

Peer Review

Review of: "Mechanisms of Glycolysis and Fermentation: A Non-Equilibrium Thermodynamics Perspective"

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This review article presents a highly original and thought-provoking reinterpretation of glycolysis and fermentation through the lens of non-equilibrium thermodynamics. The authors challenge conventional biochemical paradigms, offering an integrative perspective that attempts to reconcile classical models with physical laws, particularly focusing on proton flow (H^+) as a central energy entity. The manuscript demonstrates deep historical knowledge, referencing foundational work by pioneers such as Meyerhof, Krebs, and Mitchell. Its ambition to unify biochemical pathways with thermodynamic principles is commendable and could stimulate significant academic discussion across disciplines, including biochemistry, physics, and systems biology.

However, the manuscript is excessively dense, highly speculative in several areas, and often strays into philosophical and theoretical assertions without sufficient empirical grounding. The language is frequently convoluted, with repetitive arguments and unclear terminology that may confuse readers unfamiliar with both advanced thermodynamics and metabolic biochemistry. Furthermore, while historical references are abundant, there is limited engagement with contemporary empirical research that could substantiate the proposed models. The figures, though conceptually interesting, lack clarity and are not adequately explained. There are also concerns regarding overstatements, particularly accusations of "scientific misconduct" against prevailing biochemical models, which are inappropriate for scientific discourse.

Declarations

Potential competing interests: No potential competing interests to declare.