Development of nanofiber incorporated hydrogels as 3D scaffold skin tissue growth

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Project Objectives

- Develop Nanofiber reinforced hydrogel 3D scaffold to mimic natural ECM of cells
- *In vitro* 3D fibroblast tissue growth
- Evaluation of in vitro 3D tissue constructed using nanofiber incorporated hydrogel scaffold with that of nanofiber and hydrogel scaffold

Description

In vitro tissue engineered 3D constructs can serve as an extremely valuable platform to provide fundamental insights into the etiology of diseases as well as elucidate the pathophysiological mechanisms in disease progression and treatment. New nutraceutical or drug development requires simple *in vitro* models that resemble the *in vivo* situation more in order to select active nutraceuticals/drugs against diseases and to decrease the use of experimental animal. For example, *in vitro* 3D skin constructs can be used to evaluate the permeability as well as the adverse inflammatory responses of topical agents in a high throughput manner during the preliminary stages of transdermal and topical nutraceutical or drug discovery and formulation development. Tissue engineered 3D skin constructs provides several advantages compared with animal skin by better mimicking human skin physiology as well as by alleviating ethical concerns and conforming to emerging regulations on animal use. *In vitro* 3D tissue growth requires 3D scaffold with appropriate physical and biochemical cues. In native tissue, cell secreted extra cellular molecules forms the supporting Extra Cellular Matrix (ECM) to the cells which provides structural and biochemical signals to the cells. Since cells actively sense their microenvironment and react to the properties of their surroundings, developing a 3D artificial scaffolds that mimic the natural cells microenvironment in terms of physical and biochemical cues is of great importance for the success of *in vitro* 3D tissue growth. In this regard this project focus on developing nanofiber incorporated hydrogels as 3D scaffolds which will mimic the natural ECM for skin tissue growth.