

A new Article Series for adipose tissue



Adipose tissue is a complex organ that has crucial endocrine and metabolic functions in mammalian physiology. A new Article Series aims to collate adipose tissue content from *Nature Reviews Endocrinology* and provide a useful resource for researchers working in this field.

Once considered exclusively as a storage site for lipids, adipose tissue is now known to be a complex and dynamic endocrine organ that regulates energy homeostasis and other important physiological processes. As such, adipose tissue is crucially important for metabolic health. Dysfunctional adipose tissue can contribute to the development of pathophysiological states, such as obesity, or diseases, such as type 2 diabetes mellitus (T2DM), nonalcoholic fatty liver disease and cardiovascular disease. Thus, an improved understanding of adipose tissue biology will guide the development of new strategies to treat disease. With our new Article Series, ‘Physiology and pathophysiology of adipose tissue’¹, we aim to help researchers gather this knowledge.

Adipose tissue can be found under the skin (subcutaneous), between and around organs (visceral), in the bone marrow and in mammary glands. Different functional depots of adipose tissue exist, including the lipid-storing white adipose tissue and thermogenic adipose tissue. Each depot is comprised of adipocytes, blood vessels and immune cells, and is innervated by the sympathetic nervous system. Adipocytes function to store lipids, sense systemic and local signals and respond by regulating energy mobilization, as well as secreting paracrine and endocrine factors. Single-cell and single-nuclei techniques have started to reveal the cellular complexity of adipose tissue. A comprehensive, single-cell atlas of human and mouse white adipose tissue published in *Nature* highlighted species similarities and differences, cellular heterogeneity and identified subpopulations of adipocytes, adipose stem cells, adipose progenitor cells, vascular cells and immune cells².

Pathology can arise when adipose tissue does not function appropriately. Under conditions of overnutrition, adipose tissue might not be able to store sufficient levels of lipids, which can lead to ectopic lipid accumulation in other organs. In obesity, adipose tissue expands and can undergo remodelling, resulting in fibrosis and inflammation. Furthermore, insulin resistance of adipose tissue can contribute to the development of T2DM³. The expansion of visceral adipose tissue is also associated with increased metabolic risk⁴.

Despite this wealth of knowledge, many important questions remain to be answered in the adipose tissue field. In January 2023, researchers came together to identify and address emerging questions in adipose tissue and

bioenergetics at Keystone, Colorado, USA, in two joint international Keystone symposia. The two meetings were: ‘Adipose tissue: Energizing good fat’⁵, organized by Silvia Corvera, Kendra Bence and Rana Gupta, and ‘Bioenergetics in health and disease’⁶, organized by Shingo Kajimura, Anna Krook and Jared Rutter. One important outcome of these symposia was the identification of four emerging key questions. First, understanding how the different adipose tissue depots contribute to systemic metabolism. Second, identifying how many types of adipocyte exist and what their contributions are to the function of different adipose tissue depots. Third, asking how progenitor cells give rise to different types of adipocytes, as well as how other elements affect adipocyte development. Fourth, investigating how lipid droplets and mitochondria develop in adipose tissue, and how these organelles influence systemic metabolism.

We hope that our new Article Series will be a knowledge hub for the adipose tissue research community by highlighting exciting developments in adipose tissue biology that address these questions and more. We are proud to launch the Series with a Review by Bret Goodpaster et al. on intermuscular adipose tissue in metabolic disease⁷, a Year in Review on adipose tissue by Yu-Hua Tseng⁸ and a Comment by Melia Granath-Panelo and colleagues highlighting cutting edge perspectives in bioenergetics that emerged from the January Keystone symposia⁹. In addition, the Article Series also collates related articles from the past two years. Future exciting content is also planned, which we look forward to highlighting in the Series. Adipose tissue is crucial in health and disease and an understanding of its role in the body is critical for the development of effective strategies to target metabolic disease and improve human health.

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