

Passage of cows' milk protein in breast milk

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Summary

An enzyme-linked immunosorbent assay has been used to search for lactoglobulin and bovine casein in breast milk. Initial results suggest this may be a simple and useful method for such studies. Detection and prevention of antigen passage could influence the prevalence of atopic disease.

Introduction

In a study of the entire infant population on the Isle of Wight, breast feeding was not found to protect the infant from developing eczema (Hide & Guyer, 1981). Neither was the prevalence of colic any less in the exclusively breast-fed group (Hide & Guyer, 1982).

More than 60 years ago Talbot (1918) related eczema in a 3-week infant to chocolate eaten by the breast-feeding mother. Shannon (1921) demonstrated the presence of food antigens in breast milk by inducing anaphylatic reactions in guinea pigs sensitized to egg protein which were challenged with breast milk from a woman taking eggs in her diet. When eggs were excluded from the diet her milk did not cause anaphylaxis.

Much more recently, Jakobsson and Lindberg (1978) showed that infant colic could often be relieved in the breast-fed child by removing cows' milk from the mother's diet. Studies on the Isle of Wight had shown that colic was not directly related to the mode of feeding although it could often be alleviated by excluding dairy products from the mother's diet. Not infrequently it was also relieved by switching the formula-fed infant to an alternative preparation, for example a soy milk.

The passage of cow's milk protein in breast milk could sensitize the infant and predispose infants to allergy. This could account for the failure of the Isle of Wight and other studies to demonstrate that breast milk bestows any protection against eczema

(Halpern *et al.*, 1973; Kramer & Moroz, 1981; Fergusson *et al.*, 1981; Cogswell & Alexander, 1982).

Methods

Twenty-eight mothers provided samples of their milk, usually 7 or 8 days after the birth of their infants.

The antigens, β lactoglobulin and bovine casein, were detected by the double-antibody sandwich method of Voller, Bidwell and Bartlett (1976).

Polystyrene microtitre plates were coated with anti- β lactoglobulin and anti-casein respectively and the excess washed off. Test samples were diluted in phosphate-buffered saline (PBS) and a series of standards were added to the plates. After incubation these were washed with PBS. Enzyme-labelled specific antibody was then incubated on the plate and the excess removed by thorough washing. Finally enzyme substrate was added giving a colour change proportional to the concentration of the antigen.

Rabbit anti- β lactoglobulin, IgG fraction and alkaline phosphatase labelled rabbit anti- β lactoglobulin were kindly supplied by Dr Peter Kilshaw of the National Institute for Research in Dairying as was the procedure for the technique (Kilshaw & Slade, 1980).

Results

Beta lactoglobulin was detected in the milk of five of twenty-eight mothers. Cows' milk casein was detected in thirteen of twenty-eight. Quantitative results are summarized in Fig. 1.

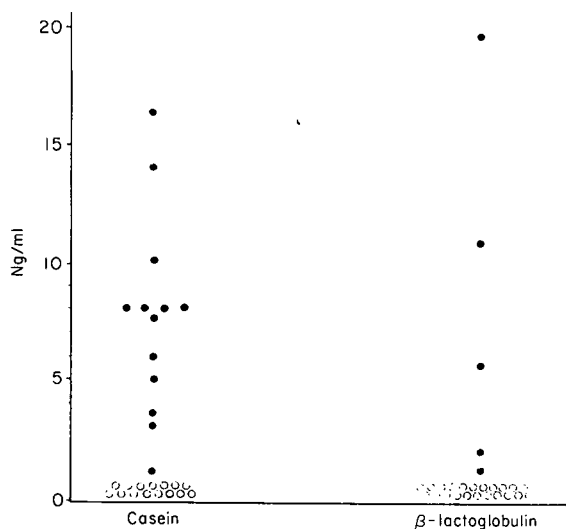


Fig. 1. Detection of cow's milk proteins in breast milk by the ELISA method.

Discussion

These preliminary results suggest that significant numbers of mothers excrete some fractions of cow's milk protein in their milk. There are more than twenty-five separate protein components in cows' milk (Bahna & Heiner, 1980), but clinical studies have

suggested that β lactoglobulin and casein most commonly produce allergic reactions. Using the ELISA technique, casein, and less frequently β lactoglobulin, have been found in breast milk. Such passage of antigenic material, at a time when the newborn is highly vulnerable immunologically, could sensitize against cow's milk proteins and account for the prevalence of atopic disease in breast-fed infants.

Certain questions remain to be answered. It is possible that some cross-reactivity may occur between bovine and human casein, although presumably casein would have been detected in all samples if this were a major problem.

In the course of this study it was found that cow's milk protein was often detectable in breast milk 12 hr after mother has last consumed milk.

It is intended to study excretion for several days after excluding cows' milk from mother's diet.

This study has concentrated on antigen passage 1 week after birth. Serial analyses of breast milk will be made at weekly intervals to determine whether such protein passage persists.

It is intended also to look for bovine γ globulin, bovine albumin, α lactalbumin and other food antigens, particularly egg albumin as antisera become available.

Eventually it may prove possible to influence the prevalence of allergic disease in infancy by controlling the mother's diet and monitoring her milk.

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