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New autologous engineered pigmented skin for human skin graft

J.C. Lepivert[1,2], C. Pain[1], E. Desnouveaux[2], V. Casoli[1,2], M. Cario[1, 2]
[1]INSERM 1035, France
[2]Hospital Center University De Bordeaux, France

Since many years, we studied human pigmentation using a model of skin reconstruct on dead deepidermized dermis. These reconstructs were made with human primary cells obtained from human skin. Since this model has a short lifetime, we improved our technic of reconstruction to have efficient engraftment on immunodeficient mice in order to achieve long-term studies such as effect of chronic irradiation. Furthermore, dermal collagen-based matrices such as IntegraTM or Matriderm® were used as dermal substitute for many years in reconstructive surgery. Thus, we developed a model of pigmented skin reconstructs with, as dermal layer, a bovine collagen-based matrix colonized by fibroblasts. On top of this dermal matrix keratinocytes and melanocytes were seeded to produce the epidermal layer. In the dermal compartment, fibroblasts secreted human collagen and remodeled the matrix. Both fibroblasts and keratinocytes secreted proteins of the dermo-epidermal junction such as collagen IV and laminin. These proteins are essential for epidermal differentiation and melanocyte basal location. This human model and a pig model were xenografted with success on immunodeficient mice and mini-pigs respectively. Since all our results were promising, we continued our research to produce an autologous-engineered skin for clinical use. We obtained a skin with a remodeled dermis, a dermal epidermal junction and a stratified epidermis with its stratum corneum. Our patent (WO2016151134A1) is in preclinical step on immunodeficient mice. First results, 6 months follow-up of xenografted mice and histology of reconstructed pigmented human skin, are in line with our expectations. A clinical trial is planned mid-2020.