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Phosphatides of Normal Human Serum. Part II. Fatty Acids of Phosphatidyl Inositol and Other Phosphatidyl Compounds*,**

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Phosphatidyl inositol (PI) and the corresponding lyso compound (LPI) were recently isolated from a lipid extract of pooled normal serum.[1] The present report describes the analysis of fatty acids in these lipids and other phosphatidyl compounds of our serum extract.

The phospholipid samples have been described previously (the phosphatidyl ethanolamines (PE) were purified further by eliminating the plasmalogens); being both pure and representative our samples were particularly suitable for fatty acid analysis.[1] Methanolysis of the lipids, and subsequent analysis of the fatty acid methylesters were carried out by methods described elsewhere.[2] The results are shown in Table 1. Phosphatidyl inositol was rich in stearic and arachidonic acid, but it contained relatively little of palmitic and linoleic acid. Lecithin (PC) showed just the opposite figures, high palmitic and linoleic acid, but relatively low stearic and arachidonic acid. Phosphatidyl ethanolamine (PE) revealed intermediate figures, but it had a high docosahexaenoic acid value.

Table 1. Fatty acid composition of serum phosphatides

	Relative amounts of principal acids						
	16:0	18:0	18:1	18:2	20:3	20:4	22:6
PI	7.5	40	9.8	4.7	2.9	28	3.8
LPI	6.0	27	13	6.8	4.2	37	3.2
PC	32	14	16	22	2.7	6.1	3.2
LPC	54	24	11	8.0	tr.	2.1	tr.
PE	14	28	10	11	1.8	15	13
LPE	3.5	5.6	8.0	17	3.9	33	17

Table 1 shows also that lysophosphatidyl inositol had approximately the same fatty acid composition as phosphatidyl inositol, whereas lysolecithin (LPC) was more saturated, and lysophosphatidyl ethanolamine (LPE) more unsaturated than the corresponding diacyl phosphatides.

Recent work from this and other laboratories has shown that phospholipase A liberates fatty acids specifically from the C-2 position of the glycerol moiety of phosphatidyl inositol.[3-4] Positional distribution of the fatty acids could thus be determined in the serum inositide. The analysis was carried out with *Crotalus adamanteus* venom under conditions described elsewhere.[4] The results are given in Table 2 together with figures for the other phosphatidyl lipids of our extract. Phosphatidyl inositol revealed mostly saturated acids and oleic acid on the C-1 position, and mostly unsaturated acids on C-2. Thus it was similar to the other serum phospholipids. Phosphatidyl inositol from other sources too appears to have the

Table 2. Positional distribution of fatty acids in serum phosphatides

	Relative amounts of principal acids						
	16:0	18:0	18:1	18:2	20:3	20:4	22:6
C-1 position							
PI	17	74	8.0				
PC	66	26	6.1	1.0			
PE	32	51	12	3.1			
C-2 position							
PI	6.6	2.7	21	10	4.9	45	4.1
PC	2.7	tr.	22	47	4.9	12	6.1
PE	4.3	2.1	11	24	1.9	27	22.2

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same type of fatty acid distribution; this is true at least for samples isolated from pigeon pancreas,[3] ox-heart,[4] and rat liver mitochondria.[5]

Table 2 very clearly reveals the characteristically high figures of stearic acid on C-1 and arachidonic acid on C-2 of phosphatidyl inositol. This feature appears to be rather general in phosphatidyl inositol from other sources too, and it is interesting that Pascaud proposes specific "structural functions" for glycerophosphatides of stearic-arachidonic acid type.[6]

It remains to be seen whether lysophosphatidyl inositol is really a native component of serum. Had it been more saturated we could have accepted it as a genuine component, but since its fatty acids resemble those of phosphatidyl inositol we cannot exclude the possibility that it was formed artificially during the isolation procedure. The same applies to the lysophosphatidyl ethanolamine which might be an artificial or native degradation product of the corresponding plasmalogen or the diacyl lipid.

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Tetraethyl Ammonium Fluoroborate as a Supporting Electrolyte in Polarography

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Quaternary alkyl ammonium halides are currently used as supporting electrolytes in polarography. However, in some cases the halide ions interfere: the halide ions, which are poorly solvated in acetonitrile and in dimethylformamide, are strong bases in these solvents,[1] and in inorganic polarography, the halides sometimes interfere by their tendency to coordinate. These unfavorable effects may be avoided by the use of quaternary alkyl ammonium perchlorates, but the possible dangers in the handling of perchlorates, especially in organic solvents, suggested the use of the corresponding fluoroborates, the fluoroborate ion being isosteric with the perchlorate ion.

The fluoroborate ion has a limiting ionic conductance in ethylene chloride slightly superiour to the chloride and the perchlorate ion.[2]

The tetramethyl ammonium cation has a higher ionic conductance than the other tetraalkyl ammonium ions and because of its size would tend to adsorb less at the cathode surface, and so alter the reduction mechanism less than the other alkyl cations.[3] However, because the salts of the tetramethyl ammonium ion are somewhat more associated in a number of solvents [4-6] and less soluble than the corresponding tetraethyl ammonium salts, the tetraethyl ammonium fluoroborate was chosen as a desirable supporting electrolyte.

Experimental. Several methods of preparation are reported in the literature.[7-9] We prepared the tetraethyl ammonium fluoroborate by neutralizing a fairly concentrated aqueous solution of tetraethyl ammonium hydroxide with 40 % aqueous fluoroboric acid. After evaporation of the water, the crude fluoroborate, which contained traces of sodium fluoroborate, was purified by recrystallization from ethanol containing approximately 2 % of water. The sodium fluoroborate is less