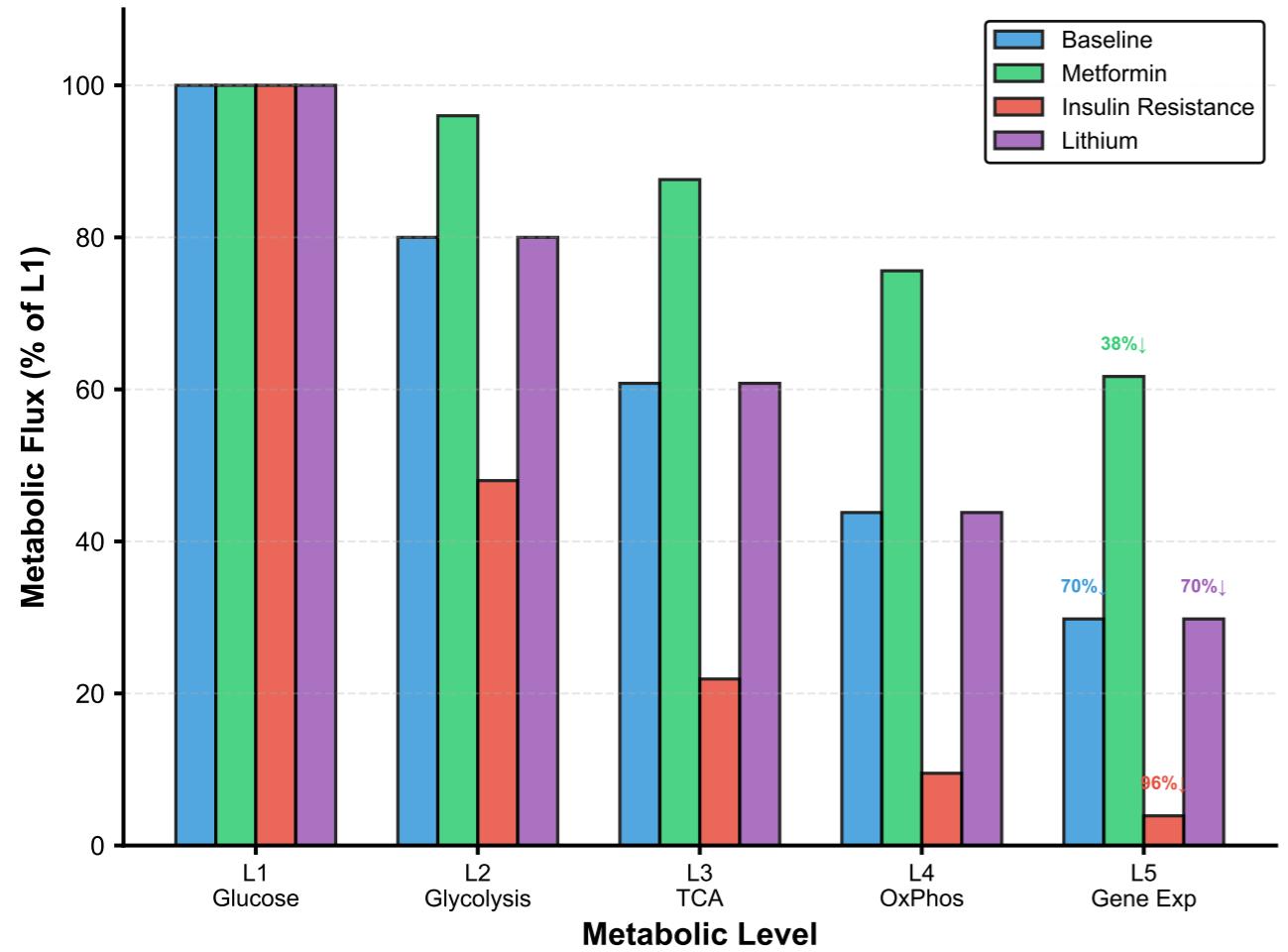
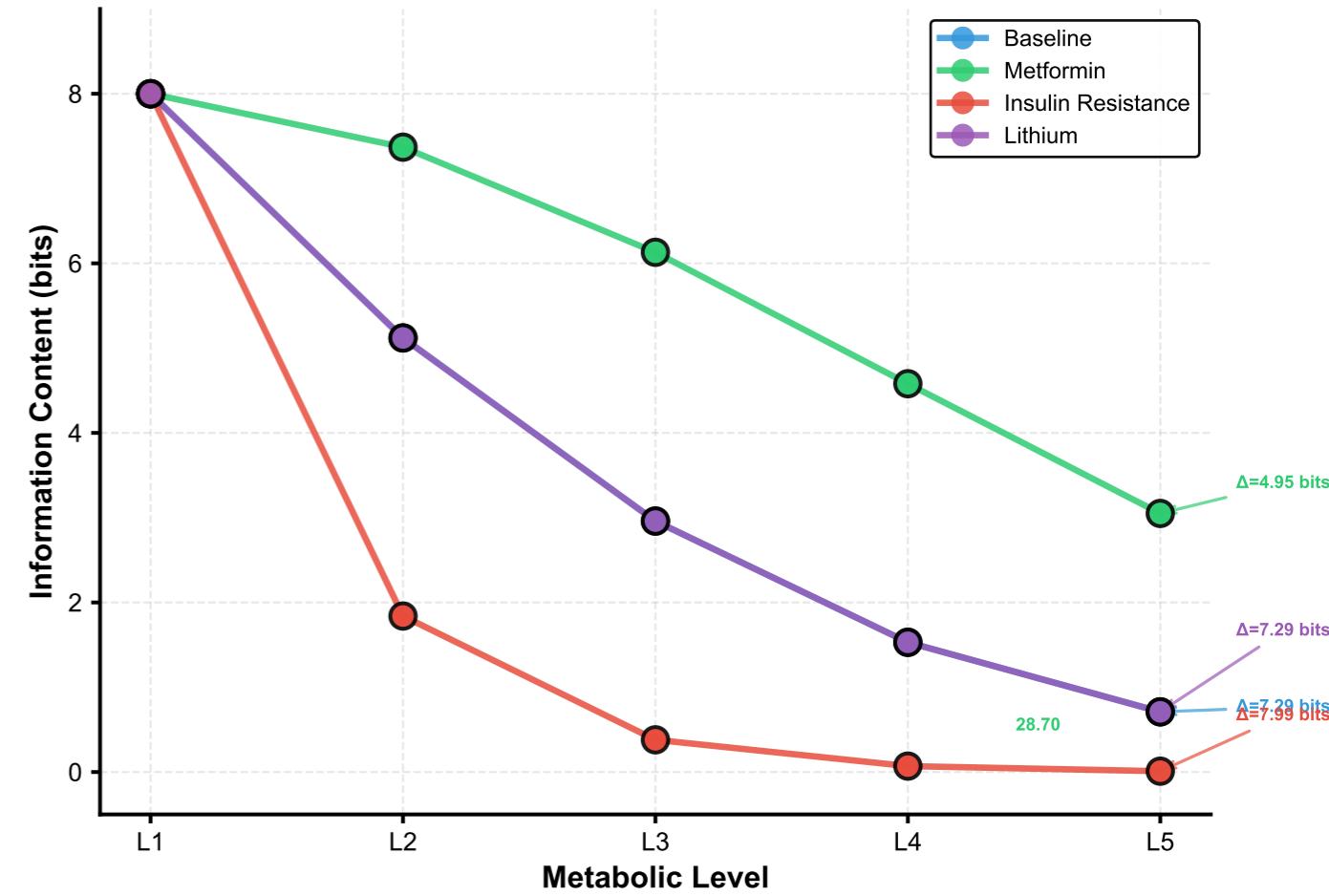


Metabolic Flux Hierarchy: Multi-Scale Information Cascades Through Metabolic Pathways

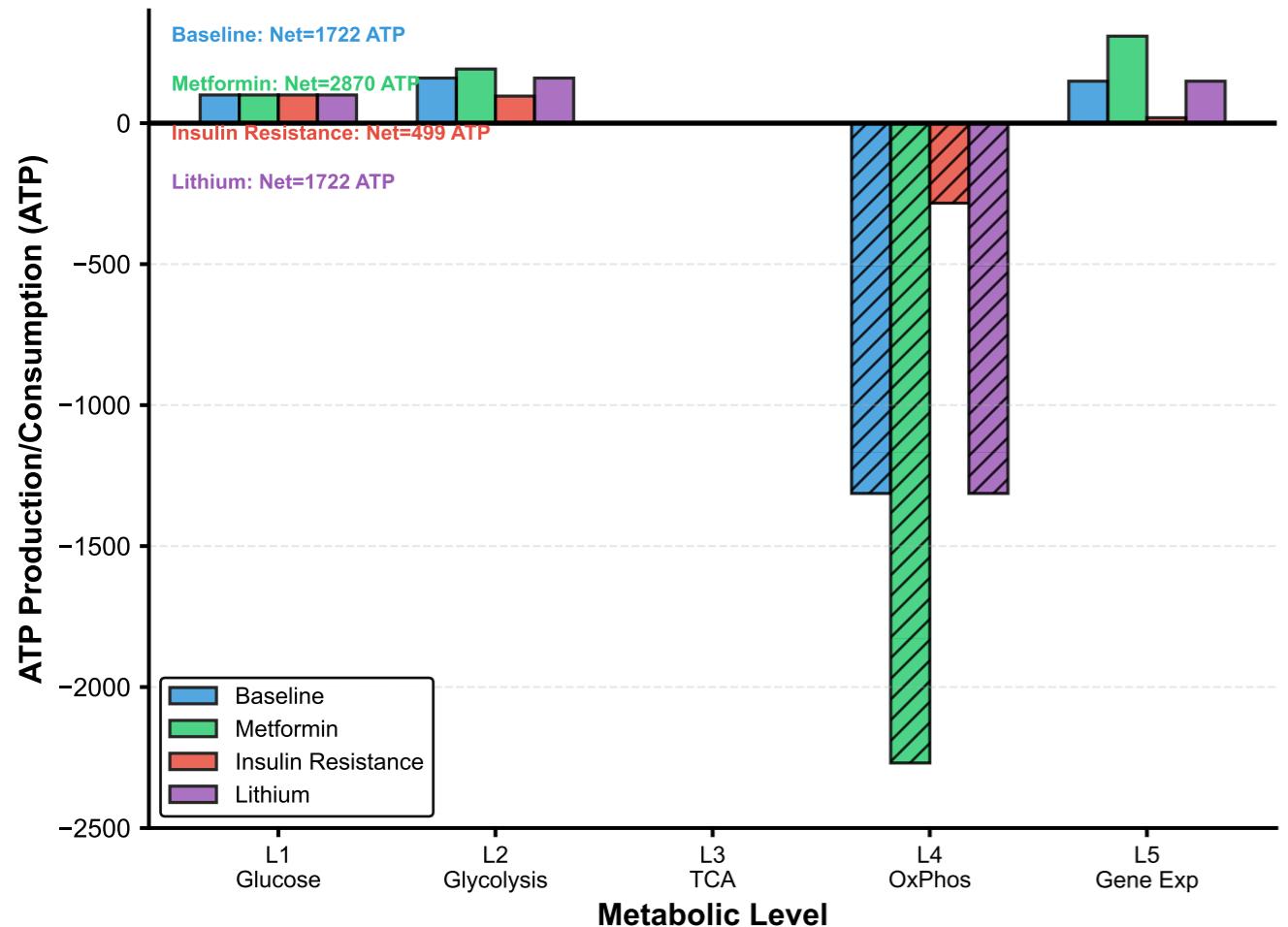
(A) Hierarchical Flux Cascade Across Metabolic Levels



(B) Information Compression Through Metabolic Hierarchy



(C) ATP Production/Consumption Profile



(D) Comprehensive Metabolic Efficiency Comparison

