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Perspective

Metabolic Diseases Related to Lipids and their Mechanisms

Anshu Karan*

Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod, Kerala 671316, India

DESCRIPTION

Metabolic diseases have become a pressing global health concern in recent decades, with their prevalence reaching alarming levels. Among the various factors contributing to their rise lipids, a group of diverse molecules that include fats and cholesterol, have emerged as key players. Lipid metabolism dysregulation has been strongly implicated in the development of several metabolic diseases, including obesity, type 2 diabetes, and cardiovascular disorders. Here we explore the intricate relationship between lipid metabolism and metabolic diseases, shedding light on the underlying mechanisms and potential therapeutic strategies.

Lipid metabolism

Lipids play essential roles in the human body, serving as an energy source, structural components of cell membranes, and precursors to signalling molecules. To maintain metabolic homeostasis, the body orchestrates a delicate balance between lipid synthesis, storage, and breakdown. This intricate system is regulated by a network of enzymes, hormones, and transcription factors, ensuring the availability and utilization of lipids in response to energy demands.

Obesity

Obesity, characterized by an abnormal accumulation of body fat, is a major risk factor for metabolic diseases. It results from an imbalance between energy intake and expenditure, ultimately leading to an excessive storage of lipids in adipose tissue. Adipocytes, the primary cells in adipose tissue, serve as reservoirs for triglycerides, the predominant form of stored lipids. When energy intake exceeds expenditure, adipocytes undergo hypertrophy and hyperplasia, contributing to weight gain and obesity.

Adipose tissue inflammation

Growing evidence suggests that lipid metabolism dysregulation within adipose tissue can trigger a cascade of inflammatory events, further exacerbating metabolic diseases. In obese individuals, adipose tissue undergoes remodeling, leading to a state of chronic low-grade inflammation. This inflammatory milieu arises from an overproduction of pro-inflammatory cytokines and adipocytes, which are influenced by altered lipid metabolism. The resulting chronic inflammation contributes to the development of insulin resistance, a hallmark of type 2 diabetes, and promotes the progression of cardiovascular diseases.

Lipid factors

Beyond their role in inflammation, lipids can directly exert toxic effects on various tissues and organs when dysregulated. Excessive lipid accumulation, particularly in non-adipose tissues like the liver, skeletal muscle, and pancreas, disrupts normal cellular functions and induces cellular stress. This phenomenon, known as lipotoxicity, impairs insulin signaling pathways, disrupts glucose homeostasis, and contributes to the pathogenesis of type 2 diabetes. Moreover, lipids can also promote oxidative stress, impair mitochondrial function, and alter lipid composition within cells, further exacerbating metabolic dysfunction.

Targeting lipid metabolism for therapeutic intervention

Recognizing the critical role of lipid metabolism in metabolic diseases, targeting this intricate system has emerged as a potential therapeutic strategy. By modulating lipid metabolism, researchers aim to restore metabolic homeostasis and ameliorate the progression of metabolic diseases. Several avenues for intervention are being explored, including pharmacological agents targeting lipid synthesis, agents promoting lipid breakdown, and compounds modulating lipid-related signaling pathways. Furthermore, lifestyle modifications, such as adopting a healthy diet and engaging in regular physical activity, remain crucial in maintaining lipid balance and preventing metabolic diseases.

CONCLUSION

Metabolic diseases continue to pose significant challenges to global health, necessitating a comprehensive understanding

Correspondence to: Anshu Karan, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod, Kerala 671316, India, E-mail: akaran7583@gmail.com

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of their underlying mechanisms. The intricate relationship between lipid metabolism dysregulation and metabolic diseases has shed light on the pivotal role of lipids in disease development.