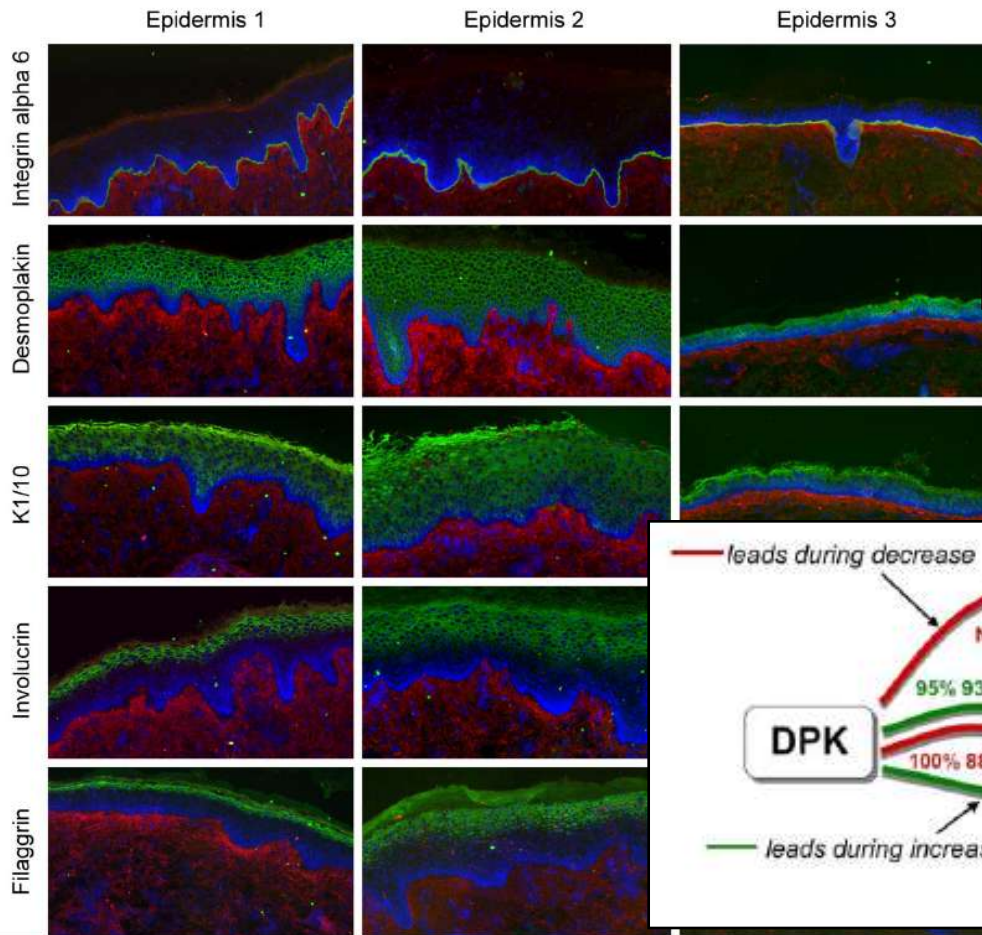


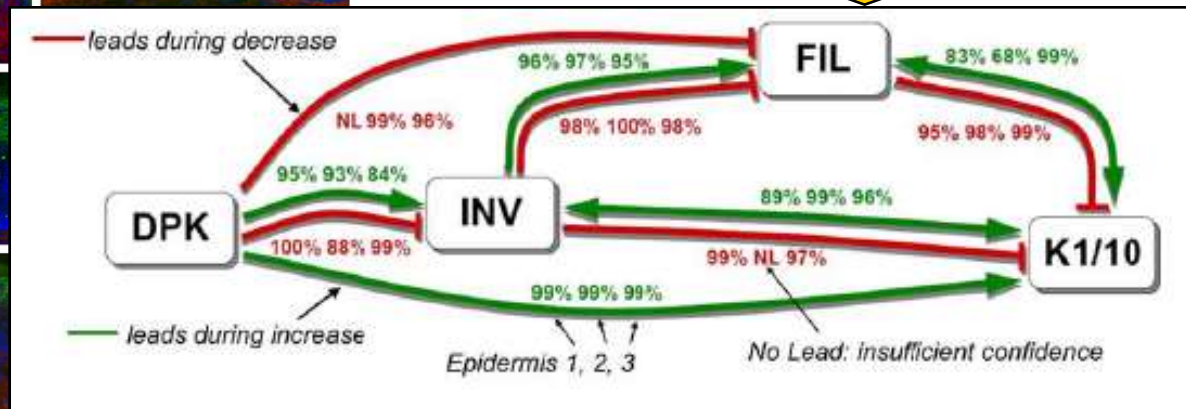
Department of Oral Biotechnology
Pascal Tomakidi

Quantitative Spatial Profiling of Epithelial Tissues

Reconstructing Protein Networks of Epithelial Differentiation



1. Microscopic Imaging
2. Image Processing
3. Quantitative Spatial Biomarker Profiling/QSP
4. Network Reconstruction



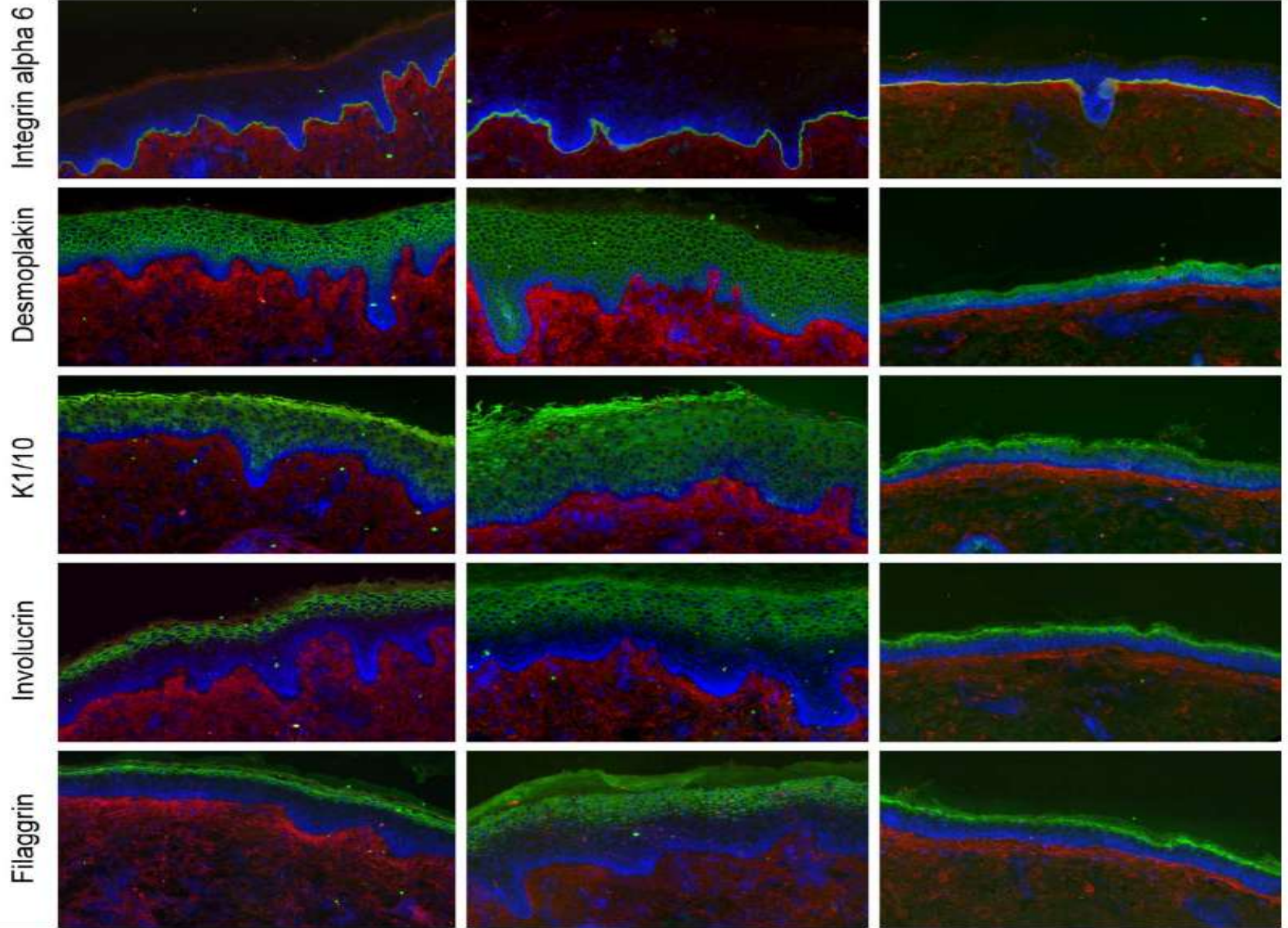
Grabe, Pommerencke, Steinberg, Dickhaus, Tomakidi,

Reconstructing Protein Networks of Epithelial Homeostasis, Bioinformatics, 2007

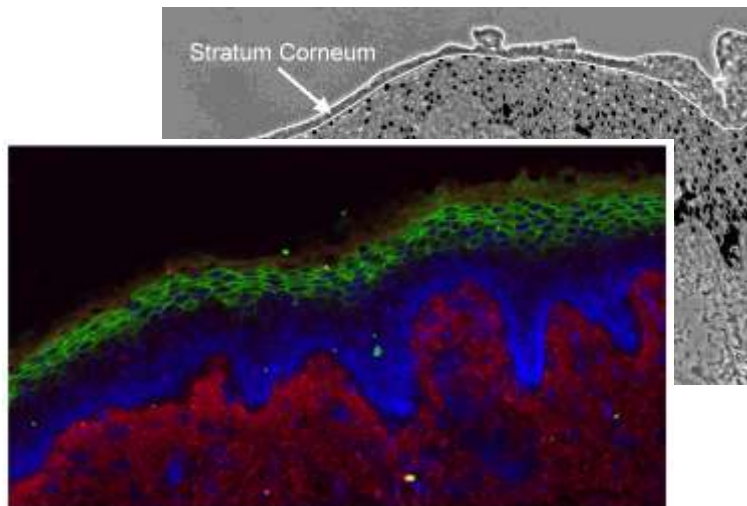
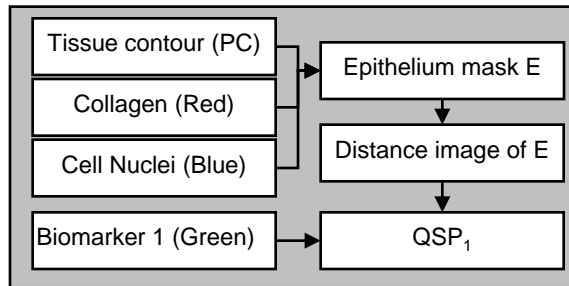
Epidermis 1

Epidermis 2

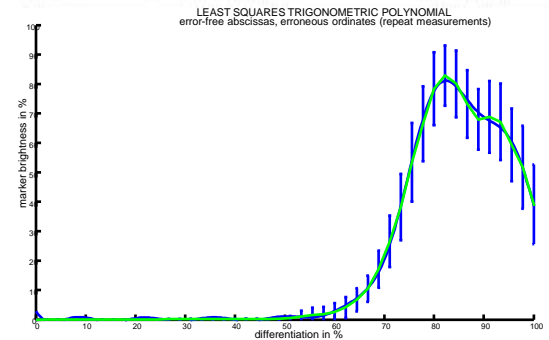
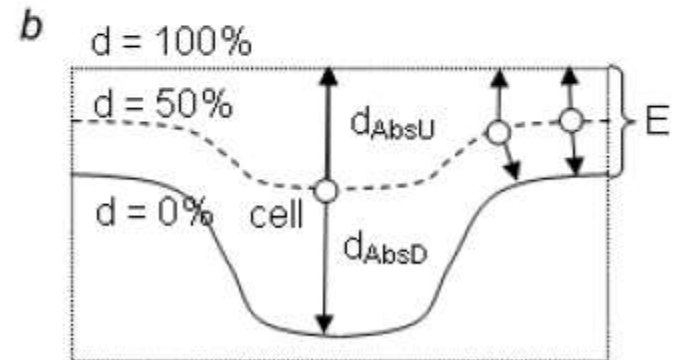
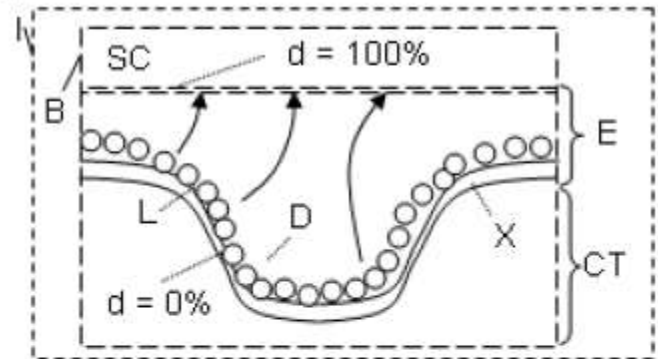
Epidermis 3



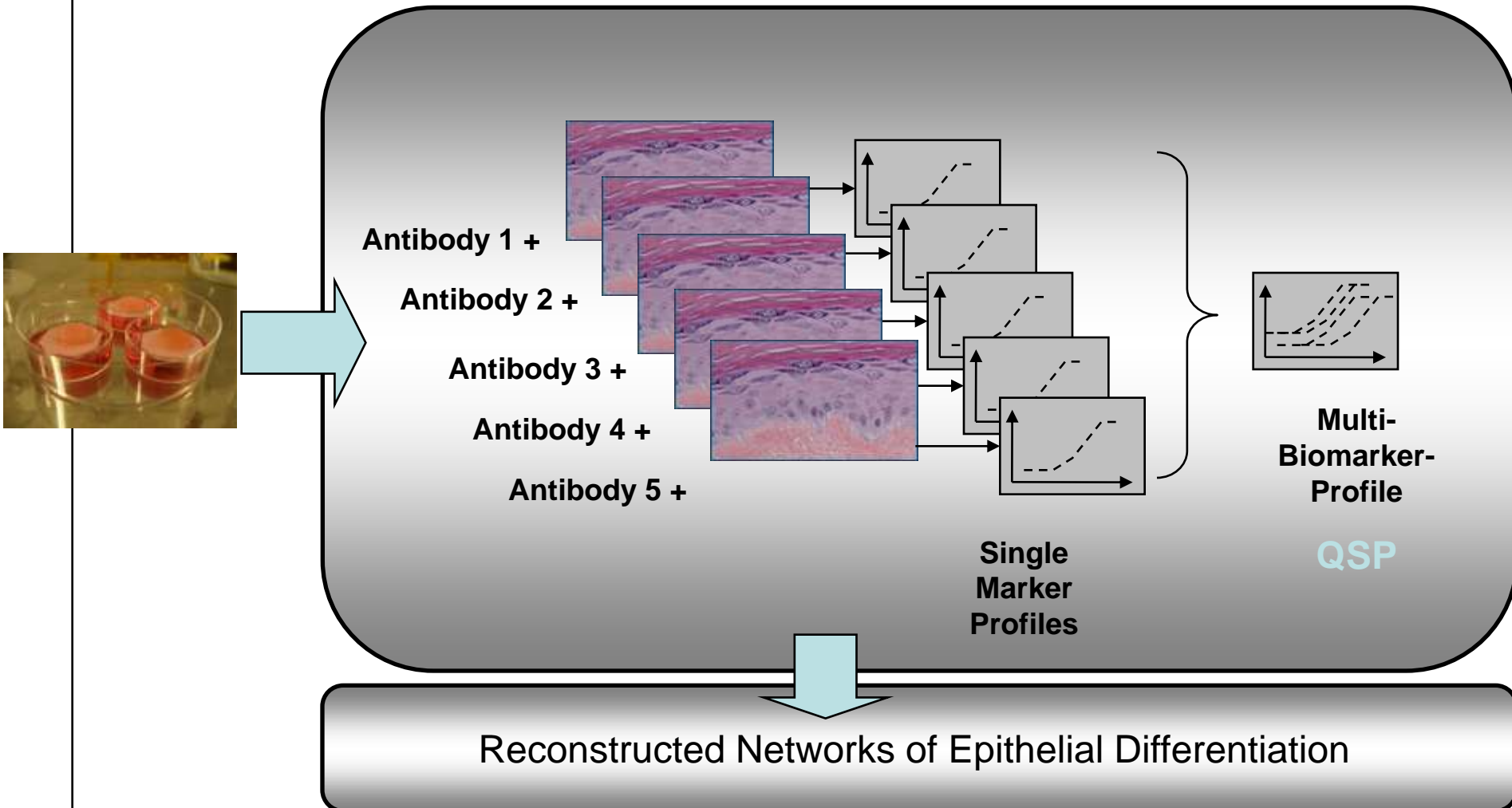
Generation of a Quantitative Spatial Biomarker-Profile/QSP



a Distance Method



Creating a Quantitative Spatial Multi-Biomarker-Profile/QSP



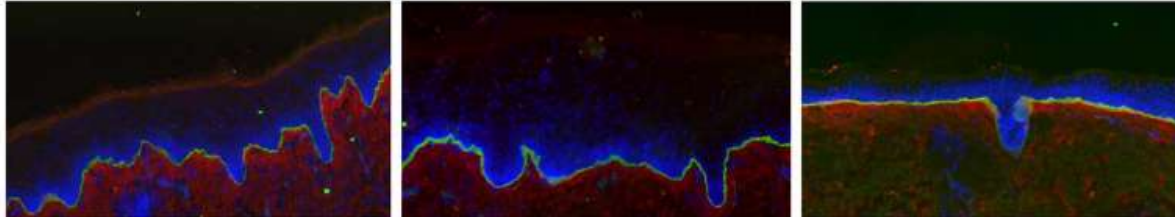
Quantitative Spatial Multi-Biomarker-Profiles (QSP) of Epithelia

Epidermis 1

Epidermis 2

Epidermis 3

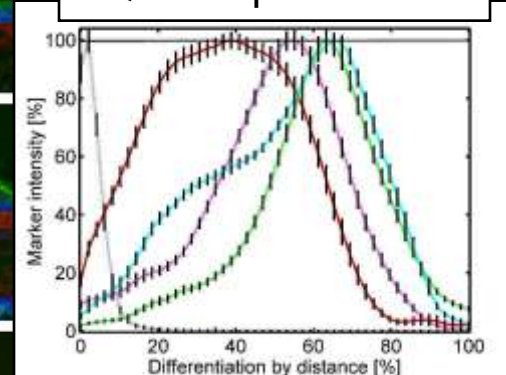
Integrin alpha 6



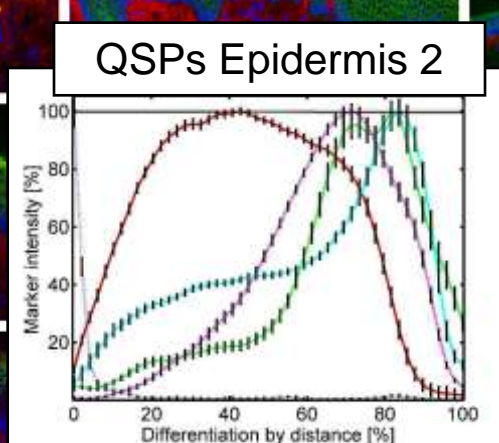
Desmoplakin



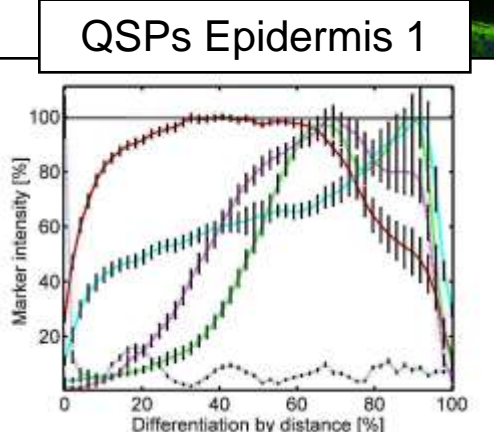
QSPs Epidermis 3



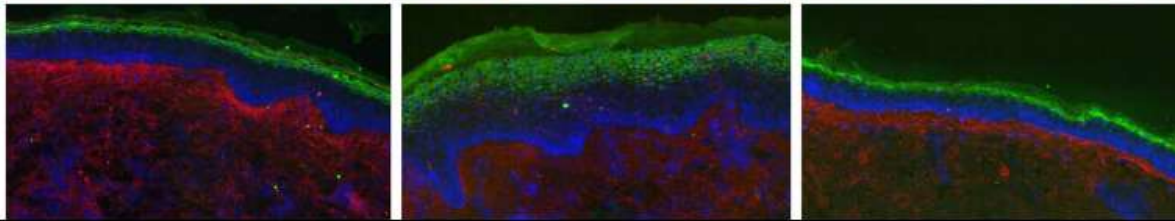
QSPs Epidermis 2



QSPs Epidermis 1



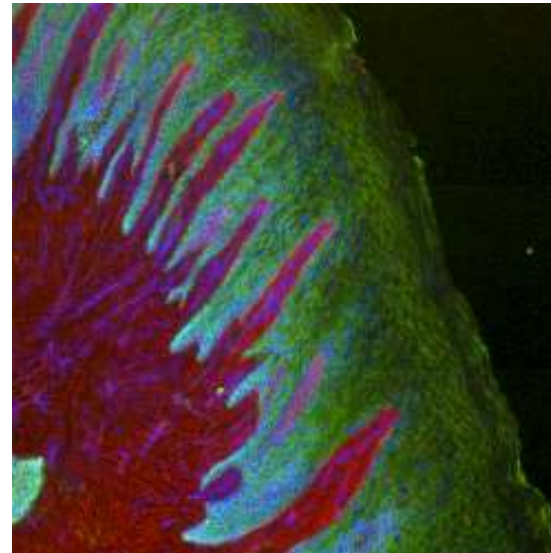
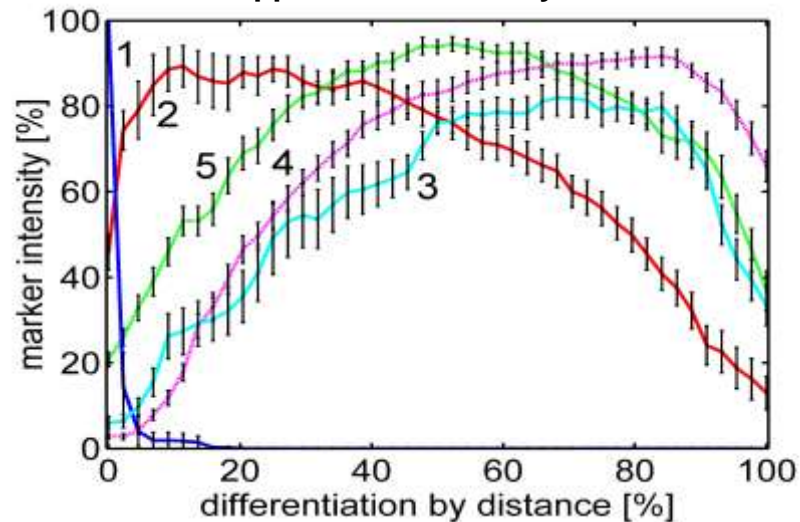
Filaggrin



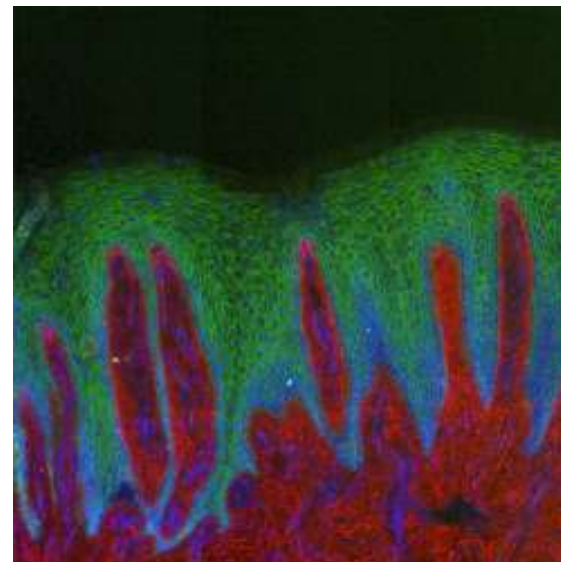
Human Gingiva

Method works with very pronounced *rete ridges* !

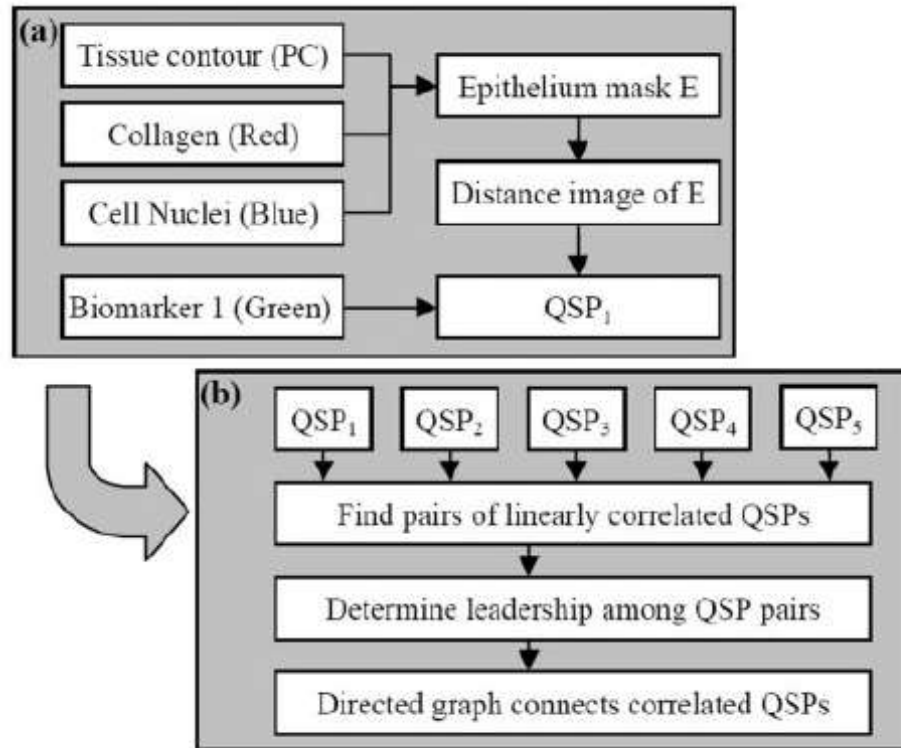
approx. 10-40 cell layers



Desmoplakin

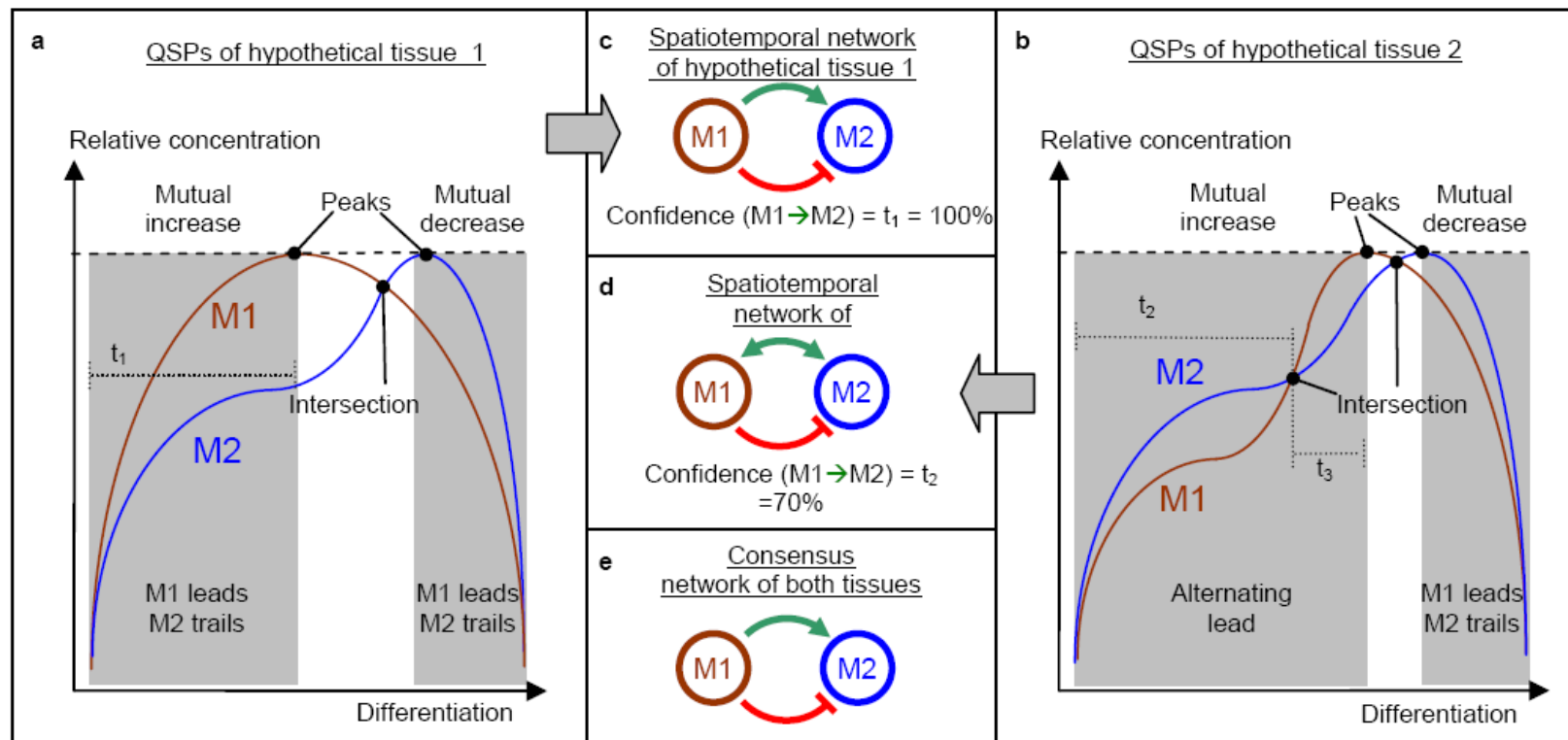


Correlation Analysis as Strategy for Reconstruction of a Protein Network

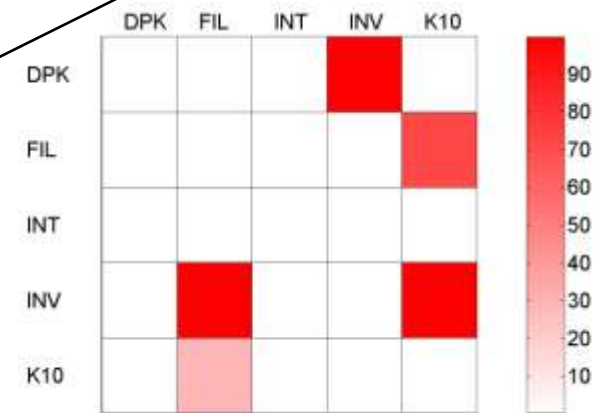
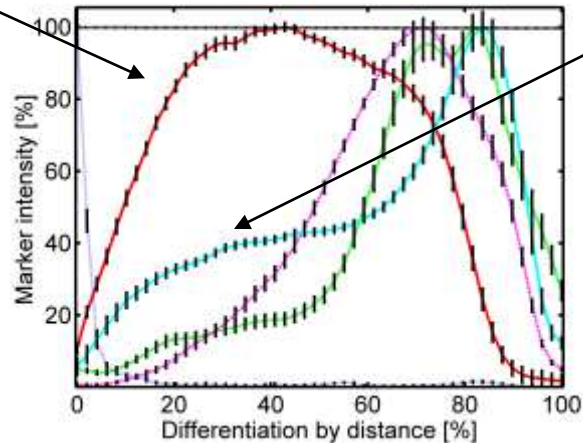
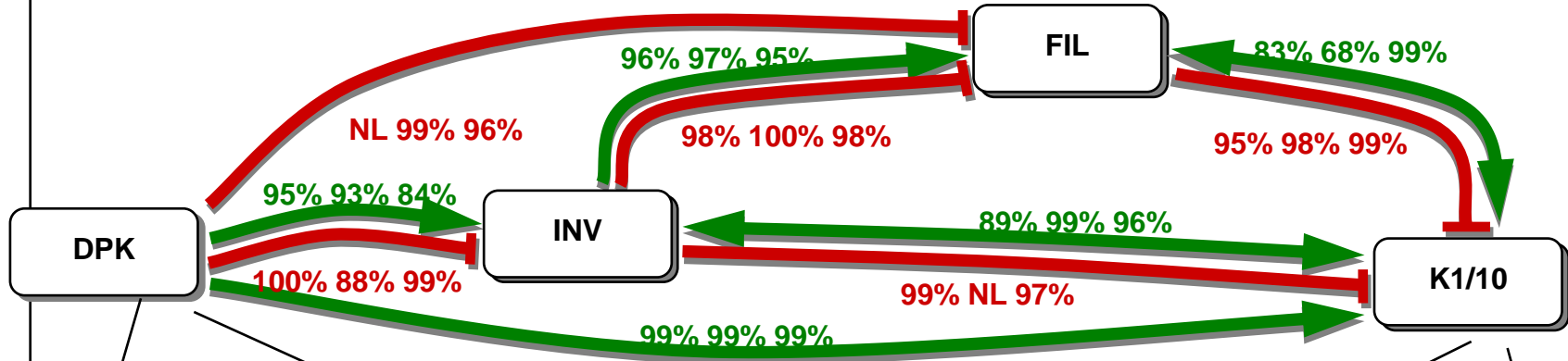


Correlation Analysis Indicates that Two Biomarkers are Truly Co-Regulated

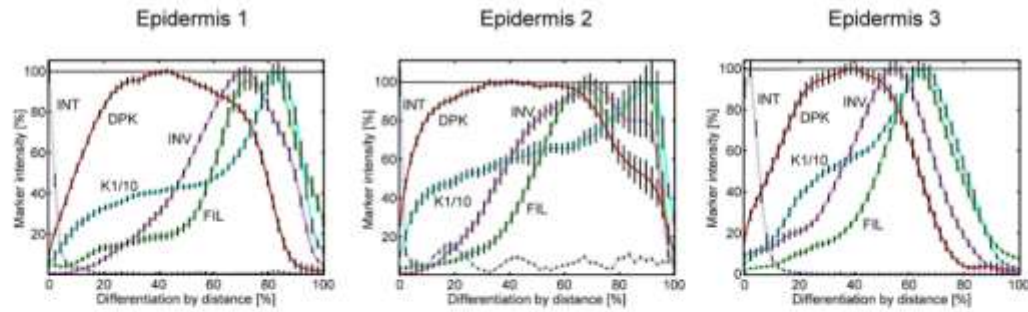
Reconstruction of a Protein Network by Correlation Analysis



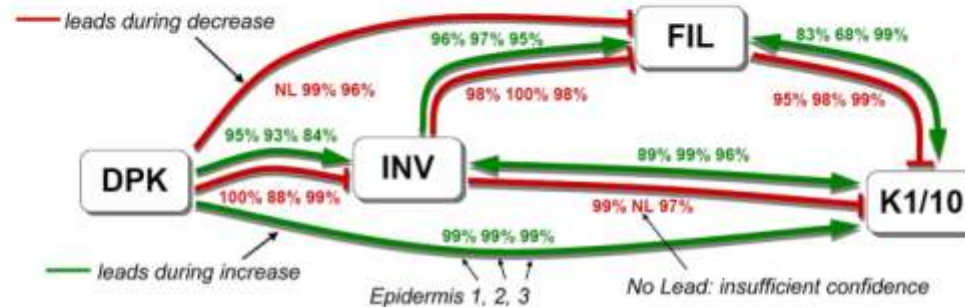
Validation by Temporal Confidence



(a)
Quantitative
Spatial
Profile (QSP)



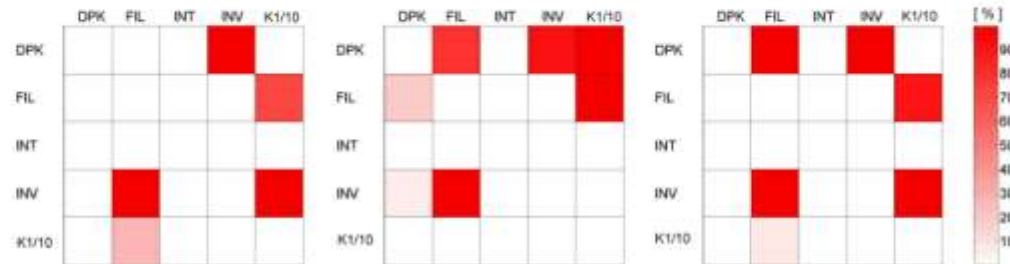
(b)
Spatiotemporal
Regulatory
Consensus
Network
(Epidermis 1-3)



(c)
Confidence in
correlated increase
(row leads column)



(d)
Confidence in
correlated decrease
(row leads column)

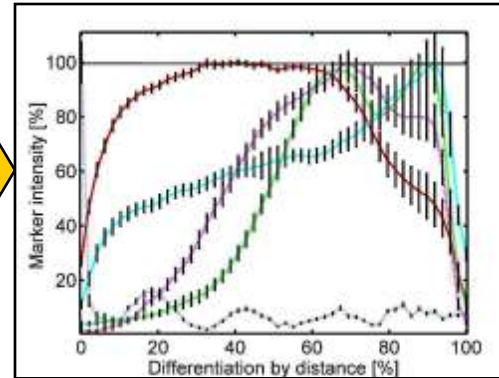
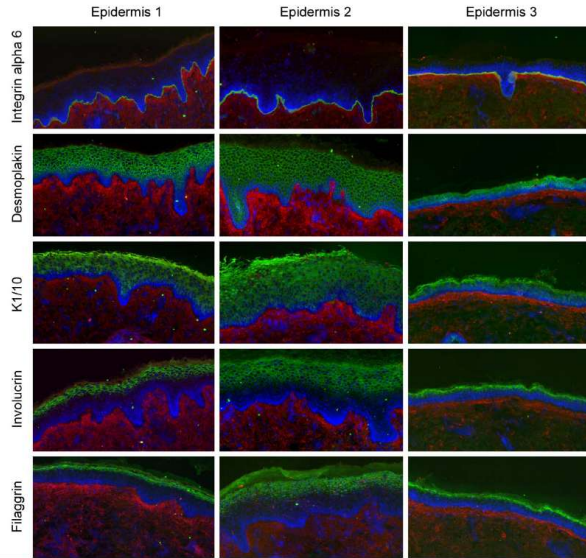


Epidermis 1

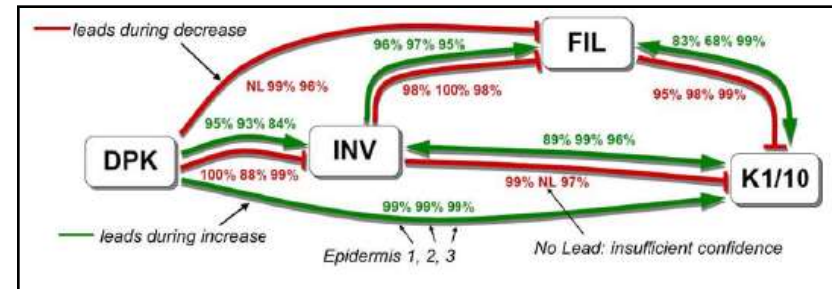
Epidermis 2

Epidermis 3

Summary



Correlation Analysis
- Co-Regulation
- Time-Period of
Co-Regulation



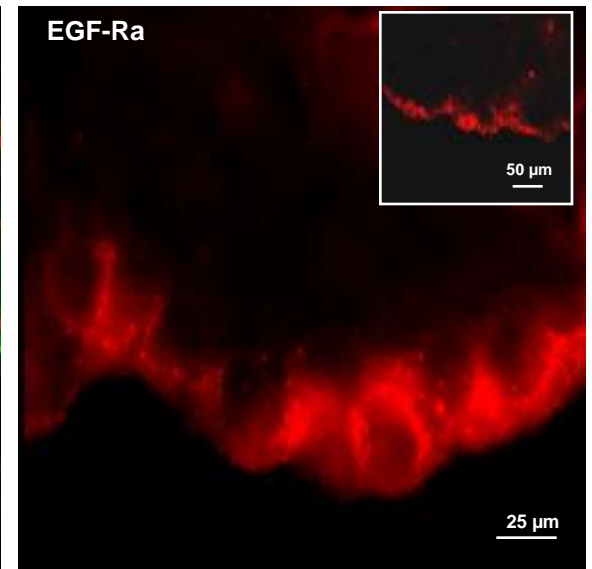
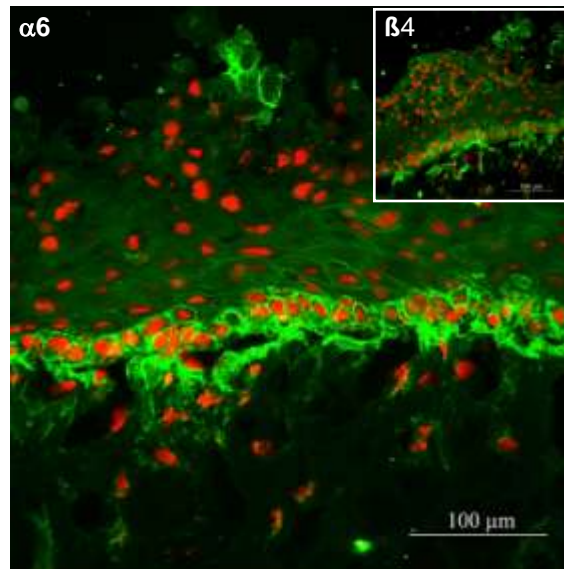
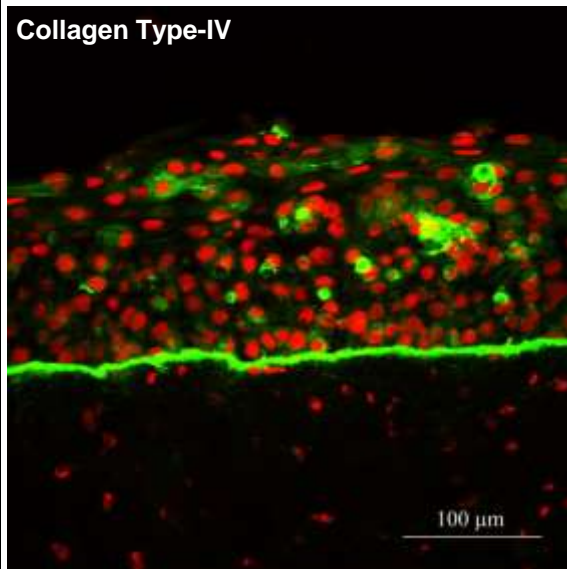
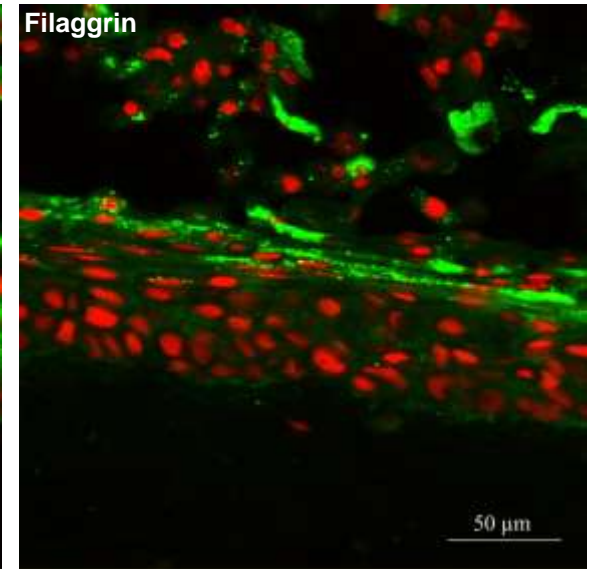
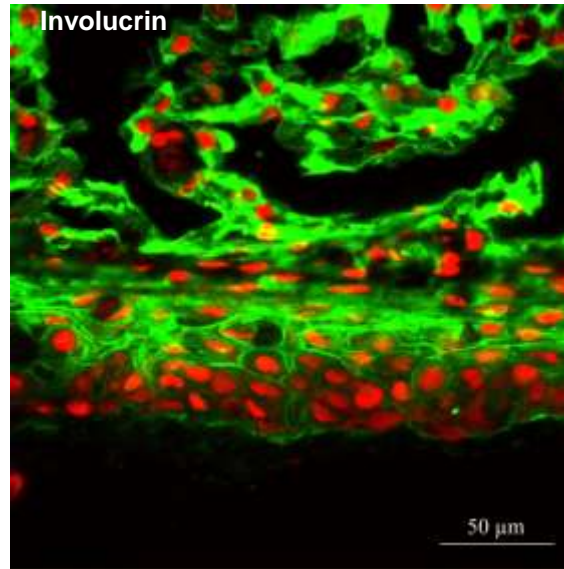
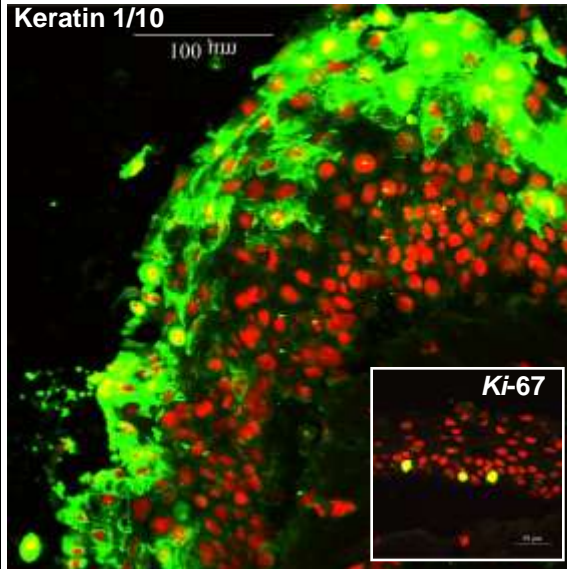
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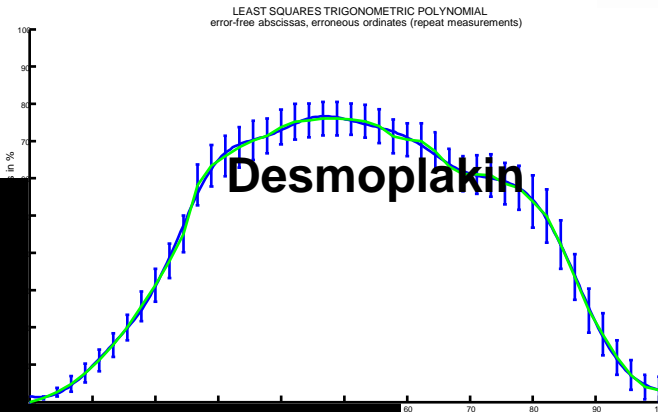
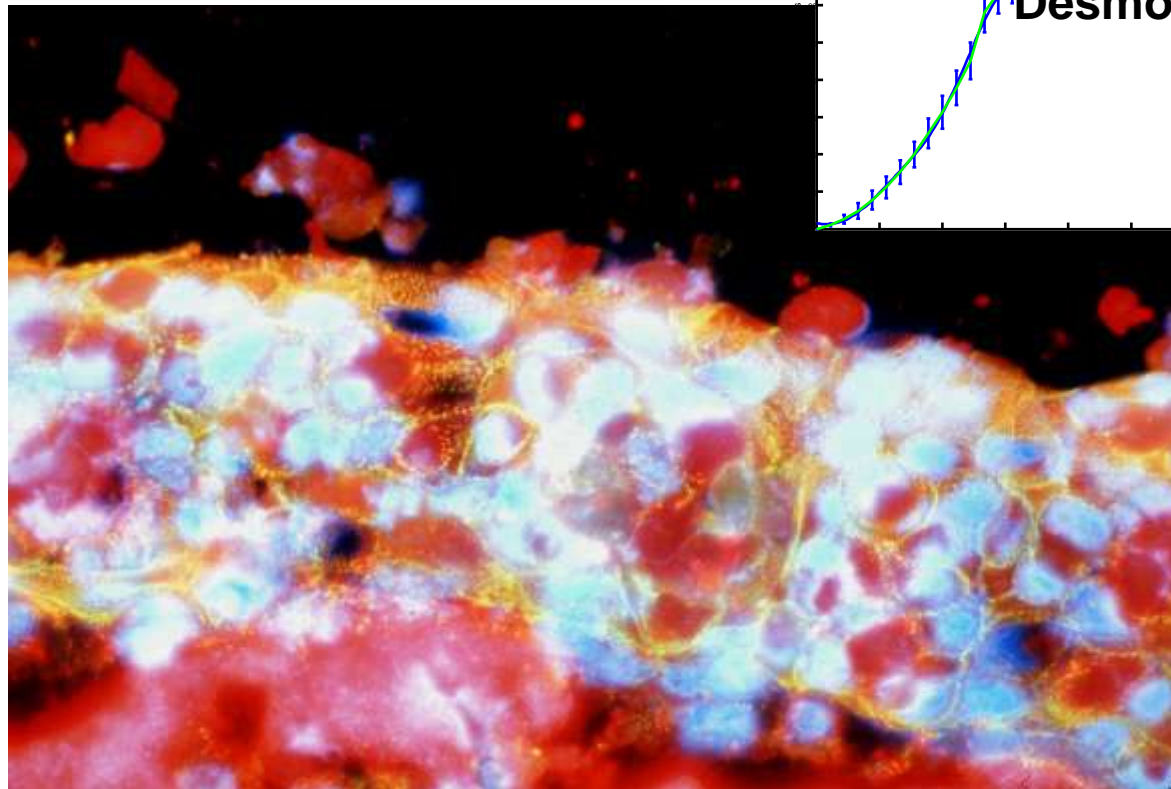
**QSPs in Conjunction with
the Protein Network**

**Modelling and Simulation
of Epithelial Tissues**

**Physiology and Pathophysiology of
Epithelia in Systems Biological Terms**

In Vitro Epithelial Equivalents of Human Oral Gingiva





Systems Biological Understanding

Developmental Processes like Epithelial Regeneration after Wounding
Evaluation of Effects of Miscellaneous Drugs on Epithelial Homeostasis

Niels Grabe, Thora Pommerencke and Thorsten Steinberg

Bundesinstitut für Risikoabschätzung/BfR, Berlin