Structural preferences of dioleoyl glycolipids with mono- and disaccharide head groups

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The structural preferences of 1,2-dioleoyl-sn-glycerol glycolipids with glucose, galactose, maltose, and cellobiose as sugar head group were investigated under near physiological conditions with Fourier-transform infrared spectroscopy (FT-IR) and synchrotron radiation small-angle X-ray scattering (SAXS). Whereas all glycolipids have a very high fluidity at temperatures above 0 °C, the mono- and disaccharide compounds differ considerably in their aggregate structures. The monosaccharide compounds adopt only inverted hexagonal (HII) structures in the temperature range 5 – 70 °C (Fig. 1), while the disaccharide compounds adopt only multilamellar structures (Fig. 2). Since these and similar glycolipids are frequently found in nature, these data should be of relevance for the function of their host cell membranes.

Figure 1: Synchrotron radiation small-angle X-ray diffraction patterns of dioleoyl-maltoside and -cellobioside at 5 and 70 °C and 90 % water content. The reflections are grouped in equidistant ratios, i.e., 1, 1/2, 1/3, 1/4, etc. of the lamellar repeat distance.
Figure 2: Small-angle X-ray diffraction patterns of dioleoyl-glucoside and -galactoside at 5 and 70 °C and 90 % water content. All patterns are indicative for the existence of the inverted hexagonal phase H_{II}.

References