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ADRENAL HORMONES AND THEIR ROLE IN GLUCOSE AND LIPID METABOLISM

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Introduction

The adrenal glands play an important role in metabolic homeostasis through the secretion of glucocorticoids, mineralocorticoids, and catecholamines. These hormones regulate glucose availability, lipid mobilization, insulin sensitivity, and energy balance. Disturbances in adrenal hormone activity may therefore contribute to metabolic abnormalities, including insulin resistance and obesity [1,2].

Aim

To review the role of major adrenal hormones in glucose and lipid metabolism and to summarize their potential contribution to metabolic dysfunction.

Materials and Methods

A narrative review of scientific literature was performed using published studies addressing the metabolic effects of adrenal glucocorticoids, aldosterone, and catecholamines. Particular attention was given to their effects on glucose production and utilization, insulin sensitivity, lipolysis, and lipid storage.

Results

Glucocorticoids, particularly cortisol, are important regulators of glucose and lipid metabolism. Cortisol increases hepatic gluconeogenesis and can reduce insulin sensitivity in skeletal muscle, liver, and adipose tissue. Prolonged glucocorticoid exposure is also associated with increased visceral adiposity, altered lipolysis, and elevated circulating free fatty acids [1,2].

Catecholamines, mainly adrenaline and noradrenaline, participate in the acute metabolic response to stress by promoting glycogenolysis, gluconeogenesis, and lipolysis. These effects increase the availability of glucose and free fatty acids as energy substrates during periods of increased metabolic demand [3,4].

Aldosterone has traditionally been considered primarily a regulator of sodium and water balance. However, evidence suggests that mineralocorticoid receptor signaling in metabolic tissues may also influence insulin sensitivity, adipose tissue function, inflammation, and lipid metabolism. Increased aldosterone activity has been associated with insulin resistance and other cardiometabolic abnormalities [5,6].

Conclusion

Adrenal hormones participate in the regulation of both glucose and lipid metabolism. Cortisol primarily influences gluconeogenesis, insulin sensitivity, and lipid metabolism, whereas catecholamines promote rapid mobilization of glucose and fatty acids during stress. Aldosterone may additionally affect metabolic tissues through mineralocorticoid receptor signaling. Together, these findings indicate that adrenal hormone regulation is closely connected with metabolic homeostasis, although further research is needed to clarify how these pathways contribute to chronic metabolic disease.

Keywords: adrenal hormones; cortisol; aldosterone; catecholamines; glucose metabolism; lipid metabolism; insulin resistance.

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