

The Immunometabolic Nexus: Insights into Autoimmune Disease, Chronic Kidney Disease, and Cancer

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The immune system is designed to protect the body from foreign pathogens. However, dysregulated immune responses can lead to autoimmune disorders, where self-antigens are mistakenly targeted, resulting in systemic dysfunction. Additionally, certain immune cells can contribute to immune evasion in tumors, impairing immune surveillance, while others drive immune dysregulation in various chronic diseases.

Nutrient availability plays a critical role in T cell activation, with glucose and amino acid metabolism regulated by multiple signaling pathways. The key to restoring immune balance and accelerating disease recovery may lie in specific metabolic cues, such as essential nutrients and bioactive molecules.

In this discussion, we explore the immunometabolic nexus, particularly how metabolic regulators such as HIF-1 and amino acids influence biomaterial generation and biochemical modifications beyond their conventional role as protein building blocks. These insights may offer novel therapeutic strategies for modulating immune function in autoimmune diseases, chronic kidney disease (CKD), and cancer.