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Entitled

UNDERSTANDING THE INTRACELLULAR POSITIVE REGULATORY INTERACTIONS IN THE METABOLIC NETWORK

by

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Date & Venue

12:00 pm

Monday, 05 Jun 2023

Room 132, F1 Building

Abstract

Metabolism is an essential cellular process that produces essential components such as energy molecules and cellular building blocks. It is regulated by intracellular metabolite-enzyme interactions, which can increase or decrease enzyme efficiency. Each metabolic process is not evolved in nature and may not contribute to the optimal efficiency of the organism's metabolism. However, this study aims to clarify the relationship between cellular positive regulatory interactions and the cell's metabolic network, especially how these relationships regulate metabolism and how it evolved in nature. To obtain that, for each enzyme, I downloaded activation molecules from the BRENDA database, mapped data to the existing metabolic network, and combined activator molecules to form an intracellular enzymes-activator interactions network.

The findings of this study were that one-third of total enzymes were intracellularly activated, covering two-thirds of total pathways. After the analysis, the constructed metabolic network of enzymes and activator metabolites was obtained. And we found that the enzymes which are highly regulated were significantly non-essential. On the other hand, it has the opposite relation with the activator molecules, where those activating more enzymes tend to be more essential. Furthermore, I study the distribution of these activated enzymes in pathways to see which pathways tend to connect with activation to other pathways. It is possible that some enzymes in particular pathways will lose the products they make; those products will be activators, so I try to examine that and found several pathways activating other metabolic pathways.

Keywords: essential, activator metabolites, metabolic network, enzyme, pathway, intracellular, BRENDA, evolved.