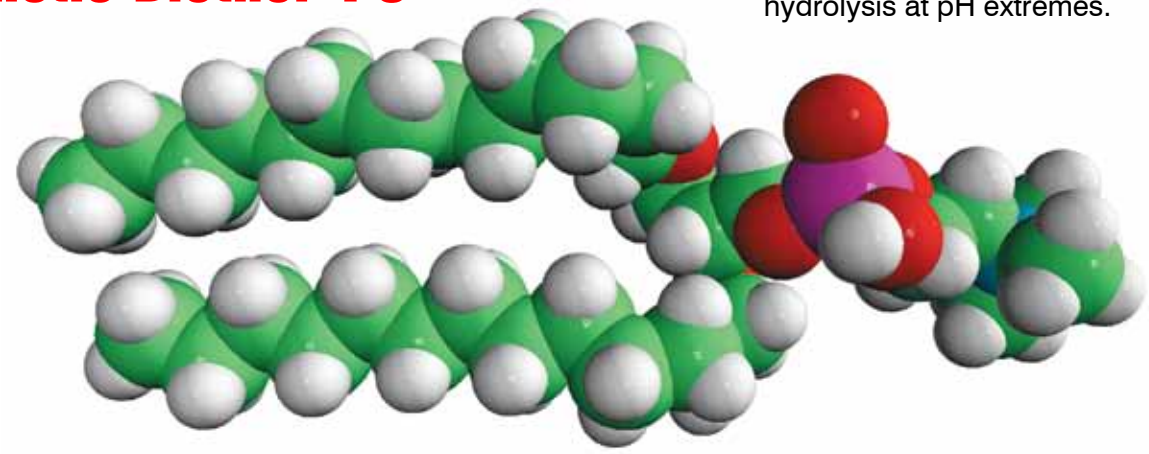
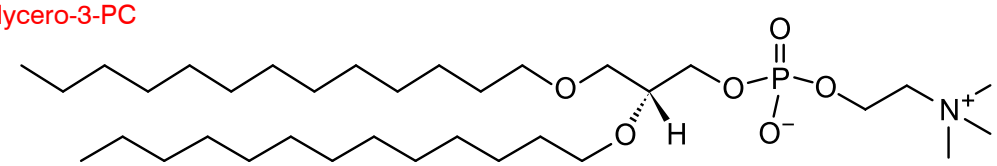
Avanti's Ether Lipids for Bicelle Formation

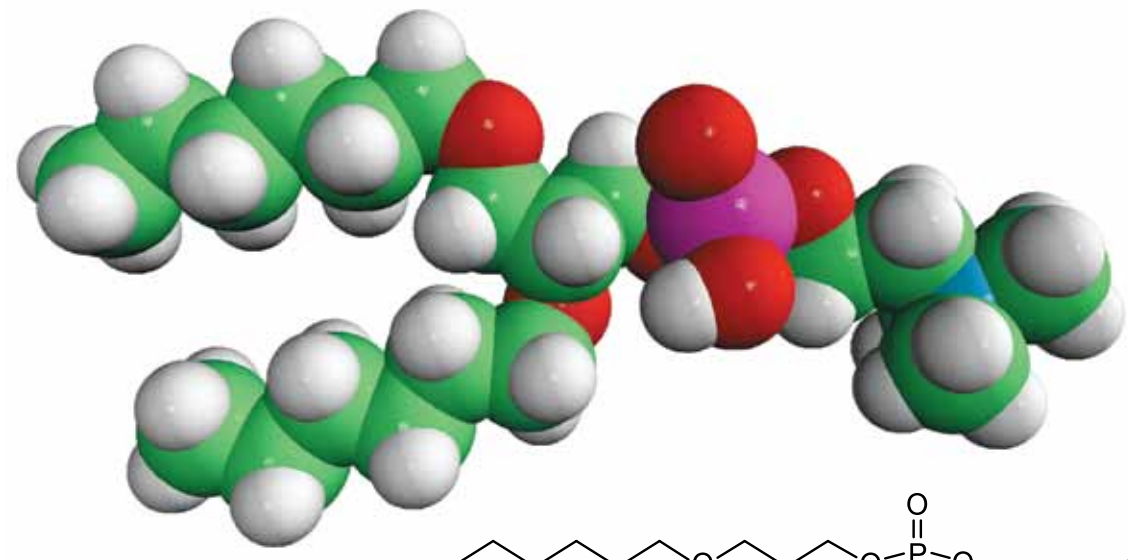
Synthetic Diether PC

These products are stable to hydrolysis at pH extremes.

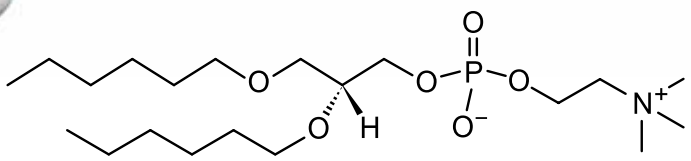


1,2-Di-O-tridecanyl-*sn*-Glycero-3-PC
Avanti Number 999988





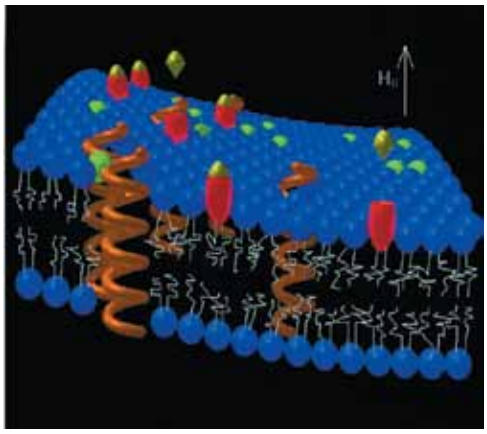
1,2-Di-O-hexyl-*sn*-Glycero-3-PC
Avanti Number 999998



C_{12}, C_{14}, C_{16}, C_{18}, $C_{18:1}$, and C_{18}-C_1 also available, visit www.avantilipids.com for more details.

continued overleaf

Phospholipids for Magnetic Alignment



Blue, green, and red stylized molecules represent DMPC, DMPG, and DMPE-DTPA, respectively, and yellow represents the Yb^{3+} ion DHPC, which is believed to be sequestered in curvature defect regions, is not shown in this figure.

We thank *Biophysical Journal* for permission to use this graphic.

Now in Stock:

DMPE-DTPA (NH_4)
DMPE-DTPA (Gd)
DMPE-DTPA (Cu)
DMPC
DMPG
DHPC

Magnetic Alignment of Biological Membranes

A phospholipid chelate complexed with ytterbium (DMPE-DTPA:Yb^{3+}) is shown to be readily incorporated into a model membrane system, which may then be aligned in a magnetic field such that the average bilayer normal lies along the field. This so-called positively ordered smectic phase, whose lipids consist of less than 1% DMPE-DTPA:Yb^{3+}, is ideally suited to structural studies of membrane proteins by solid-state NMR, low-angle diffraction, and spectroscopic techniques that require oriented samples. The chelate, DMPE-DTPA:Yb^{3+}, which strongly binds the lanthanide ions and serves to orient the membrane in a magnetic field, prevents direct lanthanide-protein interactions and significantly reduces paramagnetic shifts and line broadening. The greatest advantage of the positively aligned lanthanide-chelate membranes lies in their application to the study of large immobile membrane proteins. Similar low-spin lanthanide chelates may have applications in field-ordered solution NMR studies of water-soluble proteins and in the design of new magnetically aligned liquid crystalline phases.

The model membrane consisting of the phospholipids DMPC and DHPC, in combination with the negatively charged lipid, DMPG, and a minimal concentration of DMPE-DTPA chelate, complexed with equimolar Yb^{3+}, results in a stable positively aligned bilayer phase suitable for membrane protein studies. The authors typically use either a 25% aqueous (w/w) dispersion of DMPC/DHPC/DMPG/DMPE-DTPA:Yb^{3+} in a 2.75/1.00/0.1375/0.0306 mole ratio or a 40% (w/w) aqueous dispersion of DMPC/DHPC/DMPG/DMPE-DTPA:Yb^{3+} in a 2.75/0.458/0.1375/0.0306 mole ratio; the 25% mixture often results in the best linewidths, whereas the latter combination yields larger order parameters and chemical shift offsets. The addition of peptide often necessitates higher lanthanide concentrations to maintain alignment. In such cases, the chelate is expected to be essential in sequestering the lanthanides away from the protein or molecule of interest and minimizing paramagnetic broadening. Both ^{31}P and ^{13}C NMR spectra reveal that the DMPE-DTPA chelate, in combination with minimal concentrations of Yb^{3+}, significantly reduces paramagnetic shifts and broadening in both lipid and peptide spectra. The minimal Yb^{3+} concentration for positive alignment in the presence of equimolar chelate is observed to be ~25% smaller (i.e., Yb3+/DMPC = 0.008 with chelate versus Yb^{3+}/DMPC = 0.010 without chelate). Furthermore, the use of negatively charged lipid and chelate stabilizes the liquid crystalline phase as a function of temperature and seems to prevent long-term sample degradation. The use of negatively charged lipid in combination with the chelate is essential.

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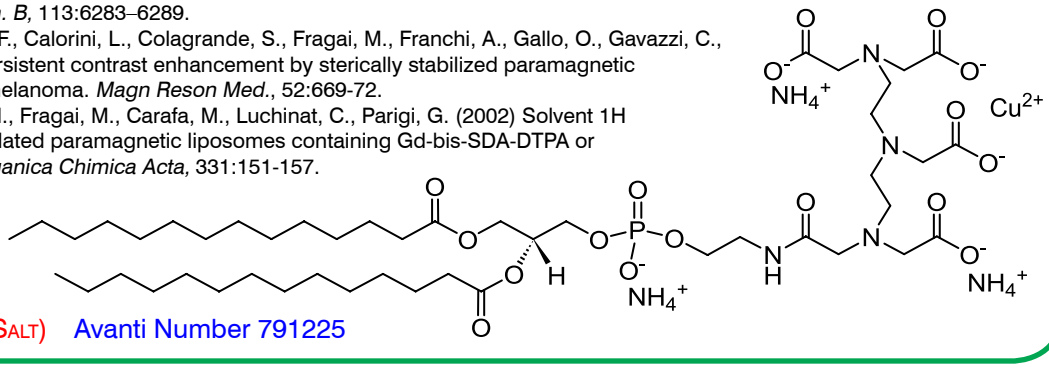

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