Bioengineering a complex skin equivalent for skin care applications

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Tissue fibrosis in many organs results from altered and excessive extracellular matrix (ECM) deposition. Concomitant with ECM expansion, resident lipid-filled cells including mature adipocytes are lost in human skin, fibrosis, and disease states. We have designed and characterized a human skin equivalent (HSE) that mimics the dermal ECM and contains mature adipocytes, with a focus on the role of mature adipocytes in fibrosis.

The HSE is composed of primary human skin fibroblasts and primary human fat cells co-cultured in a 3D collagen gel scaffold. The dermal fibroblasts are induced to produce collagen and other ECM components, while the fat cells differentiate into mature adipocytes. The adipocytes are differentiated using a combination of insulin and isoproterenol, followed by treatment with adipocytokines to further enhance their maturation.

The HSE has several advantages over existing skin equivalents. It is composed of human cells, allowing for more accurate modeling of human skin diseases. It is highly reproducible, with consistent phenotype and function across multiple batches. It is also biocompatible, with no evidence of cellular toxicity or inflammatory response.

The HSE is currently being used to study the role of mature adipocytes in fibrosis. It is being used to investigate the mechanisms by which adipocytes contribute to fibrosis, and to develop novel therapeutic strategies to target adipocytes in fibrotic diseases. The HSE is a valuable tool for the study of skin fibrosis and other related diseases, and has potential applications in the development of new therapies.