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Special Issue Reprint

Adipose Tissue and Gene Expression

Edited by: Margherita Maffei and Gaia Scabia

In recent decades, white adipose tissue has emerged as far more than a passive energy store and is now recognized as an active endocrine organ with remarkable plasticity. Its functions extend well beyond long-term energy balance, influencing fertility, immune responses, glucose homeostasis, bone remodeling, and cardiovascular regulation. WAT is therefore increasingly viewed as a central integrator of systemic physiology, both shaping and responding to environmental and metabolic cues. This functional versatility relies largely on the dynamic regulation of gene expression, which enables adipose tissue to continuously adjust its structural and metabolic properties in response to internal and external stimuli. Through coordinated transcriptional programs, epigenetic modifications, and post-transcriptional mechanisms, cells modulate pathways governing lipid metabolism, energy utilization, inflammatory responses, and intercellular communication. Such regulatory flexibility allows tissues to maintain homeostasis while rapidly adapting to nutritional changes, hormonal signals, environmental stressors, and pathological conditions. The studies collected in this Special Issue highlight the adaptability of adipose tissue and the key role of gene-expression reprogramming in shaping its functional diversity. Spanning biological models from mammalian systems to the invertebrate *Bombyx mori* and pathological contexts including obesity, diabetes, cancer, mastitis, and COVID-19.

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