O-20.6 Short talk

Neutron crystallography of Pseudomonas aeruginosa lectins LecA and LecB: Insights into carbohydrate recognition

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Lectins are carbohydrate-binding proteins involved in host-pathogen interactions, facilitating bacterial adhesion during infection. Pseudomonas aeruginosa produces two soluble lectins, LecA and LecB, which recognize specific host glycans and contribute to virulence. Both proteins are potential drug targets for glycomimetic compounds with antiadhesive properties.

LecB is a fucose-specific lectin that binds with high affinity due to two calcium ions in its binding site. LecA is a galactose-specific lectin that targets the globotriaosylceramide (Gb3), a glycosphingolipid on human cells, with one calcium ion involved in the recognition.

Neutron macromolecular crystallography provides direct visualization of hydrogen (or deuterium) atoms, revealing hydrogen-bonding networks, protonation states, and solvent interactions. Using advanced in vivo deuteration techniques, we produced both lectins and their carbohydrate ligands in perdeuterated form, refining our understanding of lectin-carbohydrate recognition at the atomic level. Neutron diffraction data collected on crystals of LecB-fucose and LecA-galactose complexes revealed the hydrogen-bonding network and protonation states of key residues with unprecedented detail. These findings enhance structure-based drug design efforts aimed at developing novel glycomimetic inhibitors to combat P. aeruginosa infections.