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Identification of Key Regulators in Glycogen Utilization in *E. coli* Based on the Simulations from a Hybrid Functional Petri Net Model

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Keywords: metabolic pathway; glycogen; hybrid functional Petri net; PTS; HPr and EIIAGlc proteins; gene regulation

Background: Glycogen and glucose are two sugar sources available during the lag phase of E. coli, but the mechanism that regulates their utilization is still unclear.

Methods: Attempting to unveil the relationship between glucose and glycogen, we propose an integrated hybrid functional Petri net (HFPN) model including glycolysis, PTS, glycogen metabolic pathway, and their internal regulatory systems.

Results and Conclusions: By comparing known biological results to this model, basic necessary regulatory mechanism for utilizing glucose and glycogen were identified as a feedback circuit in which HPr and EIIAGlc play key roles. Based on this regulatory HFPN model, we discuss the process of glycogen utilization in E. coli in the context of a systematic understanding of carbohydrate metabolism.