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Adipose stromal-vascular fraction-derived paracrine factors regulate adipogenesis

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Abstract Visceral and subcutaneous adipose tissue depots have distinct features and contribute differentially to metabolic disease. Therefore, the adipogenic potential of different fat depots was investigated and found to be higher in subcutaneous compared with visceral stromal–vascular fraction (SVF), which contains adipocyte precursor cells. This increased differentiation capacity was not due to elevated numbers of $Lin^{-}Sca1^{+}CD29^{+}CD34^{+}Pref1^{+}$ precursor cells, as the number of preadipocytes was higher in visceral than in subcutaneous SVF. The secreted heat-sensitive factors from the SVF inhibited adipocyte differentiation more in visceral than in subcutaneous SVF. In order to explore secreted proteins that potentially inhibit differentiation, the secretome of murine SVF was analyzed by mass spectrometry, which resulted in the identification of 113 secreted proteins with an overlap of 42 % between subcutaneous and visceral SVF. Comparison of the mRNA expression in SVF from both depots revealed 16 transcripts that were significantly expressed more in visceral than in subcutaneous SVF. A functional differentiation screen identified seven potential inhibitory candidates: biglycan, decorin, bone morphogenic protein 1, epidermal growth factor-containing fibulin-like extracellular matrix protein 2, elastin microfibril interfacer 1, matrix gla protein, and Sparc-like 1. For further verification, murine recombinant decorin or Sparc-like 1 was added to the media during the differentiation process leading to a dose-dependent decrease in adipogenesis. Further analysis will be necessary to assess the impact of the other candidates on adipocyte differentiation.

Keywords Adipogenesis · Paracrine factors · Stromal vascular fraction · Adipose

Introduction

Adipose tissue is an important regulator of lipid metabolism within the body. Adipocytes serve as a safe storage place for excess lipids in times of abundant nutrient supply. Vice versa, adipocytes release free fatty acids during fasting to supply other peripheral tissues with energy [1]. Apart from its role as a lipid reservoir, adipose tissue is also an endocrine organ secreting adipokines, cytokines and hormones, which exert paracrine effects on adipose tissue function as well as endocrine regulation of whole body energy homeostasis [2].

In response to fluctuations in energy supply, adipose tissue has evolved into a very dynamic tissue being able to expand and shrink in mass according to the nutritional status [3]. To do so, adipocytes have the unique capability to change their size several folds [4]. In addition, adipocytes are thought to have a constant turnover rate [5] with new adipocytes being formed by de novo differentiation

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