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Glucose metabolism and immune dysregulation – a metabolic lens on lupus pathogenesis

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The immune system is energetically demanding, and its activation, regulation, and dysfunction are intricately tied to metabolic reprogramming. In this issue of the *Central European Journal of Immunology*, Jin *et al.* present a significant contribution to our understanding of how altered glucose metabolism drives $CD4^+$ T-cell dysfunction in systemic lupus erythematosus (SLE) [1].

Through comprehensive metabolic analyses, the authors demonstrate that $CD4^+$ T cells from SLE patients exhibit a hypermetabolic state, marked by enhanced glycolysis and oxidative phosphorylation. These metabolic shifts are closely associated with disease flares and immune dysregulation. This study builds on a growing body of work within CEJI that emphasizes the immune-metabolic interface. For example, transcriptomic profiling by Wang *et al.* revealed that anaerobic glycolysis strongly influences Jurkat T-cell proliferation and gene expression signatures [2], offering foundational insight into T-cell bioenergetics under stress conditions. Moreover, recent work by Tao *et al.* highlighted how IL-17A, a cytokine implicated in autoimmunity, promotes glycolysis in hepatic stellate cells *via* the TRAF2/TRAF5/HuR/PFKFB3 axis, illustrating that immune-driven glycolysis is not restricted to lymphocytes, but extends to tissue remodeling and fibrosis [3].

Together, these findings suggest that dysregulated glucose metabolism is a common theme underlying both adaptive and tissue-resident immune cell dysfunction [4-6]. The work of Jin *et al.* distinguishes itself by directly linking these metabolic changes to clinical disease activity in SLE, opening the door to novel metabolic interventions [1].

As immunometabolism continues to shape our understanding of autoimmunity and immune cell fate, this study stands out as a timely and mechanistically insightful contribution [7]. It reinforces the concept that targeted metabolic modulation, such as glycolysis inhibition, could complement immunosuppressive therapies in diseases like SLE.

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