INSIGHTS ON THE DYNAMICS AND THERMOSTABILITY OF AN ARCHAEAL OLIGOSACCHARYLTRANSFERASE

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N-glycosylation is one of the most prevalent post-translational modifications. The addition of newly formed glycan chains to a nascent polypeptide is fulfilled by the oligosaccharyltransferases PglB (Bacteria), AglB (Archaea), and Stt3 (catalytic subunit in Eukarya). Previous crystallographic data for these enzymes identified structural units with distinct functions, such as catalysis (CC) and structural stability (IS, P1, and P2). Studies regarding these enzymes and its units may support the development of vaccines and glycoprotein engineering. Therefore, here, we examine the predicted role of P1 unit from AglB, aiming to contribute with insights for the comprehension of AglB thermostability. We performed molecular dynamics simulations of the following systems: i) wild type AglB, ii) AglB lacking the P1 unit (AglBΔP1), and iii) P1 unit, as a control. The force field employed was GROMOS54a7, at a temperature of 356 K, in the presence of explicit aqueous solvent, catalytic ion (Zn2+), and a membrane bilayer composed of only palmitoyl-oleoyl-phosphatidylethanolamine lipids. AglB maintained a stable behavior during simulations, while the AglBΔP1 structure became highly unstable, losing contacts and secondary structure elements, although not influencing the large transmembrane section. Nevertheless, AglBΔP1 maintained some organization at the catalytic site, such as the coordination of the metal ion with the catalytic residues, which indicates the many roles played by Zn2+, acting both as a catalytic and as a structural ion. Additionally, we detected regions with conserved residues that preserves the strong interaction between P1 unit and AglB, and could be the target of mutational studies. This data may provide the basis for the engineering of thermostable oligosaccharyltransferases from different species. The insertion of a P1 unit at the C-terminal end of PglB from C. jejuni would be the first step on the generation of chimeric OSTs with biotechnological applications.

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