seems reasonable to assume that the presence of divalent cations caused the larger spacings in less exhaustively washed membranes. Interactions between these ions and the phospholipids would thus be the most feasible ones.

To investigate the influence of dehydration on the structure of the lipids in the *Acholeplasma* membranes, an X-ray powder diffractogram was taken, using a Guinier camera. The same spacings as in the diffractograms described above were obtained. This indicates that the water content of the membrane is of minor importance for the lipid structure below the thermal transition temperature.

The distances and angles characterising the diffractogram presented here are rather close to the parameters of the proposed hexagonal structure of biological membranes above the transition temperature[1,3,6]. The latter structure could be obtained by small changes in the 3.67 and 2.49 Å distances reported above. Thus our results show that diffraction studies of dry, single membranes in the static state prevailing below the thermal transition temperature are of importance for our understanding of the dynamic state characterising the membranes above this temperature. The finding that the 3.67 Å reflection is probably caused by lipids and not by proteins as proposed earlier[5] should also be mentioned in this connection.

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Primordial origins of chirality

THE origin of optical asymmetry in relation to the origin of life has been extensively discussed[1-4]. One suggestion is that there is a connection between molecular asymmetry and the asymmetry of elementary particles produced by weak interactions. Various mechanisms have been proposed whereby the choice of one optical isomer could be influenced by longitudinally polarised (left handed) electrons from β decay[5,6], but early experiments did not give any significant results[7]. Later, both positive[8,9] and negative[10-12] results have been obtained in a variety of experiments (differential decomposition of enantiomers bombarded by β^--rays, spin-polarised positron and muon annihilation in enantiomers).

In a new approach to this problem we carried out the crystallisation of DL-$NaNH_4$ tartrate in the presence and absence of chiral β^- particles from ^{32}P. Below 27 °C, DL-$NaNH_4$ tartrate crystallises in racemic conglomerates[13], that is, D and L crystallisation centres form independently and then grow. Any difference between the number of D and L centres will have a more marked effect on the optical activity of the conglomerates as crystallisation proceeds.

Pure DL-tartaric acid, free of mesotartaric acid, was converted to the sodium ammonium salt. Its optical activity was checked by measuring α_{280} with a JASCO ORD/UV-5 spectropolarimeter, and θ_{225} with a JASCO 40c dichrograph. The sensitivity of the latter is ± 0.1 m°, and a 1×10^{-6} M excess of one isomer could have been detected. In the starting racemic material 2×10^{-5} M predominance of D (+) isomer was found.

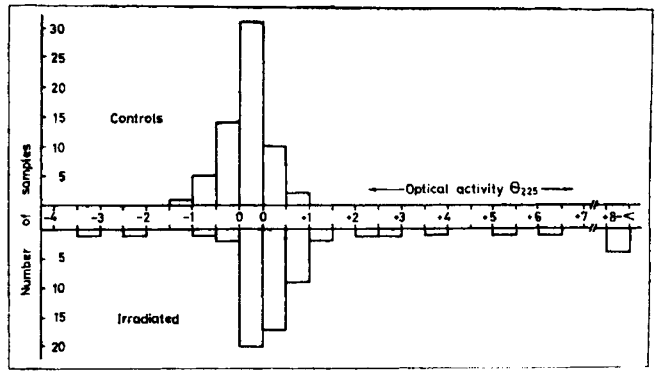

Fig. 1 Distribution of levels of optical activity in $NaNH_4$-tartrate samples as crystallised in the absence (upper part of diagram) and in the presence (lower part) of chiral β^- particles (63 crystallisations in both cases). Positive CD signal at 225 nm (θ_{225}) corresponds to a negative rotation at the sodium D line, which is characteristic of the unnatural L (−) isomer.

For crystallisation, 8 ml 45% solutions of the tartrate were used. In six series (in all, 63 independent crystallisations) $K_3{}^{32}PO_4$ was added, the level of radioactivity being 20 μCi ml^{-1}; in the six control series, inactive $K_2H^{31}PO_4$ was added. The *p*H in all series was adjusted to 9.5 with NH_4OH. After equilibration at room temperature crystallisation was carried out over P_2O_5 in a desiccator at 1–4 °C. Precautions were taken in cleaning the glassware, excluding dust, and so on. When the crystallisation was about half complete (8–12 d), the crystals were filtered and weighted, and their optical activity measured in 2×10^{-2} M aqueous solution. As a check, the optical activity of the supernatant was also measured.

Figure 1 shows that in the presence of chiral electrons (^{32}P) the unnatural L (−) salt crystallised preferentially whereas an approximately symmetrical distribution is obtained in the control series, in the series with ^{32}P there is a markedly asymmetric distribution. It is clear, however, that β^- particles shifted the crystallisation towards L (−) isomer. The shift is significant at the 0.1% level (both χ^2 and Student's *t* test). The magnitude of the shift is indicated by the medians: 0.0 for control series, and 0.2 for irradiated samples. As would be expected, the small predominance of the D (+) isomer in starting material very slightly shifted the crystallisation of the control samples towards D (+) isomer.

The exact mechanism of the effect is not known. We think it unlikely that β rays would influence crystal growth, and suggest that the influence was to enhance the number of crystallisation centres of the L isomer. In this connection it should be mentioned that hydrated electrons have quite a long lifetime, particularly in alkaline solutions[14].

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