interpretations are based, may not, however, be wholly correct for mammalian systems. Glucose infusion prevents the postnatal increase in hepatic glucose 6-phosphatase (Dawkins, 1966) and phosphopyruvate carboxylase (Yeung & Oliver, 1968) activities, but there is no apparent normal change in glucose concentration that could account for the development of the enzymes. Hormonal effects appear to be permissive rather than direct.

A number of the characteristic enzymic control sites of the mammalian liver develop therefore at around birth or during weaning. The factors controlling these steps in maturation probably involve processes in addition to genetic control mechanisms (Reiner, 1968). Further analysis of events at the enzyme level are likely to be rewarding and to lead us closer to the nature of the triggering mechanisms.

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COMMUNICATIONS

Properties of Particles derived from Detergent - Disaggregated Erythrocyte Membranes

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Non-ionic detergents in combination with urea and mercaptoethanol have been used to extract proteins from biological membranes (Schneiderman, 1965). Certain other detergents also cause disaggregation of the membrane, and results obtained suggest that the process may be partially reversible (Green *et al.* 1967). The use of non-ionic detergents has advantages in that the solutions obtained are relatively stable and that they retain the charge characteristics of the membrane components.

Human erythrocyte membranes (prepared by a

method adapted from that of Dodge, Mitchell & Hanahan, 1963) in the presence of excess of Triton X-100 (an alkylphenylpolyoxyethylene condensate) break down into particles that give a single partially included peak on 4% agarose-gel exclusion chromatography. The membrane acetylcholinesterase activity, which has been shown to be closely associated with the structure (Mitchell, Mitchell & Hanahan, 1965), coincides with this peak. Separation of the enzyme from a single major fraction can, however, be achieved by DEAE-cellulose chromatography in detergent solution with salt-gradient elution.

When exhaustively dialysed against water, whole membranes aggregate into a heavy precipitate caused by decrease in ionic strength of the suspending medium. The phenomenon appears to

be completely reversible. The retention of this characteristic by disaggregated material suggests that the substances responsible on the original membrane surface remain in an accessible position on the particles. If the precipitate is washed with water to remove detergent and is resuspended in water, addition of M-tris-HCl to a final concentration of 5 mM causes a decrease in turbidity and a new material is obtained, which is totally excluded by agarose gels but which may be disaggregated by re-addition of detergent. The detergent-free suspension retains acetylcholinesterase activity and can be shown by light-scattering to be osmotically sensitive. It is believed that the re-aggregate may correspond to that obtained by other workers who have shown its membrane-like nature and vesicular form by electron microscopy (Green *et al.* 1967).

Although it cannot necessarily be inferred that particles obtained by detergent disaggregation of membranes represent fundamental structural units, their properties suggest that further study of them may help to elucidate the role of proteins and protein-lipid interactions in maintaining the integrity of membranes.

R.W.B. is the holder of a Medical Research Council Research Studentship.

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The Effect of Conjugated Bile Salts on the Esterolytic Activity of Rat Serum

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Fatty acid esters of the naphthols have been extensively used in the assay of esterases and lipases. The influence of sodium taurocholate on the hydrolysis of a large series of esters of α - and β -naphthol by various esterases has been studied by Gomori (1953); human serum esterase activity towards β -naphthyl acetate was found to be inhibited by sodium taurocholate. In methods for determining serum and urinary lipase with these chromogenic substrates, bile salts have been used as inhibitors of esterase and activators of lipase. Recently, it has been shown that esterolytic activity of rat pancreatic juice towards β -naphthyl acetate

and p -nitrophenyl acetate is enhanced by conjugated bile salts (Barrowman & Borgström, 1968). It was decided, therefore, to study the esterolytic activity of rat serum in systems containing conjugated bile salts.

The incubation systems used were essentially the same as those described by Nachlas & Blackburn (1958), with β -naphthyl acetate as substrate. The bile salts used were sodium taurocholate and sodium taurodeoxycholate. Synthetic sodium taurocholate was shown by thin-layer chromatography to be approximately 96% pure; this preparation contained 4% of sodium taurodeoxycholate, but no unconjugated salts were present. The sodium taurodeoxycholate was also synthetic and shown to be better than 97% pure by thin-layer chromatography. Fresh rat serum, diluted 200-fold with 0.15 M-sodium chloride, was used and incubation systems contained samples corresponding to 0.5 or 1 μ l. of whole serum.

Within the range 0.1–10 mM-bile salt in the incubation system, enhanced esterolysis by serum was observed; sodium taurodeoxycholate was the more active of the two bile salts in this respect. A maximum activation of the esterase activity of 0.5 μ l. of serum was obtained with 0.4 mM-sodium taurocholate in the incubation system; this represented approximately 130% of the non-activated value. No further activation was observed with larger amounts of the bile salt. Sodium taurodeoxycholate gave maximum activation at approximately 165% of the non-activated value.

Rat serum samples of 10–20 mg. of protein were subjected to chromatography on Sephadex G-200 and esterolytic activity was determined in the fractions. Two peaks of activity against β -naphthyl acetate were obtained, a major peak having a K_{av} of 0.42 and a broad minor peak with a K_{av} of 0.14. The activity of the major peak was enhanced by both bile salts; no significant activation of the minor peak could be detected in the presence of either bile salt.

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