**On the Possibility of Inter-Transglycosylation by the Branching Enzyme *Rhodothermus obamensis***

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Branching enzymes (GBE, EC 2.4.1.18) are vital catalysts in starch biosynthesis, driving the formation of α-1,6 glycosidic bonds. This process enhances the branching of starch polymers, significantly influencing their structural and functional properties. These enzymes operate via a transfer reaction that can occur in two distinct patterns: intra-transglycosylation, which involves the same starch polymer chain, and inter-transglycosylation, which involves interactions between different starch polymer chains.

A notable and rare subtype of intra-transglycosylation is the cyclisation reaction, documented exclusively in a limited number of thermostable branching enzymes. While the unique structural signatures of cyclisation can be readily identified, distinguishing between inter- and intra-transglycosylation remains a more elusive task. Consequently, this aspect has garnered limited research focus, despite its potential implications for the resulting polymer structures and their emergent properties.

In this presentation, we will investigate the potential for inter-transglycosylation in the branching enzyme Rhodothermus obamensis. By examining the structural differences associated with these reaction patterns, we aim to elucidate their respective contributions to polymer architecture. Additionally, we will highlight the opportunities these mechanisms present for designing polymers with tailored properties, paving the way for innovative applications in starch modification and beyond.