

# Lower Prevalence of Atopic Dermatitis in Breast-Fed Infants Whose Allergic Mothers Restrict Dairy Products

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**Objective:** To study the prevalence of atopic dermatitis in exclusively breast-fed infants of allergic mothers who were placed either on liberal diets or on dairy-product-restricted diets.

**Material and Method:** Infants aged 0 to 4 months old, who were exclusively breast-fed and whose mothers had a history of allergic disease, were the subjects of the present study. The mothers were randomized into two groups; mothers in a control group were on liberal diets, while mothers in an intervened group were on dairy product-restricted diets. Infants of both groups were examined for atopic dermatitis at seven days, one month, and four months of age.

**Results:** There were 32 and 30 infants in the control and intervened groups, respectively. Eight infants in the control group and two infants in the intervened group developed atopic dermatitis by the age of four months. The prevalence of atopic dermatitis in the intervened group was significantly lower than that in the control group (6.67% vs. 25%,  $p < 0.05$ ).

**Conclusion:** Dairy product restriction in allergic mothers results in decreasing prevalence of atopic dermatitis in 4-month-old infants who were exclusively breast-fed.

**Keywords:** Atopic dermatitis, Cow's milk allergy, Dairy product-restricted diet, Exclusive breast-feeding, Infant

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Cow's milk protein allergy (CMA) is one of the most common food allergies, and presents with diverse manifestations affecting more than one body system<sup>(1)</sup>. Its incidence is in the range of 2% to 5%, of which only 60% are IgE-mediated<sup>(2,3)</sup>. Early recognition of this condition and prompt initiation of dietary elimination of cow's milk protein are very important.

It has been known that infants who are breast-fed have a lower incidence of allergic diseases. There have been several studies showing evidence for and against an association between dietary intervention during breast-feeding and allergy development<sup>(4-6)</sup>. For infants at high risk of developing atopic diseases, there is evidence that exclusive breast-feeding for at least four months, compared with feeding intact cow's milk protein formula, decreases the cumulative incidence of atopic dermatitis and cow's milk allergy in the first two years of life<sup>(4)</sup>.

However, food protein can be transferred through lactation and can potentially induce allergic

reactions in infants<sup>(7-9)</sup>. In most cases, a maternal cow's milk-free diet leads to a prompt resolution of allergic reactions. Based on this, it would seem that restriction of dairy product consumption by mothers, especially allergic mothers who breast-feed their babies, should prevent allergic diseases in their babies.

Thus, the aim of the present study was to compare the prevalence of atopic dermatitis in exclusively breast-fed infants of allergic mothers who were placed either on dairy-product-restricted diets or on liberal diets.

## Material and Method

### Subjects

The expected incidence of atopic dermatitis in infants of allergic mothers on diets without dairy product restriction is 30%, while that of the dairy product-restricted group is 10%. With type 1 error of 0.05 and type 2 error of 0.20, the optimal sample size was calculated to be 62. Subjects recruited into the study were pregnant women who had a history of allergies such as allergic rhinitis, bronchitis, eczema, or food allergy. Informed consent was obtained from the participants before taking part in the present study.

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### Study design

The present study was a prospective, randomized, controlled trial. The protocol was approved by the Ethics Committee for Human Research of the Faculty of Medicine, Siriraj Hospital Mahidol University.

Infants, 0 to 4 months old of both sexes from allergic mothers, were exclusively breast-fed during the present study. The mothers were block-randomized into two groups. Those in Group I (control) were on liberal diets after parturition, while mothers in Group II were placed on dairy product-restricted diets immediately after parturition. The authors educated the mothers to restrict cow milk and dairy product in detail of each food item including how to read to food label and words meaning cow milk protein. Calcium tablets for daily requirement in adequately (1 g) were provided to mothers in Group II. Although these mothers can still intake calcium from daily diets, they provided enough calcium. The infants in both groups continued to be exclusively breast-fed. Examination for atopic dermatitis in the infants was blindly performed by at least two investigators on three occasions, when infants were 7 days, 1 month, and 4 months of age.

### Statistical analysis

Descriptive analysis was used for demographic data. The differences in prevalence of atopic dermatitis between infants in both groups were calculated by Chi-square test or Fisher's exact test. Unpaired t-test was used for comparison of means between two groups. A p-value less than 0.05 was considered as statistical significance.

### Results

There were 32 and 30 pregnant women randomly allocated into Group I and Group II, respectively. All pregnant women had a history of allergies, as shown in Table 1. Paternal and maternal history of allergic diseases between Group I and Group II were not statistically different. All infants in both groups were healthy at birth. Infant demographics in both groups were not significantly different, as demonstrated in Table 2.

As shown in Fig. 1, at 7 days of age, infants in both groups did not show signs of atopic dermatitis. At 1 month of age, two infants from Group I exhibited atopic dermatitis (6.25%), but none from Group II. At the age of 4 month, there were eight (25%) and two (6.67%) infants from Groups I and II, respectively, who had developed atopic dermatitis ( $p < 0.05$ ).

**Table 1.** Demographic data of mothers and history of allergic diseases in fathers in Group I (control) and Group II (dairy product-restricted)

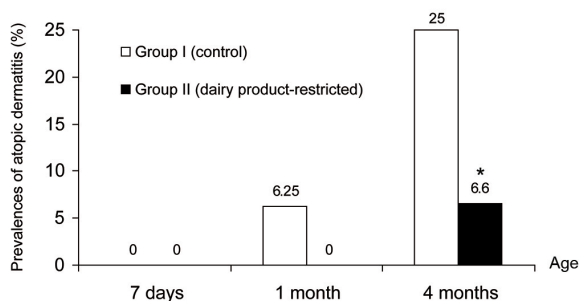
	Group I (n = 32) n (%)	Group II (n = 30) n (%)	p-value
Maternal age (mean±SD)	27.9±6.3	29.4±7.6	0.96 <sup>a</sup>
Maternal history of allergic diseases			
Atopic dermatitis	4 (12)	4 (13)	0.92 <sup>c</sup>
Recurrent urticaria	5 (16)	5 (17)	0.91 <sup>b</sup>
Allergic rhinitis	7 (22)	9 (30.0)	0.46 <sup>b</sup>
Asthma	3 (9)	3 (10.0)	0.93 <sup>c</sup>
Food allergy	13 (41)	9 (30.0)	0.38 <sup>b</sup>
Paternal history of allergic diseases			
Atopic dermatitis	2 (6.6)	1 (3.1)	0.59 <sup>c</sup>
Food allergy	1 (3.3)	1 (3.1)	0.96 <sup>c</sup>
Allergic rhinitis	0 (0)	1 (3.1)	0.30 <sup>c</sup>

<sup>a</sup> Unpaired t-test, <sup>b</sup> Chi-square test, <sup>c</sup> Fisher's exact test

**Table 2.** Characteristics of infants in Group I (control) and Group II (dairy product-restricted)

	Group I n (%)	Group II n (%)	p-value*
Sex			
Male	15 (47)	17 (57)	0.44
Female	17 (53)	13 (43)	
Birth weight (g)			
≤3,000	16 (50)	20 (67)	0.18
>3,000	16 (50)	10 (33)	
Modes of birth			
Vagina	17 (53)	16 (53)	0.99
Caesarean	15 (47)	14 (47)	

\* Chi-square test



**Fig. 1** Cumulative prevalence of atopic dermatitis among infants in Group I (control) and Group II (dairy product-restricted) at ages of 7 days, 1 month, and 4 months.

\* Significant difference,  $p < 0.05$

## Discussion

The results showed a high prevalence of atopic dermatitis in exclusively breast-fed infants whose mothers did not restrict their dairy product intake, while infants of mothers, who were on dairy-product-restricted diets, exhibited a much lower incidence of atopic dermatitis. It is interesting to note that infants whose only fathers, not mothers, have allergic diseases, exhibit a higher prevalence of atopic dermatitis than infants of allergic mothers (data not shown).

From the American Academy of Pediatrics statement on the effect of early nutritional intervention on the development of atopic disease in infants, restriction of maternal diet during pregnancy and lactation did not play a major role in the development of allergic disease<sup>(10)</sup>. However, in high-risk infants, exclusive breast-feeding for at least four months prevented or delayed atopic dermatitis, cow's milk allergy, and wheezing early in life<sup>(10)</sup>.

Several reports showed that food proteins could be transferred through lactation and were potentially able to induce an allergic reaction in infants<sup>(9,11,12)</sup>. Food proteins carried via breast milk could sensitize exclusively breast-fed infants and trigger a T lymphocyte-mediated allergen-specific immune response<sup>(13,14)</sup>. It was recently shown by Lim et al<sup>(15)</sup> that maternal non-respiratory allergy can result in the maternal transmission of asthma risk in mice. In conclusion, dairy product restriction in allergic mothers results in decreasing prevalence of atopic dermatitis in 4-month-old infants who were exclusively breast-fed. The authors would recommend that allergic mothers should restrict a consumption of dairy products during the first four months of lactation.

## Potential conflicts of interest

None.

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การลดลงของความชุกของ *atopic dermatitis* ในทารกจากมารดาในกลุ่มเสี่ยงต่อภูมิแพ้ที่งดการรับประทานผลิตภัณฑ์นมวัว

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**วัตถุประสงค์:** เพื่อศึกษาความชุกของ *atopic dermatitis* ในทารกซึ่งเลี้ยงด้วยนมมารดาอย่างเดียว โดยมารดามีภาวะภูมิแพ้ มารดาในกลุ่มหนึ่งบริโภคอาหารปกติอย่างอิสระเปรียบเทียบกับมารดาอีกกลุ่มที่งดการบริโภคผลิตภัณฑ์นมวัว

**วัสดุและวิธีการ:** ประชากรที่ศึกษา คือ ทารกอายุ 0-4 เดือน ที่มารดามีประวัติภูมิแพ้ และทารกได้รับนมมารดาอย่างเดียว มารดาจะถูกแบ่งโดยวิธีการสุ่มเป็น 2 กลุ่ม คือ กลุ่มที่ 1 กลุ่มควบคุม มารดาบริโภคอาหารอย่างอิสระ และกลุ่มที่ 2 กลุ่มทดลอง มารดางดการบริโภคผลิตภัณฑ์นมวัว ทารกจึงถูกแบ่งออกเป็น 2 กลุ่ม ตามการบริโภคอาหารของมารดา ทารกจะได้รับการตรวจอาการและอาการแสดงของ *atopic dermatitis* ที่อายุ 7 วัน 1 เดือน และ 4 เดือน

**ผลการศึกษา:** ทารกในกลุ่มควบคุมและกลุ่มทดลองมีจำนวน 32 และ 30 ราย ตามลำดับ ทารก 8 ราย ในกลุ่มควบคุม และทารก 2 ราย ในกลุ่มทดลอง เกิด *atopic dermatitis* เมื่ออายุ 4 เดือน ความชุกของ *atopic dermatitis* ในทารกกลุ่มทดลองน้อยกว่าในกลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (ร้อยละ 6.67 และร้อยละ 25 ตามลำดับ,  $p < 0.05$ )

**สรุป:** การงดผลิตภัณฑ์นมวัวในมารดาที่มีประวัติภูมิแพ้ส่งผลให้ความชุกของภาวะภูมิแพ้ในทารกอายุ 4 เดือน ซึ่งเลี้ยงด้วยนมมารดาอย่างเดียวลดลง

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