BPG matrix is a promising biomaterial for developing a full-thickness engineered buccal mucosa including cell differentiation and maturation similar to the native tissue when seeking new methods of urethral reconstruction.

Speaker Biography

Martin Heller has completed his PhD in Biology at the Max Planck Institute of Polymer Research Mainz in 2013. Afterwards he worked as Postdoc at the University Medical Center of Mainz and started to study Medicine in April 2014. His focus of research is the modification of biomaterials in the context of artificially generated tissue equivalents in complex multi-cultures of primary human cells.

e: martin.heller@uni-mainz.de

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