Dermal white adipose tissue (dWAT) is an adipose compartment within dermis which is primarily composed of adipocytes defined as intradermal adipocytes. dWAT has been recently recognized as an important contributor to a multitude of processes occurring in the skin including hair follicle growth, thermoregulation, immune response and wound healing. Currently it is known that the epidermal Wnt/β-catenin signaling pathway is a key initiator of the signaling cascade that stimulates the process of adipogenesis in the skin. Activation of Wnt/β-catenin signaling induces differentiation of progenitor cells into adipocytes by stimulation of ligand secretion of BMP2 (Bone Morphogenetic Protein 2) and IGF2 (Insulin-like Growth Factor 2).

The molecular determinant regulating skin homeostasis is the transcription factor Foxn1. In the intact skin Foxn1 regulates the balance between proliferation and differentiation of keratinocytes and participates in hair follicle development. In the post-wounded skin, Foxn1 is associated with scar healing process. Although, expression of Foxn1 in the skin is limited to epidermal layer, it has been shown that it impacts also dermal layer. Reported in the literature resistance of $Foxn1^{-/-}$ (Foxn1-deficient) mice to diet induced obesity and decreased expression of adipogenic-related genes in the skin of mice with spontaneous deletion in the Foxn1 gene indicate that epidermal signaling upon Foxn1 action regulates dermal compartment of the skin and dWAT differentiation.

The aim of this study was to determine the potential effect of Foxn1 on the adipogenesis in intact and wounded skin with respect to age and diet, and to define the mechanism involved in Foxn1-mediated adipogenic differentiation of precursor cells in the skin. Obtained data indicate the role of the transcription factor Foxn1 in the regulation of a susceptibility to diet-induced obesity. Moreover, partial inactivation of Foxn1 ($Foxn1^{+/-}$ mice) resulted in abrogated expression of genes involved in adipogenesis in the skin, suggesting a modulating role of Foxn1 in the regulation of dWAT. The results of the present study have shown that both age and diet regulate numerous processes in the skin including dWAT expansion, adipocyte progenitor cells turnover and migratory abilities of dermal fibroblasts (DFs). *In vitro* studies using keratinocytes – DFs coculture model showed that age, diet and epidermal signaling influence the potential of DFs adipogenic differentiation. Moreover, obtained results revealed that Foxn1 has a stimulatory effect on the adipogenic signalingof BMP2 and IGF2.