

Respiratory pathophysiologic responses

Do dairy products induce bronchoconstriction in adults with asthma?

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Background: Dairy products have often been implicated as a cause of exacerbation of asthma, but there is little scientific evidence to support this hypothesis.

Objective: We sought to determine whether dairy products induce bronchoconstriction in a group of adults with asthma.

Methods: Twenty subjects with asthma (13 women and 7 men) were recruited from respondents who had previously completed a food and asthma questionnaire. Ten subjects perceived that their asthma became worse with ingestion of dairy products (positive perceivers), whereas ten were negative perceivers. None of the subjects had positive skin prick test results with cow's milk. The study was a randomized, cross-over, double-blind, placebo-controlled trial. Subjects complied with a dairy-free diet throughout the study. The active challenge was a single-dose drink equivalent to 300 ml of cow's milk. A positive reaction was defined as a 15% reduction in both FEV₁ and peak expiratory flow (PEF) on the active challenge day compared with results obtained at the same time on the placebo day.

Results: For both FEV₁ and PEF there were no statistically significant differences in group means between active challenge and placebo challenge, between sequence of administration, or between perceptions. Nine subjects showed FEV₁ or PEF changes that were greater than 15% of baseline values: four patients showed changes after both active and placebo treatment; two after treatment with placebo only; and three after active treatment alone. Of the latter group, two subjects showed changes only in PEF, and when one of these subjects underwent a further detailed study, no asthmatic reaction could be demonstrated.

Conclusion: It is unlikely that dairy products have a specific bronchoconstrictor effect in most patients with asthma, regardless of their perception. (*J Allergy Clin Immunol* 1998;101:45-50.)

Key words: Dairy products, asthma, double-blind challenge, food hypersensitivity

Dairy products have long been implicated as a cause of exacerbations in asthma. This dates back to at least the twelfth century when it was thought that ingestion of

Abbreviations used

ANOVA:	Analysis of variance
BMI:	Body mass index
ECP:	Eosinophilic cationic protein
FEF _{25-75%} :	Forced expiratory flow over the middle half of the forced vital capacity maneuver
FVC:	Forced vital capacity
PEF:	Peak expiratory flow

milk and dairy product promoted mucus production that led to a worsening of asthma symptoms.¹ However, there is little scientific evidence that milk ingestion causes an increase in mucus production in the respiratory tract,² and in the few studies that have been conducted, there has been no deterioration in asthma status after ingestion of dairy products.^{3, 4}

Despite the lack of data to support the hypothesis that dairy products may exacerbate asthma, there continues to be widespread community belief that people with asthma should limit their intake of dairy products.^{5, 6} Dairy products are the major source of dietary calcium in adults.⁷ If people with asthma are actively avoiding dairy products, the impact on their long-term health may be significant, especially in a vulnerable group (e.g., postmenopausal women or growing children) that may require regular or occasional corticosteroids. Thus, many people with asthma may be unnecessarily depriving themselves of a rich and important source of nutrients, a situation that could lead to malnutrition and osteoporosis. It has been shown that calcium deficiency can occur in children who have limited their dietary intake of calcium because of suspected food allergy.⁸⁻¹⁰

The aim of this study was to determine whether dairy products could induce bronchoconstriction in a group of adults with asthma.

METHODS

Subjects

Twenty-two subjects with asthma who met the American Thoracic Society definition of asthma¹¹ were recruited, with 20 subjects successfully completing the study. One subject withdrew from the study at visit 3 (second challenge day) because of perceived inability to tolerate the second challenge drink. The other subject's dietary compliance was inadequate and the results were therefore not included. All subjects had previously completed a food and asthma questionnaire, the details of

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TABLE I. Ingredients of challenge vehicle

Active	Placebo
300 ml UHT skim milk	300 ml UHT rice milk
Sugar	Sugar
Decaffeinated coffee	Decaffeinated coffee
Citric acid	Citric acid
	Rice syrup

UHT, Ultra high temperature.

which have been published elsewhere.⁵ From the responses to the questionnaire, it was determined that 10 of the subjects perceived their asthma to worsen after the ingestion of dairy products (positive perceivers), whereas the other 10 subjects did not perceive any such relationship (negative perceivers).

All subjects were clinically stable, with no changes to their regular asthma medications in the 4 weeks before the study. Subjects who reported a previous life-threatening attack of asthma or life-threatening anaphylaxis to dairy products, women who were pregnant or lactating, and subjects whose baseline FEV₁ measurement was less than 70% of predicted values or less than 1.5 L, were excluded. All subjects gave informed consent and the project was approved by the Alfred Healthcare Group Ethics Review Committee.

Protocol

This study was conducted as a randomized, cross-over, double-blind, placebo-controlled trial. The procedure used was similar to that outlined by Bock et al.¹² At the first visit (visit 1), skin prick tests and spirometry were performed. Subjects were asked to describe the perceived effect on their asthma after they ingested dairy products in order to confirm their responses from the food and asthma questionnaire. The positive perceivers stated that one glass of milk was sufficient to induce asthma symptoms within 5 minutes to 2 hours after ingestion.

Skin prick tests were performed on the volar surface of the arm with standardized allergen extracts (*Dermaphagoides pteronyssinus*, cat hair, *Aspergillus* mix, *Cladosporium herbarium*, *Lolium perenne*, Southern grass mix, feather mix, cow's milk, soybean), histamine (positive control), and a negative control (Bayer Corporation, Sydney). A positive skin test result was defined as a wheal, 3 mm or more in diameter, in response to at least one of the allergens.

Baseline spirometry, including flow volume loops, were conducted with a computerized rolling seal spirometer (Sensor-Medics Corporation, Calif.), according to the American Thoracic Society standards for spirometry equipment and methodology.¹³ The European Community for Coal and Steel predicted values for lung function were used.¹⁴

Subjects commenced a dairy-free diet after visit 1 and complied with the diet for a minimum of 14 days before visit 2. However, one subject (subject 18) completed the diet for only 12 days before visit 2 because of other commitments. Each subject was advised to take one calcium tablet (Caltrate, Lederle; 600 mg elemental calcium/tablet) per day for the duration of the study because the diet was low in calcium. A food and beverage diary was kept for the duration of the study to check for dietary compliance.

Subjects continued to take their usual daily inhaled and oral antiinflammatory asthma medications throughout the study. Short-acting bronchodilators were continued on an "as required" basis throughout the study. However, on each of the challenge days, subjects withheld their short-acting bronchodi-

lators for at least 4 hours before arrival at the laboratory and, if possible, throughout the entire first challenge day. If relief medication was required, the dose and time were recorded, and this use was duplicated on the second challenge day.

Visits 2 and 3 were the challenge visits, at which subjects were administered a single dose of drink in the morning, after an overnight fast. The active challenge was equivalent to 300 ml of cow's milk and the placebo was equivalent to 300 ml of rice milk (Table I). Each challenge drink was prepared and the challenge selection was randomly allocated by a researcher located at a site different from that where the challenges were administered and who was not otherwise involved in the study. Each drink was presented in an opaque sports drink container so that the color, smell, and texture of the drink were not perceived by either the subject or the researcher recording the results. The challenge days were separated by 4 to 10 days to allow for washout of the previous challenge.

Spirometry was performed with a hand-held electronic spirometer that had been evaluated by the Department of Respiratory Medicine and was shown to produce results similar to those with a rolling seal spirometer.¹⁵ "Resting" spirometry was performed at 30 and 15 minutes before challenge and just before challenge (0 minutes); the best of three forced expiratory maneuvers for both FEV₁ and peak expiratory flow (PEF) were recorded at each time point. Spirometry was performed every 15 minutes for the first hour and then every 30 minutes for the next 2 hours postchallenge. Subjects left the laboratory 3 hours after the challenge but were required to continue using the spirometer hourly until at least 12 hours postchallenge. These results were recorded in a diary. Subjects inhaled 200 µg salbutamol (albuterol) if their spirometry results decreased by more than 20% from their baseline value and repeated this dose at the same time(s) on the subsequent challenge day.

Symptom scores for asthma symptoms were recorded throughout each challenge visit and for up to 12 hours postchallenge. Subjects also recorded any other symptoms that they experienced, such as gastrointestinal tract and nasal symptoms or sputum production, after each challenge.

A "likely positive" challenge was defined as a 15% reduction in both FEV₁ and PEF from baseline on the active challenge day but not at the same time on the placebo day. A challenge was deemed to be "potentially positive" if there was a 15% reduction in either FEV₁ or PEF from baseline on the active challenge day but not at the same time on the placebo day.

All subjects who were deemed to have had at least a potentially positive reaction were asked to return for a further detailed investigation that employed a more stringent method of determining whether a reaction had really occurred. The full details of this challenge method have been published elsewhere.^{16,17} In brief, this method involved collecting time-matched "control spirometry data" (FEV₁ and PEF) for three whole days before administering the challenge sequence. This allowed construction of 95% confidence limits at each time point, in order to take into account each subject's normal day to day variation in ventilatory function. Time-matched spirometry data for three separate challenge days (2 × 300 ml cow's milk; 1 × 300 ml placebo) were then collected. Subjects complied with the dairy-free diet throughout the study. Nonspecific bronchial hyperresponsiveness to methacholine was determined at baseline, after the control days, and at the conclusion of the challenge sequence. Venous blood samples were taken at baseline and on each challenge day to determine levels of the soluble inflammatory markers eosinophilic cationic protein (ECP) and tryptase.

TABLE II. Characteristics of study subjects and individual challenge results

Subject No.*	Gender	Perception	Age (yrs)	Asthma medications†	Baseline (visit 1) % predicted FEV ₁ and PEF	Maximum % decrease in FEV ₁ and (PEF)		Symptom scores‡ Daytime/Nighttime		Reported symptoms§	
						Dairy	Placebo	Dairy	Placebo	Dairy	Placebo
1	M	—	43	SB, SM, FT, PN, NAC, TH	67 (71)	11.4 (12.9)	−5.0 (6.3)	0/0	0/0	DT	
2	M	—	50	SB, BU	84 (70)	8.4 (12.9)	11.4 (19.8)	0/0	2/0		
3	F	—	63	SB, BE, IP	90 (72)	27.1 (27.6)	23.4 (24.7)	2/2	2/0	IG	
4	F	+	33	SB, BU	107 (99)	9.3 (11.9)	5.1 (8.8)	1/0	0/0	ST	
5	F	+	25	SB, SM, BU	90 (98)	3.3 (5.7)	14.6 (13.9)	0/0	1/1		
6	F	+	29	SB, BU	76 (73)	6.0 (3.6)	4.2 (6.6)	0/0	0/0		
7	M	—	23	SB, BU	106 (103)	1.8 (15.2)	2.9 (7.8)	0/1	1/0		
8	M	—	64	TE, BU	73 (63)	9.0 (3.3)	18.1 (15.3)	0/0	0/0		
9	F	+	20	TE, BU, NAC	94 (102)	19.1 (23.9)	26.2 (36.7)	3/0	3/0		
10	F	+	43	SB, BU	116 (109)	4.7 (0.4)	9.4 (10.2)	0/0	1/0		
11	M	+	24	SB, BU	122 (120)	6.5 (6.9)	7.4 (9.2)	1/0	1/0	SOB	
12	F	+	38	SB, BE	107 (71)	7.5 (19.5)	6.0 (−1.2)	2/0	0/0	WH, HD	
13	F	+	21	SB, BU	113 (124)	9.2 (14.4)	4.3 (8.2)	1/0	0/0		
14	F	—	65	SB, BE	70 (66)	20.6 (16.8)	22.6 (16.8)	2/1	2/0	TC**	TC**
15	F	+	22	SB, BU	82 (90)	14.8 (18.5)	16.4 (18.5)	3/0	2/0	BL	
16	F	—	45	SB, BU	101 (116)	6.9 (5.2)	4.7 (7.0)	0/0	0/0		
17	F	—	18	SB, BU	133 (102)	9.3 (5.7)	14.7 (10.4)	2/1	2/1		
18	M	—	33	SB	129 (115)	2.8 (1.6)	4.8 (4.0)	0/0	0/0	NA	
19	F	+	21	TE, BU	102 (88)	37.0 (40.5)	3.4 (0.3)	5/2	1/1	TC, WH**	
20	M	—	29	SB	110 (116)	1.3 (4.9)	3.3 (9.1)	1/2	2/2		

*Subject 4 was nonatopic; subject 12 underwent further study.

†Asthma medications: SB, salbutamol (prn use); SM, salmeterol; TE, terbutaline (prn use); FT, fluticasone; PN, prednisolone; NAC, sodium cromoglycate; TH, theophylline; BU, budesonide; BE, beclomethasone; IP, ipratropium bromide.

‡Daytime symptom score: 0 = no symptoms; 1 = symptoms for one short period; 2 = symptoms for two or more short periods; 3 = symptoms for most of the day that did not affect normal daily activities; 4 = symptoms for most of the day that did affect normal daily activities; 5 = symptoms so severe that normal tasks could not be performed. Nighttime symptom score: 0 = no symptoms; 1 = awake once or waking early; 2 = waking twice or more (including waking early); 3 = awake for most of the night; 4 = did not sleep at all.

§Reported symptoms: DT, dry throat; IG, indigestion; ST, “sticky” throat; SOB, slightly short of breath (spontaneously resolved); WH, wheeze, HD, headache; TC, tight chest; BL, blocked nose; NA, nausea.

||Change in spirometry of more than 15%.

**Bronchodilator given for resolution of symptoms.

Statistical considerations

For this two-period crossover study, a total of 20 subjects were required to detect a 10% change in FEV₁ with 90% power for a two-tailed test at the 5% significance level. Ten subjects were required in each individual perception group (positive and negative perceivers) to detect a 12% change in FEV₁ with 90% power for a two-tailed test at the 5% significance level.

Data were analyzed with the SPSS computer package to generate descriptive statistics and cross-tabulations when required.¹⁸ χ^2 -tests were used to assess associations between categorical data, and the Student's *t* test was used to assess differences between the means of continuous data. Analysis of variance (ANOVA) for repeated measures was performed to test for between-subject and within-subject effects with the Genstat computer program.¹⁹ A *p* value of less than 0.05 was considered significant for all tests.

RESULTS

Subject characteristics

The mean age of the subjects was 35.4 years (SD = 15.4 years). All subjects except one (subject 4) were

atopic to at least one of seven common aeroallergens. None had a positive skin prick test response to either cow's milk or soybean. The mean body mass index (BMI) was 25.7 kg/m² (SD = 4.4 kg/m²), a value considered to be in the overweight category. Of the 20 subjects, 11 were currently employed outside the home, 4 were students, 2 were retired/pensioners, 2 were involved with home-duties, and 1 was unemployed.

Demographic characteristics, baseline spirometry, and current asthma medication are outlined in Table II. There were no statistically significant differences in baseline spirometry, gender, atopic status, height, or current medication use between positive and negative perceivers. The negative perceivers were significantly older (*p* < 0.02) and weighed more (*p* < 0.0005) than the positive perceivers.

Challenge results

Table III outlines the results from the ANOVA for repeated measures, which tested for between-subject

TABLE III. Repeated measures ANOVA of FEV₁ and PEF between challenges for between-subject effects

Outcome (main effect)	Degrees of freedom	Mean square	F statistic	p value
FEV₁				
Perception	1	0.10	0.97	0.761
Sequence	1	0.00	0.95	0.993
Period	1	0.24	0.87	0.627
Treatment	1	0.06	0.97	0.812
Time	16	1.54	1.00	0.078
Time × treatment*	16	0.46	1.00	0.964
PEF				
Perception	1	0.06	0.89	0.816
Sequence	1	0.05	0.94	0.823
Period	1	0.09	0.99	0.766
Treatment	1	0.05	0.97	0.829
Time	16	2.16	1.00	0.005
Time × treatment*	16	0.89	1.00	0.577

*Refers to time treatment interaction (trend for early or late asthma reaction; see text for interpretation).

effects of dairy products. For both FEV₁ and PEF there were no statistically significant differences in mean group data between the dairy challenge or the placebo (treatment effects), the sequence of administration (period or order effects), or between positive and negative perceivers (perception effect). PEF values did significantly differ with time ($p = 0.005$), but values actually improved over the day on both challenge days, as might be expected from diurnal variation in asthma. The time-treatment interaction tested whether a difference in response to dairy or placebo challenge over time had occurred. No significant time-treatment interaction was found, thereby indicating that neither early nor late asthma reactions had occurred in the group as a whole.

Further analysis, with ANOVA for repeated measures, of within-subject variability for both FEV₁ and PEF was also performed (results not shown). No clinically or statistically significant increase in variability was found between dairy or placebo challenge, order effects, perception, or time.

Five (subjects 1, 9, 10, 14, and 17) of the seven subjects who required short-acting bronchodilators during the postchallenge period accurately duplicated their usage on both challenge days. One subject (subject 3) inadvertently took the bronchodilator 1 hour later than intended on the second challenge day, whereas the other subject (subject 19) required it only on the second challenge day (active challenge).

Table II outlines each subject's challenge results. There were no statistically significant differences in either daytime or nighttime symptom scores between the dairy and placebo challenge days ($\chi^2 = 1.90$, $p = 0.75$ and $\chi^2 = 1.13$, $p = 0.57$, respectively). However, positive perceivers reported more daytime, but not nighttime,

asthma symptoms than did negative perceivers ($\chi^2 = 10.91$, $p = 0.03$) after both challenges.

No subject reported an increase in cough or sputum production after the dairy challenge. Eight subjects (subjects 1, 3, 4, 11, 12, 15, 18, and 19) reported symptoms after the dairy challenge only, with only one subject (subject 19) requiring bronchodilator to resolve asthma symptoms. The other seven subjects' symptoms were self-limiting and resolved spontaneously. Five of these subjects (subjects 1, 3, 4, 12, and 15) had the dairy challenge as their first challenge. One subject (subject 14) required bronchodilator after reporting asthma symptoms after both the dairy and the placebo challenge.

Although no significant treatment effects were found for the group as a whole, nine subjects did have a decline in ventilatory function of greater than 15% of baseline after one or both challenges. In four of these subjects (subjects 3, 9, 14, and 15) there were similar declines in ventilatory function at the same time point between active and placebo challenge. Five subjects did show a fall in FEV₁ or PEF greater than 15% from baseline disproportionately on one challenge only: two subjects received placebo challenge only (subjects 2 and 8 [negative perceivers]) and three subjects received active dairy challenge (subject 7 [negative perceiver], subject 12 [positive perceiver], and subject 19 [positive perceiver]). Of the latter group, two subjects (subjects 7 and 12) showed changes only in PEF and not FEV₁ and thus their response did not meet the definition of a likely positive reaction. The third subject (subject 19) showed changes on both FEV₁ and PEF and thus technically met the definition of a likely positive reaction. However, her baseline measurements for the dairy challenge day were also considerably lower and were probably related to the symptoms of an incipient respiratory tract infection that she was experiencing at the time.

Although the numbers for this analysis were small, no statistically significant associations were found between subjects who showed ventilatory function changes and gender, atopy, challenge sequence, or perception of dairy sensitivity. Subjects who showed ventilatory function changes after dairy challenge only were more likely to have higher daytime asthma symptom scores ($\chi^2 = 13.5$, $p = 0.01$), but not nighttime symptom scores ($\chi^2 = 3.2$, $p = 0.20$) than those who did not show any ventilatory changes.

Further detailed study

Only one (subject 12) of the three potentially positive subjects (subjects 7, 9, and 12), who showed a change in PEF on active and not placebo challenge, agreed to undergo the further detailed study with three whole time-matched "control" days of FEV₁ and PEF monitoring to construct 95% confidence limits. No asthmatic reaction could be demonstrated with spirometry, bronchial hyperresponsiveness measurements, or soluble inflammatory marker activity (ECP and tryptase) in peripheral blood.

DISCUSSION

The present study was unable to demonstrate that dairy products induce bronchoconstriction or changes in asthma symptoms in this group of adults with asthma. This is the first report of a double-blind study that assesses the effect of dairy products on asthma control in adults.

Because all subjects gave negative skin prick test responses to cow's milk, it is difficult to generalize these findings to patients with asthma who do have skin reactivity to cow's milk. However, the aim of the study was to determine whether dairy products could induce bronchoconstriction in a group of adults with asthma and not to test for an allergic (IgE) reaction to milk. In a study by May, only the subjects who had strong positive skin prick test reactions to foods also had positive food reactions when tested in a double-blind fashion.²⁰

A previous single-blind study by Haas et al with 11 patients with asthma and 10 controls also found no significant changes in FEV₁, FVC, or FEF_{25-75%}.³ The single asthma patient who had a positive response to milk challenge in a double-blind study of asthma-induced food allergy reactions in a study of 300 consecutive patients with asthma developed gastrointestinal symptoms, but not asthma symptoms, after the milk challenge.⁴

The negative perceivers were significantly older and heavier than the positive perceivers. This is consistent with the Australian population, in whom the BMI has been found to increase with age.²¹ It is unlikely that these differences would alter the validity of the results obtained. The inclusion of the results from the two subjects who failed to complete the study would not have affected the conclusions.

Positive perceivers were not more likely to react to dairy products than the negative perceivers. Previous publications have advocated the inclusion of both positive and negative perceivers in trials for the results to be representative of the general community.^{22, 23} Positive perceivers reported more daytime asthma symptoms than did negative perceivers after both challenges, but there were no statistically significant differences in symptom scores. This may reflect the fact that positive perceivers were more aware of daytime asthma symptoms than were negative perceivers, but there were no significant differences between the two groups in current asthma medication, baseline spirometry, or spirometric variability.

Eighteen subjects were taking medication, which could potentially have confounded these results. However, the aim of the study was to determine whether people with asthma, regardless of medication, show bronchoconstriction after dairy challenge. Two subjects were taking regular long-acting bronchodilators throughout the study; however, the regular use of long-acting bronchodilators does not offer good protection against challenge-induced bronchoconstriction.²⁴ Seven subjects (three positive and four negative perceivers) did require short-acting bronchodilators throughout the challenge period. Only one of these subjects (a positive

perceiver) required bronchodilator on the active challenge day alone, but she also had an incipient upper respiratory tract infection that may explain the results obtained (see below).

Two subjects (subjects 2 and 8) showed clinically significant changes on placebo challenge only, which highlights the importance of double-blind, placebo-controlled studies. This also demonstrates that spurious reactions to either active or placebo challenge are quite common.

Of the three subjects (subjects 7, 12, and 19) who did show spirometric reductions in excess of 15% from baseline on the active challenge day alone, only in one subject (subject 19) did both FEV₁ and PEF decline significantly. Thus, only subject 19 was identified as a "likely" reactor to dairy products. However, this subject had impaired baseline ventilatory function on that day and also had symptoms of an incipient upper respiratory tract infection (cough, rhinitis, and mild sore throat). The study was continued because of her inability to return, after resolution of her symptoms, for a further challenge. Anecdotal accounts suggest that some people believe that ingestion of dairy products can make any respiratory illness, including asthma, worse. However, this subject reported that if she had monitored her spirometry before the dairy challenge, her measurements would have been as poor on preceding days as those on the dairy challenge day regardless of dairy product intake. It is therefore unclear whether the decrease in this subject's spirometry results was due to the dairy challenge alone. She was unable to participate in the further detailed study. In order to clarify this type of response further, it may be useful to conduct a challenge study at a time when the individuals are symptomatically and physiologically unstable. However, in this situation, a controlled, blinded study would be most difficult to perform and to interpret and would also be least likely to be acceptable to the patient.

Subject 7 showed a 15.2% decrease in PEF after dairy challenge, which is most likely to reflect random PEF variability, as seen to a lesser extent on the placebo day. Nevertheless, he was defined as a "potential" reactor. He however declined to undergo the further detailed study. Subject 12 had a marked change in PEF after dairy challenge but again with no change of FEV₁. This patient underwent the further detailed study, and no asthmatic reaction was demonstrated.

In summary, from all the challenges performed, we identified one patient with a "potential" reaction and one with a "likely" reaction, according to our definitions. However, the reaction in neither patient is convincing. For this study to be considered completely negative, both these individuals, particularly subject 19, would need to undergo the further detailed study.

One of the difficulties of randomized, controlled food challenges is the interpretation of the results. When an arbitrarily defined decrease in FEV₁ or PEF is used as the endpoint, it can be difficult to interpret a positive reaction without prior knowledge of that individual's

normal diurnal variation in spirometry. For some individuals, a decrease of 20% in FEV₁ is a typical random variation, whereas for others a decrease in FEV₁ of 8% or less may be a true reaction, even if it is clinically insignificant. Our study suggests that even in patients such as subject 12 who appear to have a positive reaction as demonstrated by conventional methods of analysis, when normal diurnal variations in spirometry are taken into account, no such reaction should be inferred. Thus, the design of this study is such that it can serve as a useful screening tool to determine whether an individual is likely to have a reaction. For subjects who do appear to have a positive reaction, it is important to repeat the challenge process and also to obtain adequate control day spirometry data so that an individual diagnosis can be accurately made.

In our recent survey of 135 adult asthma patients who were attending the Asthma and Allergy Clinic at the Alfred Hospital, dairy products were the most commonly avoided foods, with 12% of patients currently avoiding them, 16% having avoided them in the past, and 36% stating that dairy products had induced asthma symptoms.⁵ A New Zealand study also found that dairy products were the most commonly avoided foods reported by parents of children with asthma.⁶

Because this study has found minimal evidence of dairy products inducing bronchoconstriction, we suggest that a significant number of people with asthma are unnecessarily restricting their diet and are at risk of developing nutritional deficiencies. A double-blind study for the diagnosis of cow's milk allergy in rhinitis patients also found that the majority of patients suspected to have hypersensitivity to cow's milk could in fact tolerate dairy products.²⁵ The focus in clinical and education sessions should be on preventing unnecessary dietary restriction and thus ensuring adequate nutrient intake, such as that of calcium, from dairy products. It is also important that in individuals who do have a positive challenge result, appropriate double-blind trials be conducted in order to fully evaluate their need for dietary restriction. To do this properly with adequate control data is potentially time consuming and expensive but should be feasible with patients who are committed to obtaining a definitive answer.

In conclusion, we were unable to convincingly demonstrate that the ingestion of dairy products induced bronchoconstriction in a group of adults with asthma. We recommend that clinicians ensure that their asthma patients are not unnecessarily restricting their dairy product intake and thus risking the development of nutritional deficiencies.

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