A New Endocrine "Gland": Adipose Tissue

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Abstract

Current clinical and experimental research fundamentally changed the definition of adipose tissue as one dedicated exclusively to energy storage and release. Adipose tissue seems to be a glucocorticoid target site. Contrary to the traditional understanding that adipose tissue acts as an inactive organ for storage extra energy as fat, it has always been well known that adipose tissues are in fact one of the main and most active organs in our body and play an important role in controlling energy homeostasis. Adipose tissue is one of the first organs to react to changes in nutritional status, such as increased food intake, fasting, lower exposures to temperature and physical activity. The functional role of adipose tissue is likely to be regulated rather completely by adipokines, among other specific biologically active molecules. A better knowledge of adipokine biology will also help the design and implementation of new therapeutic groups with fewer side effects.

Keywords: Adipose Tissue; Endocrine Gland; Adipokines; Adiponectin; Leptin; Tumor Necrosis Factor-α (TNF-α); Interleukin-6 (IL-6); Plasminogen Activator Inhibitor-1 (PAI-1); Angiotensinogen and Monocyte Chemoattractant Protein

Current clinical and experimental research fundamentally changed the definition of adipose tissue as one dedicated exclusively to energy storage and release. Adipose tissue seems to be a glucocorticoid target site [1]. Many studies of the hypothalamic-pituitary-adrenal axis function in obese subjects have tended to arrive at sufficient data. A groundbreaking hypothesis is that cortisol is produced by adipose tissue from its inactive precursor cortisone. Leptin recognition, a hormone synthesized by adipose tissue, has contributed to its being a real endocrine "gland" in the modern interpretation. Leptin is provided by subcutaneous tissue, and to a lower degree by visceral fat deposits [2]. It plays a key role in regulating body weight, and extremely fat stores, but is often implicated in many complex functions, particularly puberty-related physiological mechanisms. Angiotensinogen (AGT), another hormone synthesized by adipose tissue in excess, is formed by visceral to greater quantities than subcutaneous fat [3]. Furthermore, adipose tissue tends to contain the entire renin-angiotensin system (RAS) in both humans and animals, indicating that angiotensin II, the entire system final effector, is made locally. The role of adipose RAS is not clearly documented; apart from intervening in adipocyte proliferation and fat tissue development together with other hormones and molecules, this could also be implicated in the pathogenesis of obesity complications [4]. Each of these results helped open exciting opportunities and are required to give more encouraging observations into the adipose organ's physiopathology.

Contrary to the traditional understanding that adipose tissue acts as an inactive organ for storage extra energy as fat, it has always been well known that adipose tissues are in fact one of the main and most active organs in our body and play an important role in controlling energy homeostasis [5,6]. Adipose tissue is one of the first organs to react to changes in nutritional status, such as increased

food intake, fasting, lower exposures to temperature and physical activity. Besides lipolysis and fatty acid metabolism, they often require extensive renovation in multiple aspects like cell size and morphology, angiogenesis, responses to normoxia/hypoxia, whitening/browning characteristics, immune reactions. Perhaps notably, modifying of different pathways inside adipose tissues inevitably leads to significant changes in the mechanisms of adipose tissue expression/secretion, which structurally enhances and promotes the localized effects [7]. The functional role of adipose tissue is likely to be regulated rather completely by adipokines, among other specific biologically active molecules. Adipokines are a group of medium and low molecular weight pharmacologically active proteins that have autocrine and paracrine effects, and are considered to be inflammatory and immune systems products [8]. These adipokines even play a key role in the physiology of adipose tissue and in inducing many metabolic and cardiovascular disorders, not only in patients with overweight and obesity but also in many healthy persons with greater visceral fat mass [9]. Such cytokines comprise adiponectin, leptin, tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), resistin, plasminogen activator inhibitor-1 (PAI-1), angiotensinogen, and monocyte chemoattractant protein [10]. An elevated volume or unequal distribution of adipose tissue between central and peripheral body areas is linked to modified serum levels of these cytokines [10]. Certain cytokines are made, with the exception of leptin and adiponectin, not only from fat cells but also from adipose-tissue resident macrophages, found in the stromal tissues accompanying fat cells [11]. Nevertheless, it is still promising that many pharmacological products focused on adipokine have been produced, such as adiponectin receptor agonist [12], PEGylated FGF-21 [13] and antibody neutralization against IL-1β [14], most of which have reported interesting consequences on metabolic-related illnesses. A better knowledge of adipokine biology will also help the design and implementation of new therapeutic groups with fewer side effects.

Another, it is possible that variations have been observed in its lipolytic or lipogenic ability, relying on the origin of the adipose tissue (for example, whether periepididymal or retroperitoneal) [15]. Periepididymal tissue, usually from rodents, has been commonly used as a criterion for testing reactions to some of the most complex natural or pathological conditions. Problems started to arise regarding the representativeness of this fatty cushion, suggesting that a complete review of its physiological function was indispensable.

Given the variety of functional capabilities and the vast variety of pathways that adipose tissue has at its disposition to correct metabolic disorders, it is important to identify the probability of using those capabilities in health promotion and disease management or treatment. A better knowledge of the ability of adipose tissue would certainly make it a great support in combating not only the above-mentioned pathologies but also many others, and this will become a significant internal arm of health education. Therefore, now adipose tissue can be considered as a new endocrine "gland" in the modern interpretation.

Conclusion

Now adipose tissue can be considered as a new endocrine "gland" in the modern interpretation.

Disclosure Statement

The author declare that there are no conflicts of interest.

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