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Cell Therapy for Dermal Reconstruction

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Dear Editor,

Skin is the largest organ of human which plays a critical role in different functions of the human body, such as homeostasis, sensory detection, protecting against external insults, and healing. Skin is consisted of thin epidermis and relatively acellular dermis of collagen-rich extracellular matrix (ECM) (1). One of the major applications of tissue-engineered skin substitutes in wound healing is to promote cutaneous wound healing. The skin wounds can be caused by mechanical trauma, surgical procedures, reduced blood circulations, burns, or aging procedures. Most of the skin wounds can heal naturally, but additional surgery requires immediate coverage, using skin substitutes, to facilitate skin repair and regeneration, in cases with extensive or irreversible skin damages (2). However, the available skin substitutes often cause a range of problems including wound contraction, scar formation, and poor integration to the underlying host. Engineering the skin substitutes through tissue engineering approaches has relied upon the creation of three-dimensional scaffolds to guide cell adhesion, growth, and differentiation to form functional and structural tissues (3). The scaffolds not only cover the wounds and provide a physical barrier against external infection, but also provide support both for dermal fibroblasts and the overlying keratinocytes. A good tissue scaffold should exhibit appropriate physical and mechanical characteristics and should have appropriate surface chemical and nano- and microstructures to facilitate cellular attachment, proliferation, and differentiation (4). The composition of fibroblast-keratinocyte is formed based on the membrane with the promoted three dimensions, which can produce skin equivalent, and promising in vitro results suggested the potential application of these for the treatment of burns and chronic wounds. Significant improvements have been made to identify and to locate the stem cells in the skin. Several studies have proved that stem cells can be used for skin reconstitution in healing the skin wounds. The limited regenerative capacity of epidermal keratinocytes could be overcome by self-renewing keratinocyte stem cells. Locating hair follicle stem cells can bring possible hope to form hair follicle in future bioengineered skin products (5).

However, there are still many challenges that are collectively faced by bioengineers, cell biologists and clinicians; further development in this area needs ongoing interactions and collaborations. New technologies are being developed to provide hope for future regenerative skin technologies. Stem cell technology is making new milestones in the efficiency of cell culturing.

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