Synopsis of Original Research Paper

Development of a versatile three-dimensional skin model using silica nano-nonwoven fabrics

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In this study, epidermal and epidermal-dermal skin models were constructed using silica nano-nonwoven fabrics. To construct the epidermal skin model, epidermal keratinocyte line, HaCaT cells, or primary normal human epidermal keratinocytes (NHEK) were seeded onto silica nano-nonwoven fabrics placed in cell culture inserts and cultured at the air-liquid interface for two weeks in keratinocyte differentiation medium. In order to construct the epidermal-dermal skin model, fibroblast cell line, NIH3T3 cells, or primary normal human dermal fibroblasts (NHDF) were seeded and cultured for five days in silica nano-nonwoven fabrics prior to seeding of keratinocytes. Constructed models were evaluated by microscopic observation after hematoxylin and eosin staining, trans-epithelial electrical resistance (TEER) measurement and quantification of various epidermal/dermal-related gene expressions using real-time PCR. The thickness of epidermis of the models constructed with silica nano-nonwoven fabrics was thicker than that constructed in cell culture inserts. The expression of genes such as *hTGM1* and *hLOR* in epidermal models constructed on silica nano-nonwoven fabrics were much higher than those of cell culture inserts. This means that silica nano-nonwoven fabrics may mimic the basal lamina structure and increase the functions of keratinocytes. In the construction of epidermal-dermal skin models, similar positive effect of silica nano-nonwoven fabrics were observed. Finally, the prepared three-dimensional epidermal and epidermal-dermal skin models were evaluated by a method similar to the OECD TG skin corrosiveness test. The three-dimensional skin models met the evaluation criteria of the skin corrosiveness test. These results suggested the usefulness of the silica nano-nonwoven fabrics-based three-dimensional skin models.