Experimental Report

Proposal: **8-02-701** **Council:** 4/2014

Title: Terpenoids: their effect on biological membranes

This proposal is a new proposal

Researh Area: Chemistry

Main proposer: **CARDENAS Marite**

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Samples: TERPENOIDS
LIPIDS

Instrument	Req. Days	All. Days	From	To
FIGARO Langmuir trough	3	3	30/09/2014	03/10/2014

Abstract:

Terpenoids are the largest group of natural compounds with a high structural diversity. Synthesized out of five- carbon building blocks they are highly lipophilic, implying a potential effect on the physical and chemical properties of the biological membrane, which are proved to be crucial for each living cell. Terpenoids are synthesised by several enzymes in different organelles within plant cells for instance and the mechanism of transport is so far unknown. We have shown that terpenoids interact with lipid monolayers and we propose that they might have a phase separating effect in lipid membranes, similar to that induced by sterols. Corroborating this hypothesis might open for new explanations for molecular transport in cellular membranes.

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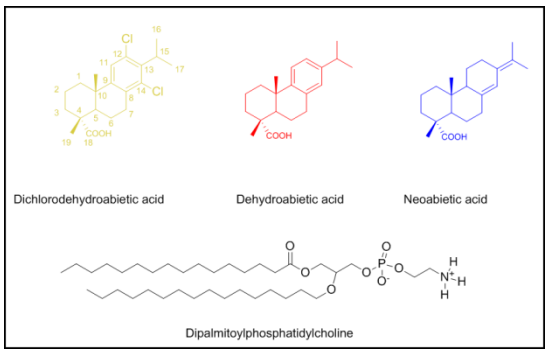
We performed experiments on DPPC lipid monolayer at the air-water interface to investigate the impact of diterpenoids on the lipid packing (mean molecular area), hydration of the head group and tilt of the tail. Previous unpublished results showed a fluidizing effect on phospholipid membranes and the formation of vesicular tubule, which indicate that the packing and the hydration of phospholipids are affected by diterpenoids.

The lipids were pre-mixed in chloroform with diterpenoids in a 9:1 molar ratio. We measured at 4 different points of the pressure area isotherm (5mN, 20mN, 30 mN and 40mN) at 4 different contrasts using air contrast matching water (ACMW; 8w% D_2O) and D_2O in combination with head tail deuterated DPPC (Avanti Polar Inc.). These different contrasts enabled us to get detailed insight in the conformation of the lipid monolayer.



Three tricyclic diterpenoids consisting of the same backbone, though different degrees of saturation and polar groups were used (Picture1: Dichlorodehydroabietic acid (Cl_2DAA), Dehydroabietic acid (DAA) and Neoabietic acid (NA). Table 1 shows data obtained at 30mN. The head group hydration decreases when terpenoids were added, while the tilt of the tail increases suggesting that these molecules localize themselves within the head group - tail interface of the lipid monolayer.

	Hydration of the headgroup	Tilt of the tail
DPPC	20 %	
+ CL2DAA	0.5 %	+ 8%
+ DAA	2 %	+9%
+ NA	16%	+4%

Table 1. Neutron Reflectivity Data showed that CL_2DAA and DAA dramatically decrease the hydration of the head group area of DPPC, while NA only shows a decrease of 4%. The tilt of the tail related to the Lipids fluidity is furthermore increased after the addition of diterpenoids.