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Carbohydrate-protein interactions are critical in a multitude of biological processes. Inter- and intracellular communication processes rely on the cell-surface bound sugar ligand interacting with the proteins. A number of studies have demonstrated the finer details of these interactions in an isolated ligand and lectin environments. Series of recent studies also demonstrate the altered mechanisms of the interactions, particularly, in those carbohydrate-protein interactions occurring at the cell surface. Thus, in addition to well-established multivalency as a central concept in carbohydrate-protein interactions, intra- and intercellular interactions are emerging as important mechanisms. With this importance, we undertook an involved study with synthetic cell-membrane systems, namely, vesicles. The covalent polymeric vesicles are imbedded with sugar ligands of varying densities at their surfaces and studied for their lectin interactions. A major outcome of the study is that the nature of the lectin interaction is sugar ligand density dependent. Vesicles with sparsely populated sugar ligands promote a cross-linking, multimeric complexation, whereas fully ligand-loaded vesicles strictly undergo only the monomeric ligand-lectin interaction, within the same plane of the vesicle. A series of techniques are involved to establish finer mechanistic details of the interactions on a synthetic cellular system, namely, the vesicles.