ENDOGENOUS STEROIDS IN BREAST MILK AND SERUM OF LACTATING WOMEN FROM PARTURITION TO ONE YEAR POSTPARTUM

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SUMMARY

Estradiol (E2), Progesterone (P) and Testosterone (T) levels were estimated in the milk and serum samples of 84 exclusively breast feeding mothers during different phases of lactation i.e. the colostrum phase (1-5 days postpartum), the transitional milk phase (10-15 days postpartum) and the mature milk phase (1-12 months postpartum). The results indicated that small but significant amounts of E2, P and T are transferred throughout the postpartum period from the maternal circulation to the breast milk. While the serum to milk transfer ratio remained more or less constant for E2 (about 25%) and T (about 13%) throughout the one year period, for progesterone it varied from 9-23 percent depending on the period postpartum.

INTRODUCTION

It is established that contraceptive steroids are transferred from the maternal circulation to breast milk (Saxena et al 1977, Nilsson et al 1977, Toddywalla et al 1980, Shikary et al (1987) but similar information regarding the primary ovarian steroids is not available. Steroids are known to be lipid soluble. A tremendous variation in the lipid content of milk is observed between the colostrum and the mature milk phase. Besides this, large variations in the circulating levels of primary ovarian steroids in the serum are observed in normal postpartum women (Vorherr 1974, Peterson and Bowes 1983) ranging from very high levels in the immediate postpartum period to very low levels thereafter, which gradually increase to normal circulating levels with the return of fertility in postpartum women. Whether the variations seen in the endogenous steroids in the maternal circulation are also reflected in her milk, formed the subject of our cross sectional

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study.

SUBJECTS AND METHODS

The subjects were 84 healthy, (not on any medication), exclusively breast feeding women who had recently delivered full term normal infants. The mothers belonged to the same lower socioeconomic class, were between the age group of 20-35 yrs. and had a body mass index between 21-23. According to their postpartum period, they were divided into the three study groups as follows :

Group I (20 women)	: 1-5 days Postpartum	- Colostrum phase.
Group II (9 women)	: 10-14 days Postpartum	- Transitional milk phase
Group III (55 women)	: 1-12 months Postpartum	- Mature milk phase

A single blood and fore and hind breast milk samples were collected simultaneously from each of these women between 8.00 & 9.00 a.m. Equal proportion of the fore and hind milk samples were mixed together. The samples were than snap frozen and stored at - 20°C till they were analysed. As we expected very low levels of E2, P & T in the milk samples (Nilsson et al 1978, Toddywalla and Joshi 1980) the quantity of milk samples taken for the extraction of each hormone was 8.0 ml. Recovery monitoring was done on a parallel set of each sample. As the quantity of colostrum samples collected from individual women was very little, colostrum samples were analysed on a pooled basis. Steroid extraction procedure from milk was similar to that described before (Saxena et al 1977, Shikary et al 1987). Serum and milk pools different concentrations of E2, P & T processed along with the respective samples as internal quality control-checks. The steroids in the milk samples after initial extraction (Saxena et al 1977, Shikary et al 1987) were analysed along with the serum samples by radio-immunoassay using the matched assay reagents and procedure provided by the special programme for Research in Human Reproduction, World Health Organisation, Geneva. The sensitivity of the assay system was 10 pg/ml for E2, 18 pg/ml for P and 10 pg/ml for T in case of serum and 50 pg/ml for milk samples for all the three steroids. The intra-assay coefficient of variation for both serum and milk samples for all the hormones was less than 10 percent and the inter-assay variation was less than 15 percent.

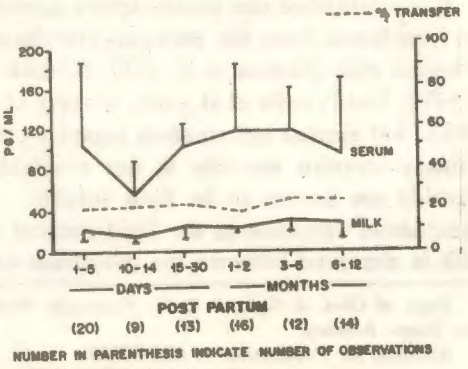
RESULTS

The results indicate that after the initial high levels of E2 and P in the maternal sera during the immediate postpartum period there was a dip followed by a gradual rise to steady state levels after 15 to 30 days postpartum. On the other hand T levels remained constant through out the one year period (Figs. 1, 2 & 3).

A constant but significant quantity of E2, T and P were detected in the breast milk through out the one year postpartum period. The relative transfer ratio of maternal serum

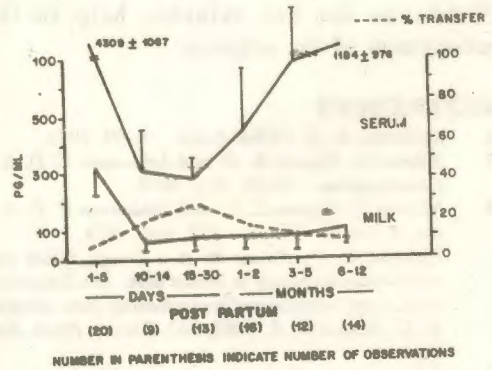
FIGURE - I

ESTRADIOL (MEAN + SD) IN SERUM AND BREAST MILK IN POST PARTUM LACTATING WOMEN



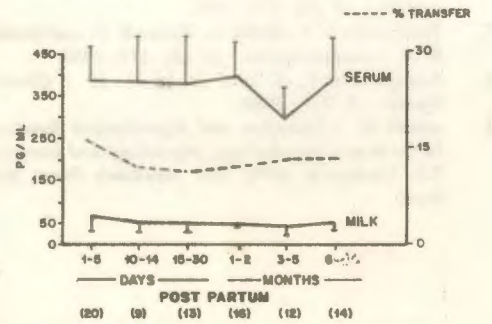
NUMBER IN PARENTHESIS INDICATE NUMBER OF OBSERVATIONS

FIGURE II
PROGESTERONE (MEAN ± SD) IN SERUM AND BREAST MILK IN POST PARTUM LACTATING WOMEN



NUMBER IN PARENTHESIS INDICATE NUMBER OF OBSERVATIONS

FIGURE III
TESTOSTERONE (MEAN ± SD) IN SERUM AND BREAST MILK IN POST PARTUM LACTATING WOMEN



NUMBER IN PARENTHESIS INDICATE NUMBER OF OBSERVATIONS

to breast milk for E2 and T remained more or less constant (Fig. 1 & 2). In contrast this ratio for P showed a slight peaking around 15 to 30 days postpartum with a gradual fall thereafter to remain more or less constant from 5 months onwards, until the 12 months observation period (Fig. 3).

DISCUSSION

To date, only two studies (Nilsson et al 1978, Toddywalla and Joshi 1980) have been undertaken to demonstrate the presence of natural steroids in breast milk. The first study reported undetectable levels of E2, whereas the second one reported detectable levels of P in 75 percent of the cases and detectable levels of E2 and T in 25 percent of the cases studied. However, neither of these studies were conducted in a systematic manner throughout all the phases of lactation.

The present study was carried out in 84 postpartum women over a one year period covering three different phases of lactation viz (i) the colostrum phase when lactation is just being established and the circulatory sex steroid levels are high, (ii) the transitional milk phase when the change from colostrum to mature milk is taking place and the circulating E2 and P have reached very low levels, land (iii) the mature milk phase when lactation is full established and wide fluctuations in the sex steroid levels are observed with the return of fertility in some women. These are incidentally phases when the fat content of human milk is also known to fluctuate, the largest quantity being present in the colostrum and the least in the mature milk.

In our study P and T in detectable quantities could be found in all the breast milk samples, whereas E2 could be detected only in those milk samples where the maternal circulatory levels were more than 25 pg/ml. To get an approximate idea of the amount of the steroid transferred from the maternal circulation into the breast milk, the maternal sera to milk relative transfer was calculated. This was found to be approximately 25 percent for E2, 13 percent for T and 9-23 percent for P. The difference in the transfer ratio for each of these steroids is probably due to the differing capacity of the E2, T and P to bind with their respective serum hormone binding globulins (Anderson 1974). The binding protein for #2 and T is testosterone estradiol binding globulin (TeBG). As the capacity of T to bind to TeBG is comparatively more than of E2,

more of T is bound to TeBG as compared to E2 and thus a lesser amount of T passes out into the milk. This explains the lower proportion of T being present in milk as compared to E2 (Fig. 1 & 3). THe carrier protein for P is corticosteroid binding globulin (CBG) (Anderson 1974). The variation observed in the relative transfer ratio for P (Fig. 2) may partly be due to the fluctuations observed in the maternal levels of P, probably because of the return of ovarian activity and menstruation in some lactating women. This is clearly indicated by the large standard deviation observed in the P levels especially after 3 months postpartum (Fig. 2). Inspite of the wide fluctuations in the circulatory levels of E2 and P in the postpartum period, the relative levels of these steroids in the breast milk remained more or less constant. The low levels of the endogenous steroids present in the breast milk appear to be natural phenomenon, and has no apparent adverse influence on the general health and well being of the suckling infant.

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