Separation and characterization of different areas constituting the syncytiotrophoblast membrane

SOLI F. CONTRACTOR, INDRAJIT DAS and MARTIN P. OAKEY

Department of Obstetrics and Gynaecology, Charing Cross Hospital Medical School, West London Hospital, Hammersmith Road, London W6 7DQ, U.K.

There is an increasing awareness of the importance of the syncytiotrophoblast (ST) membrane, which has led to its biochemical characterization by several groups of workers (Boyd et al., 1979; Whitsett et al., 1979; Ogbimi & Johnson, 1980). Morphological zonal variations in the normal human term placenta have been described by several investigators (Burgos & Rodriguez, 1966; Teasdale, 1978). There are also differentiated regions of placental cell surface that have been shown to be associated with exchange of materials between maternal and foetal circulation (Fox, 1978; Clint et al., 1979). One would expect that these differences would result in some localization of receptors and membrane enzymes according to their particular functions. It has been suggested that plasma membrane facing the maternal side is rich in alkaline phosphatase and 5'-nucleotidase and the basal membrane facing the foetal side is rich in (Na\(^+\) + K\(^+\))-activated ATPase and adenylyl cyclase (Whitsett et al., 1979; Boyd et al., 1979).

The purpose of this investigation was to isolate and characterize placental ST membrane in order to delineate those areas that have different physiological functions.

Fresh term placentae from uncomplicated pregnancies were used for all preparations. Membranes (A) were purified by differential and discontinuous sucrose density-gradient centrifugation described by Snary et al. (1976), with some modifications. Briefly, a washed microsomal pellet obtained by this technique was placed on top of a discontinuous sucrose gradient consisting of 37% (w/v) solution overlaid with 25% (w/v) solution. The sample was centrifuged at 65000g for 16h in a MSE 65 centrifuge. Membranes collecting at the interface of the fraction containing alkaline phosphatase and 5'-nucleotidase and (Na\(^+\) + K\(^+\))-activated ATPase represented the basal membrane and the fraction containing alkaline phosphatase and 5'-nucleotidase represented the microvillous fraction. We further characterized our preparations (A) and (C) by using specific antibody against type IV collagen, which is a constituent of the basement membrane (Bailey et al., 1979). By using indirect immunofluorescence we were unable to detect the presence of type IV collagen in preparations (A) and (C). This antibody showed specific binding to the basement membrane in sections of term placenta by indirect immunofluorescence (S. F. Contractor, unpublished work).

In view of its regulatory role in cyclic AMP metabolism, it is not surprising to find adenylyl cyclase activity distributed throughout the non-microvillous area of the ST membrane. It is now clearly established that the ST membrane is rich in many different receptors whose functions depend on cyclic AMP-mediated processes. This work now needs to be extended to define those processes linked to the adenylyl cyclase system of ST membrane.

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