Study of the effects of alternative fluxes on the metabolic control analysis of optimally grown *E. coli*

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The intracellular metabolite and flux states have a significant impact on the responses to metabolic networks to changes in their enzyme activities and environmental conditions. Therefore it is important to characterize systematically all possible intracellular flux states, and analyse their properties. We have developed a novel framework called Flux Directionality Profile Analysis (FDPA), which enumerates all the possible intracellular flux profiles that are consistent with an observable set of extracellular fluxes. In the current study, we applied FDPA and we found the alternative intracellular flux profiles in *E. coli* under optimal aerobic growth condition. We next applied the ORACLE (Optimization and Risk Analysis of Complex Living Entities) framework to perform metabolic control analysis and identify the differences in the rate limiting reactions between the different intracellular flux profiles. We will discuss how the assumptions about alternative intercellular states can lead to distinct and different conclusions about the metabolic design strategies.