**Biospecific Interaction Analysis of Gangliosides**

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**Introduction**

Gangliosides are essential constituents of biomembranes. Because of their location and their diversity of structure, gangliosides are well suited to function as cell-surface receptors and as modulators of various membrane processes. They are amphiphilic molecules (containing a hydrophilic sugar headgroup and lipophilic tail).

**Carbohydrate Interaction**

**Dynamic Light Scattering**

**SANS**

The critical micelle concentration (CMC) is 7.1 x 10^-6 M and 1.4 x 10^-4 M for GM1 and GT1b respectively. The surfactant molecules need at least 2 days for the diffusion to the surface.

**The size of the micelles** can be determined by dynamic light scattering. Freshly prepared gangliosides solutions (left column) show additionally to the micelles at approx 10nm (right column) higher aggregates that built initially at the solvation process.

**Interaction Analysis of Gangliosides to Lectins**

The optical biosensor uses the surface plasmon resonance effect to detect changes of the refractive index of the test solution which in turn depends on the attached mass.

**Interaction with Immobilized Lectins**

Gangliosides solutions were investigated with immobilized HPA which has got an affinity to GaINAc (green circle). Terminal GaINAc is only exposed in GM2. All other gangliosides were neglected.

**Helix pomatia Agglutinin**

Detailed investigation of the HPA-GM2 binding revealed an affinity of $K_d$=3.4x10^-10 M.

**Wheat Germ Agglutinin** got an affinity to $N$-Acetyleneuraminic acid (magenta triangle) which is characteristic for all gangliosides.

**Interaction with Model Membranes**

Liposomes were prepared by extrusion method. They can be immobilized by due to a simple injection on the sensor chip. The protruding sugar headgroups interact with lectins.

**Helix pomatia Agglutinin**

HPA GM2-Liposome binding revealed an affinity of $K_d$=1.8x10^-10 M which is about one order of magnitude higher than for the pure compounds.

**Conclusions**

- The aggregation behaviour is characteristic for amphiphilic substances. In the solvation process Gangliosides initially form microemulsions that impede the diffusion to the surface and the formation of micelles.
- Surface plasmon resonance is a useful tool for the evaluation of Gangliosides interactions. The affinity of the sugar headgroup to proteins rise, if the gangliosides were incorporated into liposomes, where multivalency might occur due to the formation of microdomains.

**Literature**