Does a Chemically Symmetric Bond Pattern Induce a Symmetric Conformation of Lecithin Molecules in Membranes?

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Extensive work has been reported on the conformation in membranes of 3-sn-phosphatidylcholines,-ethanolamines,-glycerols and -serines, where the head group is attached to the third carbon atom in the glycerol backbone. One important feature common to all these lipids was that the glycerol moiety is oriented almost perpendicular to the bilayer surface, with the sn-1 chain continuing in this direction whereas the sn-2 chain starts first in a direction parallel to the layer and then bends sharply at the second carbon atom. This was confirmed by observing a distinct pattern of quadrupole splittings in DMR experiments for the first deuterated methylene segment in both chains (1). These segments were subsequently found to be out of step by up to three carbon-carbon bond lengths in the neutron diffraction profiles (2,3,4).Here we present neutron diffraction results as well as DMR signals on 2-sn-phosphatidylcholine (β-lecithins) where the head group is attached at the second carbon atom in the glycerol part, such that a symmetric chemical bond pattern arises for the region of the chain attachment. It will be shown whether this chemical symmetry leads also to a symmetric conformation in this part of the molecule or not. The conformation in question is tested by looking at the position of equivalent segments in both chains.

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