

Thymosin α_1 in Milk Specimens from Guatemalan Women

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ABSTRACT. Cruz, J. R., Naylor, P. H. and Goldstein, A. L. (Program on Infection, Nutrition and Immunology, Institute of Nutrition of Central America and Panama, Guatemala, Guatemala, and the Department of Biochemistry, The George Washington University School of Medicine, Washington, D.C., USA). Thymosin α_1 in milk specimens from Guatemalan women. *Acta Paediatr Scand* 78:522, 1989.

Thymosin α_1 was determined in milk samples obtained from 67 Guatemalan women 5 days, and 1-3 and 6-18 months postpartum. All the specimens collected 5 days after delivery contained measurable levels (583 ± 304 pg/ml) of thymosin α_1 but only 33 % of those obtained 1-3 months postpartum and none collected thereafter did. Since thymosin α_1 has been shown to increase T-cell mediated immunity, and to enhance host resistance to infection, it may play an important role in the maturation of mucosal immunity and host resistance in general in the neonate. This study is the first to document the presence of a thymic hormone in early postpartum milk. *Key words:* thymosin α_1 , intestinal immunity, breast milk.

Human milk contains several host defense factors (1, 2) which are considered to provide protection to the breast-fed child against infections and allergic illnesses (3-5). In vitro studies (6) have suggested that human milk contains soluble factors that may enhance lymphocyte function. Moreover, determinations of secretory IgA (SIgA) in saliva and nasal secretions of infants (7, 8) indicate that breast feeding may accelerate the maturation of the SIgA system, especially during the first week of life.

The thymus produces a series of hormones that play a central role in the maturation of the immune system (9); among these is thymosin α_1 , which has been well characterized and shown to induce the maturation of thymus-derived lymphocytes (10). Taking these facts into consideration and knowing that the SIgA system is thymus dependent, we investigated the presence of thymosin α_1 in human milk.

MATERIAL AND METHODS

Individual milk samples were obtained from 67 Guatemalan mothers. Thirty-three were from Guatemala City and 34 from a rural area, Santa Maria Cauqué. Twenty-seven specimens were collected five days postpartum, 24 additional samples were obtained 1-3 months after delivery, and 16 specimens 6-18 months after parturition. The samples were collected with the use of a plastic Marshall breast pump and infant nurser (Marshall Electronics, Skokie, Illinois), and transferred to a sterile glass container and placed at -25°C . For the purpose of this study, samples were sent in dry ice to Washington, D.C., where the presence of thymosin α_1 was determined by radioimmunoassay (11). Milk volumes ingested by the children in one day were estimated by test-weighing the 1-18 month-old infants during a continuous 24-hour period.

RESULTS

Thymosin α_1 was detected in quantifiable amounts (≥ 200 pg/ml) in 35 of the 67 milk specimens; traces of the hormone were present in 12 samples and in 20, no detectable levels could be determined. Fig. 1 summarizes the findings. All 27 milk specimens taken 5

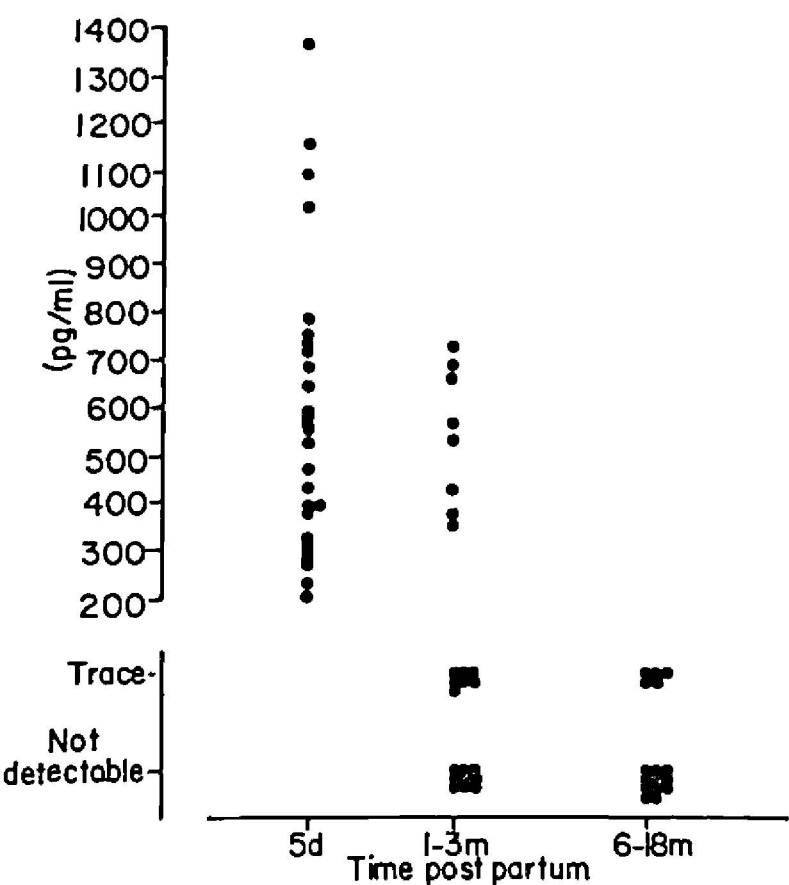


Fig. 1. Levels of thymosin α_1 (pg/ml) in milk specimens from Guatemalan women.

days after delivery had measurable amounts of thymosin α_1 , ranging from 200 to 1373 pg/ml (mean = 583, SD = 304 pg/ml). Only 8 (33 %) of those obtained 1–3 months postpartum had thymosin α_1 , in measurable levels, while in none of the 16 samples taken at 6–18 months could thymosin α_1 , be measured. The differences in the proportions of specimens with measurable levels at different times postpartum are highly significant ($X^2_{df=2}=45.65$, $p<0.001$). Milk volumes produced in the 24-hour period previous to sample collection were estimated in 40 of our subjects (1–18 months postpartum). The mean volumes (and SD) were 578 ml (258 ml), 533 ml (186 ml) and 547 ml (236 ml) for the groups of women with non-detectable amounts, traces and measurable amounts of thymosin α_1 respectively (Fig. 2).

DISCUSSION

Milk samples from Guatemalan women contain thymosin α_1 in measurable amounts during the early stages of lactation; the levels tend to diminish as lactation progresses and, after 3

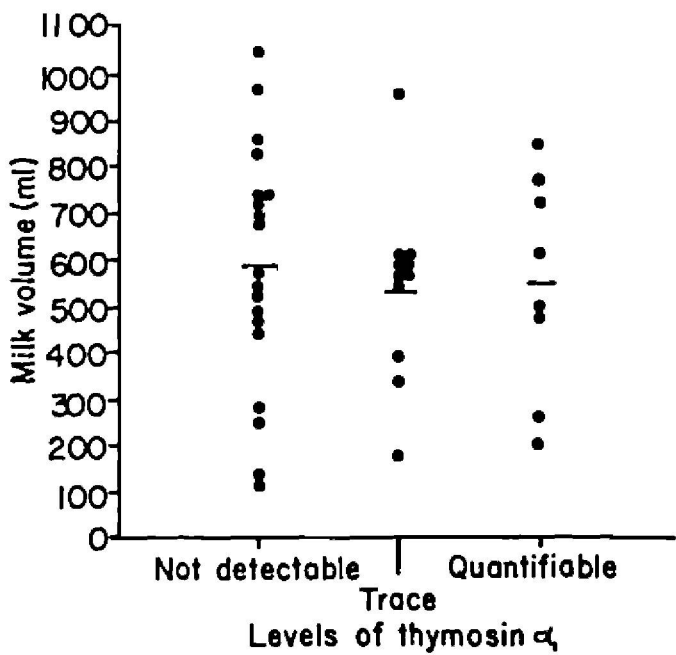


Fig. 2. Milk 24H-volumes (ml) in relation to the presence of thymosin α_1 .

months postpartum, most women do not seem to secrete the hormone through their milk. This phenomenon could be associated with the changes in the volume of milk, which is known to increase with time postpartum. We feel, however, that this is not the case since there is no correlation between milk volume and thymosin α_1 concentration. Furthermore, the means for the groups of women with non-detectable, traces and measurable amounts of thymosin α_1 in their milk are similar.

We think that the thymosin α_1 , in human milk specimens collected five days postpartum may have a beneficial effect on the immature gut-associated lymphoid tissue of the neonate, since both intestinal, cell-mediated, and SIgA responses are known to be thymus-dependent (12, 13). The early occurrence of high levels of SIgA in saliva and nasal washings of breast-fed infants, when compared to non breast-fed infants (7, 8), may be the result of thymosin-mediated phenomena.

This study is the first report on the presence of thymosin α_1 in breast milk. The observation that this thymic hormone is present in high concentrations in early postpartum milk suggests that it might play an important, but still to be defined, physiological role in the early development of the infant's immune system.

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Submitted Nov. 13, 1986. Accepted Dec 30, 1988

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