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Marine Algae Membrane Phospholipids Study by High Resolution ^{31}P NMR

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MARINE ALGAE MEMBRANE PHOSPHOLIPIDS STUDY BY HIGH RESOLUTION ^{31}P NMR

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Membrane phospholipids were extracted using a modified Folch, Lees and Sloane-Stanley method, from 21 different algae species covering three major divisions of the protista kingdom. In the modified method after chloroform/methanol (2:1 v/v) extraction and filtration, the solution was backwashed with K-EDTA, 0.6 M, instead of KCl, 1 M. Because algae samples are heavily loaded with cations that broaden NMR signals, the K-EDTA wash results in more highly resolved NMR signals. Following rotary evaporation, the crude algae lipid extract was dissolved in the chloroform-benzene(d_6)/methanol-CsEDTA (2:1 ml/ml) reagent and analyzed using a 500 MHz NMR spectrophotometer. Phospholipid chemical shifts were determined relative to standard phosphoric acid (85%), following the UIPAC convention. The internal reference used was phosphatidylcholine (PC, $-0.84\ \delta$). Division chlorophyta (8 sps.) yields phospholipid signals for phosphatidylglycerol (PG, 0.50), phosphatidic acid (PA, 0.25), cardiolipin (CL, 0.18), phosphatidylethanolamine (PE, 0.03), sphingomyelin (SPH, -0.09), phosphatidylinositol (PI, -0.37) and PC; the lysoderivatives for lyso PG (LPG, 1.09) and lyso PC (LPC, -0.28), and one uncharacterized signal at 0.32. Phosphatidylserine (PS, -0.05) and plasmalogens were not detected. Division rhodophyta (10 sps.) shows signal from PG, PA, CL, PE, SPH, PI, and PC; the lysoderivatives of lyso PA (LPA, 0.83), lyso PE (LPE, 0.43) and LPC; the plasmalogens PC plasmalogen (PC plas, -0.77), LPC plas (-0.20), and 1-O-alkyl-2-acetyl-sn-glyceryl-3-phosphorylcholine (PAF-acether, -0.70); and an uncharacterized signal at $-40\ \delta$ chemical shift. PS was not detected. Division Phaeophytas (3 sps.) showed signals for PG, PA, CL, PE, SPH, PI, and PC and lysoderivatives of LPG, LPA, LPE plas (0.53), LPE, LPC plas, and LPC. PS, PAF-acether and the uncharacterized signals at $0.32\ \delta$ and $-0.40\ \delta$ were not detected.