

Fluorescence Based Spatial Biomarker Profiling of HSP27 for Quantification and Classification of Mild Skin Irritation

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Background: Mild skin irritation is characterized by subtle protein expression changes despite unchanged histological appearance of the skin. At the example of HSP27 we studied in how far image processing of histological sections could be used for an automatic classification of mildly SDS treated organotypic skin cultures.

Methods: 48 Mattek EFT-400™ full thickness tissue cultures were treated with 0.4 % SDS or PBS or none at time points 1h, 6h, 16h, 24h. Histological sections were stained for heat shock protein HSP27 with Laminin-5 as a spatial reference. Multicolor-fluorescence slides were scanned using the full slide scanner Hamamatsu Nanozoomer HT®. We developed image processing software for automatically segmenting, profiling and classifying histological sections of the tissue cultures

Results: Application of 0.4% SDS leads to an altered premature and plateau-like HSP27 expression profile depending on treatment duration . At medium tissue differentiation (40-70 %), cultures treated 24h revealed a 2.6 fold HSP27 expression compared to none (1.7 to PBS). Different measures for quantifying the expression changes and thus quantification of mild skin irritation were developed. A first potential classifier rated as positive: 0/16 none treated, 0/4 PBS 1h, 0/4 PBS 6h, 1/4 PBS 16h, 2/4 PBS 24h, 1/4 of 1h SDS, 3/4 of 6h SDS and 4/4 of 16h SDS and 4/4 of 24h SDS.

Conclusion: We have shown a first example for quantifying mild skin irritation on the basis of changes in spatial expression patterns in histological sections using the Mattek EFT-400™ skin model.

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