Diffusion of Salts Through a Lipo-protein Interface

SIR,—The rates of diffusion of some salts through an interface formed between sols of lipid and protein have been measured every hour using a capillary cell and a conductivity apparatus. The interface was formed as previously described by Saunders (1963). The salt under examination was added to each separate sol in differing concentrations and the diffusion rate across the interface was followed by noting the changes of conductivity with time between electrodes set 5 mm. below the boundary.

Sodium chloride diffuses very slowly across the interface between a 10 per cent bovine serum albumin sol and a sol containing 10 per cent of lecithin and 5 per cent of cholesterol, dispersed ultrasonically. The rate is particularly slow in the presence of calcium chloride (Saunders, 1963).

TABLE I

EFFECT OF CHOLINE SALTS ON THE DIFFUSION OF SODIUM CHLORIDE ACROSS A LIPO-PROTEIN INTERFACE

Δ is the ratio of the change in conductivity between the electrodes to the initial difference in conductivity between the two sols. Temperature 24°.

	Δ					
Time hr.	A	B	C	D	E	F
1	0	0·03	0·01	0·02	0	0·13
2	0	0·04	0·10	0·03	0	0·19
4	0·01	0·09	0·16	0·12	0·02	0·27
8	0·02	0·12	0·21	0·20	0·04	0·32
12	0·03	0·13	0·22	0·24	0·06	0·34

A. Lower sol., 10 per cent bovine serum albumin, 0·02N NaCl, 0·001N $CaCl_2$. Upper sol, 10 per cent lecithin and 5 per cent cholesterol, dispersed ultrasonically, with 0·01N NaCl and 0·001N $CaCl_2$.
B. As A, but without the sodium chloride and with choline chloride 0·02N in lower sol and 0·01N in the upper sol.
C. As A with addition of 0·01N choline chloride to both sols.
D. As A with 0·0001N carbachol in both sols.
E. As A with 0·00001N carbachol in both sols.
F. As A but no lecithin or cholesterol in the upper liquid.

Under similar conditions, choline chloride has been found to diffuse rapidly. An interesting observation is that a low concentration of choline chloride (0·01N) on either side of the interface opens up the barrier to the diffusion of sodium chloride (Table I). Carbamylcholine chloride (carbachol) has a similar effect at a concentration of 0·0001N. These effects may well be related to the physiological action of choline salts in increasing the permeability of cell membranes to salts. The lipo-protein interface should provide a useful model for studying permeability changes in animal cell membranes.

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