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NEW TECHNOLOGIES FOR COSMETIC APPLICATIONS

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Discovery of the mechanism of cell motion in 3D epidermal wound healing reveals a higher level of tissue control regulating epidermal biomarker patterns

Wound healing uncovers the fascinating complex functional capabilites of the epidermis. It's understanding is a precondition to the correct interpretation of epidermal biomarker patterns.

For 40 years controversial results and mechanisms have been proposed to explain 3D cell movement. Using premanufactured 3D skin cultures, whole-slide imaging and image processing we assembled a novel medium-throughout platform for quantitatively measuring biomarkers in decomposable healing organotypic 3D skin cultures. We analysed over hundred in vitro tissue models using immunohistochemistry, whole slide imaging, image processing and cytokine multiplex assays. Our results show that the currently discussed models of 3D "tongue" extension during epidermal wound closure are wrong. Instead our results led us to a novel “shield extension” model. Our results clarify a long-stand question by showing for the first time a consistent experimental and theoretical model for epidermal wound closure in 3D. Moreover, it appears that epidermal wound closure is not simply an example of collective cell migration, but instead leads to a higher level of tissue control where different modes of migration are orchestrated together with proliferation. This indicates that simply reducing tissue function to single cell function is insufficient and leads to an errorneous understanding. Instead we must now come to higher level descriptions of tissue functions. Our results further show the limits of 2D monolayer wound closure assays, and that the interpretation of biomarkers in epidermal wound healing requires a standardized technology platorm as well as novel theoretical models of tissue control.