Experimental report

21/03/2017

Proposal: 8-02-749 **Council:** 4/2015

Title: Effect of sialidase activity on ganglioside containing membranes

Research area: Biology

This proposal is a new proposal

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Samples: cholesterol
glycolipids
deuterated phospholipids
neu3 sialidase

Instrument	Requested days	Allocated days	From	To
D17	4	0		
FIGARO	4	4	13/06/2016	17/06/2016

Abstract:

Gangliosides are glycosphingolipids with bulky and charged multi-saccharide headgroups particularly abundant in the outer leaflet of plasma membrane of nervous cells, where they are involved in important functions like cell-cell recognition, cross-membrane signal transduction, cell growth and apoptosis, while being embedded in functional microdomains (rafts). In real membranes, gangliosides belong to a metabolic pathway where specific enzymes act on more complex gangliosides to give a simpler ones. Any lack of enzyme activity along this pathway give rise to severe diseases. GM3, a glycosphingolipid with one sialic acid, is the main ganglioside in the majority of mammalian cells and after the action of the enzyme Neu3 sialidase it is degradated in lactosilceramide, considered an antiapoptotic compound, thus allowing cell proliferation. A specific role of Neu3 has been proposed in cancer in which high concentrations of the enzyme would maintain high levels of lactosylceramide. We propose to perform neutron reflectometry experiments to follow the action of sialidase on single model bilayers with asymmetric composition, containing GM3 ganglioside.

Effect of sialidase activity on ganglioside containing membranes

We planned to study the structural effect of a sialidase on model membranes containing gangliosides.

In particular we intended to access membrane internal structure by exploiting neutrons sensitivity to isotopes, and then to get information about the eventual rearrangement of cholesterol in a deuterated phospholipids membrane.

GM3 ganglioside incubation in a DPPC-cholesterol membrane occurred and we verified the membrane is stable also in different salts solutions (NaCl, KCl, $CaCl_2$).

Unfortunately, even if we know there is an effect of sialidase on ganglioside heads rearrangement [Rondelli et al., Membrane restructuring following in situ sialidase digestion of gangliosides: Complex model bilayers by synchrotron radiation reflectivity, BBA Biomembranes 1859 (5) (2017)845-851], we could not detect any effect on the membrane internal structure after enzymatic action.