

Prox-1 and adipogenesis

Adipogenesis is the biological process that controls adipocytes differentiation and is one of the most well studied models of cellular differentiation. Adipose tissue is involved in the control of energy balance and especially in the study of diseases, such as obesity and type II diabetes. I have already shown the involvement of Class I homeobox genes (HOX) in human adipose tissue. The HOX genes may affect several processes of tissue development in adults, including angiogenesis and wound healing. The HOXA5, A11, B1, B7 and C9 genes are active in vascular smooth muscle cells that comprise the greatest portion of the vessel wall. White Adipose Tissue is located in different areas of the body; The WAT is always locate within the sites rich in connective tissue, such as the subcutaneous layer between muscles and derma. The development of the capillary network into the connective tissue under the skin is the first event that characterizes human adipogenesis. These “primitive organs” (as they were originally called) evolve in adipose tissue, demonstrating a strong correlation between blood vessel development and adipogenesis. The white adipose tissue located in different parts of the body expresses a different pattern of angiogenic factors; indeed, vascular endothelial growth factor (VEGF) is predominantly expressed in omental adipose tissue compared with subcutaneous.



Fig. 1. Prox-1 gene expression in human adipose tissue of healthy patients.

Prox-1

Prosper homeobox-1 (Prox1) is a transcription factor related to the *Drosophila* gene Prospero, which is important in the development of the central nervous system, liver, and pancreas. Prox-1 gene expression is expressed in the primitive lymph sacs originating from endothelial budding of the cardinal vein and gives rise to the lymphatic system. Prox-1, homologous to the gene Prospero of *Drosophila*, has been connected to the development of the lymphatic system. Prox-1^{-/-} mouse embryos do not develop a lymphatic system, but undergo thorough normal vasculogenesis and angiogenesis; other tissues such as the eye lens, central nervous system and liver are compromised, leading to embryonic lethality. Prox-1 expression in vascular ECs induces proliferation (Prox-1 upregulates Cyclin E1 and E2 expression) as well as expression of lymphatic genes such as VEGFR-3 and Desmoplakin I/II and repression of vascular EC genes such as STAT 6 and Neuropilin I. Prox-1 also regulate fibroblast growth factor receptor-3 (FGFR3); FGFR3 is

required for lymphatic EC proliferation. The *Drosophila* Prospero gene is involved in asymmetric cell divisions, generating different cell types during embryonic development. Thus, Prox 1 is involved in the control of cell proliferation and the regulation of the developing lymphatic system

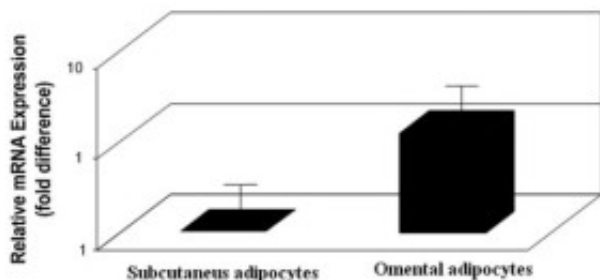


Fig. 2. Prox-1 gene expression in human adipocytes.

The Prox-1 gene is expressed in human adipose tissue of healthy patients. In several preclinical obese animal models, angiogenesis modulators significantly alter body weight and metabolic rates of the host. Moreover, insulin sensitivity and the development of type II diabetes is due to the angiogenesis factors. In effect, anti-angiogenic or angiogenic drugs have been implicated in the treatment of diabetes and diabetes related complications.

After recent studies, I have decided to analyze the Prox-1 gene expression in human adipose tissue and omental and subcutaneous adipocytes. Samples were isolated from healthy patients without inflammation (see the figure).

The results confirm that omental adipose tissue is physiologically more active than subcutaneous adipose tissue. In conclusion, the data may represent a linking between angiogenesis and adipogenesis; our data are not sufficient to demonstrate if angiogenic markers regulate adipogenesis. Further study, will be useful to understand the role of the Prox-1 gene in the control of human adipocyte differentiation.

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Publication

[Overexpression of Prox-1 gene in omental adipose tissue and adipocytes compared with](#)

[subcutaneous adipose tissue and adipocytes in healthy patients.](#)

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