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Phage Display Libraries of Monosaccharide-Modified α-Helix Peptides for Carbohydrate-Binding Proteins

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Carbohydrate-binding proteins (CBPs) are crucial in various biological events, for example cellular communication networking and adhesion, tumor metastasis, inflammations and host-pathogen interactions. Therefore, it is of importance to search for ligands targeting CBPs.

In the present study, concanavalin A (ConA) and galectin-3 (Gal3) were chosen as representative targets of CBPs, because various aspects of the proteins physiochemical properties and their interactome have been well documented. For the studies, I have designed an α-helical peptide library modified with a monosaccharide unit, a mannose for ConA and galactose for Gal3. A peptide phage library with tailored randomization was successfully constructed and phage-encoded peptides on pIII were chemically modified via the formation of a disulfide bond with thiol-bearing monosaccharide derivatives.

After selection rounds, I discovered several monosaccharide-modified ligands specific for the target lectins with reasonably good sensitivity and specificity. Taken together, this study provides methodologies for the selection of ligands, through the synergistic effects of peptide and monosaccharide units, with better specificity and affinity towards the corresponding lectins.