Syntheses of glycolipid analogues and analyses of their lectin affinity

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In order to elucidate roles for glycoconjugate molecules in biological events, including fertilization, cell signaling, pathogen identification and inflammatory response, various structurally defined glycoconjugates are necessary and should be systematically investigated.

Lipid analogues were efficiently synthesized from benzoic acid derivatives, which possessed one to three long alkoxy chain(s) as a lipidic anchor and an oligomethylene group as a spacer segment. A β-galactopyranosyl or α-mannopyranosyl group was stereoselectively introduced into the terminal hydroxy group by the conventional imidate method without any alternation of the other moieties in the molecule.

The glycolipids possessing the longer anchors specifically bound to a partner lectin on an artificial membrane. A dissociation constant of RCA_{120} over the membrane including a synthetic galactolipid with a hexamethylene spacer was estimated to be $2.3\ 10^{-8}$ M from analyses by a surface plasmon resonance technique. The great affinity indicated a clustering of binding events into multivalent arrays.

These glycolipids could be incorporated into a liposome composed of a phosphatidylcholine from egg yolk. An aqueous RCA_{120} solution was added into the liposomal suspension contained the galactolipid with a hexamethylene spacer to induce an agglutination of liposomes. In the homogeneous solution, measurements of turbidity and particle size distribution showed that RCA_{120} did not bind to other galactolipids possessing an ethylene or decamethylene spacer. These results indicated the length of the spacer segment regulated the sugar-lection recognition in a molecular level.