

Towards Modelling of Epidermal Skin Homeostasis

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Understanding epidermal tissue homeostasis requires the integration of different cellular and molecular analysis and modeling techniques. My group therefore works towards the integration of growth factor signaling in the simulation of multi-cellular epithelial systems. Results from three related projects are very briefly presented while the signaling modeling itself is covered by an extra talk of a member of my group (Dr. Carito Guziolowski). In my talk I will first present a combined experimental and image processing approach to get first quantitative cellular data on wound closure. As an experimental system we used organotypic 3D in vitro skin cultures containing fibroblasts and keratinocytes to develop a novel experimental punch wound model. For imaging virtual microscopy or whole-slide scanning with subsequent image processing was used. The results show a dynamic spatiotemporal behavior of the tissue. Then a bioinformatic approach will be shown for systematically uncovering signaling networks involved in epidermal homeostasis. Lastly, a brief outlook on our multi-agent based modeling environment for multi-cellular systems with a vertex based biomechanical cell membrane model is given. Our works form exemplary building blocks towards a multi-scale model of epidermal wound healing.