

## Design and synthesis of functional bio-probes based on complex carbohydrates, and their application for bio-medical use

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### 【Outline of survey】

Complex carbohydrates on cell surfaces have been recognized to play crucial roles in various biological processes, such as infection, receptions of toxins and hormones, fertilization, cell adhesion, cell differentiation and proliferation, tumor progression, aging, immune responses, brain-neural functions, and so on. In the study, we direct our attention to the elucidation of the structure-function relationship of gangliosides as well as proteoglycans at the molecular level. In particular, the ligand activities of gangliosides for selectin family and siglecs (sialic acid binding Ig-like lectins) will be studied in detail to demonstrate the crucial importance of protein-carbohydrate binding in cell-cell interactions, providing new opportunities for the development of therapeutic agents based on carbohydrates as binding inhibitors. The relation between the structures and the brain-neural function of heparan sulfate (HS) and chondroitin surfaces (CS) also will be studied, after the accurate determination of the structures of HS and CS, which have been recognized to be ambiguous so far.

### 【Expected results】

This study is featured by developing novel bio-probes, which are designed to facilitate the study of structure as well as functions of complex carbohydrates. Molecular design, chemical and enzymatic synthesis, and evaluations of the molecules should be developed as fundamental technologies, and which can be applied to develop therapeutic agents to control immunological (up-and down-regulation) as well as neural functions, too.

### 【References by the principal researcher】

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【Term of project】 FY 2005 - 2009

【Budget allocation】 69,800,000 yen

【Homepage address】 <http://www.gifu-u.ac.jp/~kassei/>