## Electron Microscope and X-ray Diffraction Studies of a Saturated Synthetic Phospholipide.

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In the course of a study of natural, hydrogenated, and synthetic phospholipides it has already become clear that some compounds in which the lipide chains are fully saturated do interact with osmium tetroxide and that suitable preparations of such compounds show a regular, layered structure when viewed in the electron microscope. One clear cut example, which seems worthy of early mention, is a synthetic L-$\alpha$ distearoyl phosphatidyl L-serine kindly supplied for structural studies by Dr. Erich Baer. X-ray diffraction studies show that at room temperature, the layer spacing in this material is about 63 A, but at higher temperatures two other polymorphic forms showing smaller layer spacings have been detected. At 70 to 80°C. the layer spacing is reduced to 55 to 50 A, and at 90 to 100°C. there is a further sharp decrease in layer spacing to about 38 A.

Unlike the fully saturated synthetic phosphatidyl ethanolamines and phosphatidyl cholines previously studied (1), the phosphatidyl serine does react with osmium tetroxide, though only slowly, requiring 6 to 8 hours in buffered 1 per cent osmium tetroxide to become really blackened. This fixed material shows a 63 A diffracting unit which is unchanged after dehydration and embedding in araldite.

Thin sections (Philips or Porter-Blum ultramicrotomes) of this araldite-embedded phosphatidyl serine have been examined in the electron microscope (Siemens Elmiskop I). Typical electron micrographs are reproduced in the page of illustrations (Fig. 1). The material is invariably fragmented, but sufficient layers remain closely associated for accurate layer thickness measurements to be obtained. The periodicity is of the order of 50 A, and the dense line is noticeably narrower than the light interspace. The layering appears similar to that previously reported for acetal phospholipide by Geren and Schmitt (2), and for myelin forms of mixed brain lipides by Stoeckenius (3), but this preparation differs from those previously studied in that the lipide chains are fully saturated.

The main point about this observation from the point of view of interpretation of electron micrographs of tissue preparations is that both unsaturated lipide chains and certain phospholipide end groups provide possible sites for interaction with osmium tetroxide. The point will be expanded later when the data on the wider series of lipides is presented.

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### References

1. Finean, J. B., *Exp. Cell Research*, 1954, **6**, 283.
2. Geren, B. B., and Schmitt, F. O., *J. Appl. Physics*, 1953, **24**, 1421.
3. Stoeckenius, W., *Proc. Conf. Electron Micr.*, Berlin, 1958, in press.

## EXPLANATION OF PLATE 79

FIG. 1. Electron micrographs of osmium tetroxide–fixed and araldite-embedded L-$\alpha$ distearoyl phosphatidyl L-serine. Magnification, 160,000. Layer periodicity, 50 A.

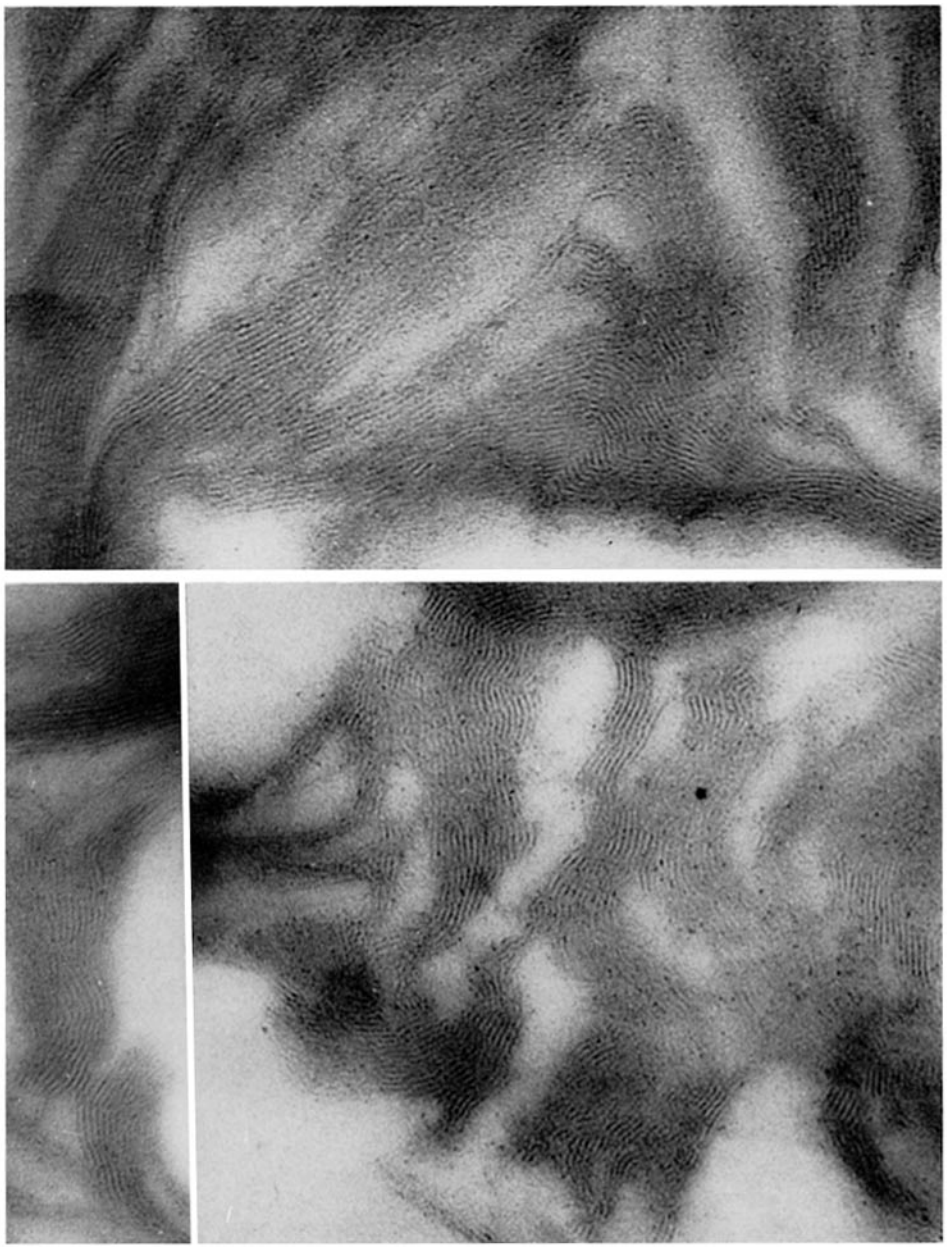

FIG. 1

(Finean: Saturated synthetic phospholipide)