

# Early nutrition in the prevention of allergic disease: A survey of general paediatricians and dietitians in Atlantic Canada

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**BACKGROUND:** Recommendations for maternal diet during pregnancy and breastfeeding and the timing for the introduction of commonly allergenic foods are changing.

**OBJECTIVE:** To determine how general paediatricians and dietitians in Atlantic Canada counsel families regarding early nutrition as a means of preventing allergic disease.

**METHODS:** In 2010, a survey was distributed to general paediatricians and dietitians in Atlantic Canada. Results were compared with a similar study that was conducted in British Columbia.

**RESULTS:** Most respondents did not advise maternal elimination diets during pregnancy or breastfeeding. Two-thirds of respondents always or regularly advised breastfeeding as a method to prevent atopic dermatitis. The majority of respondents advised delayed introduction of commonly allergenic foods beyond one year of age, especially for infants at risk of developing allergic disease.

**CONCLUSIONS:** There are differences in the practices of general paediatricians and dietitians with respect to early childhood nutrition for the prevention of allergic disease compared with international guidelines.

**Key Words:** Allergy; Dietary advice; Disease prevention; Guidelines; Infant; Nutrition

Over the past several decades, the incidence of allergic disease (eg, atopic dermatitis, asthma, food allergies) has increased (1-4). The development of allergic disease involves complex interactions between genetic and environmental factors (5-7). Specifically, there has been a focus on the effects of early nutrition, including maternal diet during pregnancy and breastfeeding, and the timing of introduction of commonly allergenic foods (eg, cow's milk, egg, peanut proteins) in the prevention of allergic disease. Previous prevention strategies proposed the avoidance of allergenic foods by mothers during pregnancy and breastfeeding and delaying the introduction of highly allergenic foods (8). However, more recent studies report maternal elimination diets have no effect on the incidence of allergic disease in children (9-13) and that early introduction of commonly allergenic foods may decrease the risk of allergic disease (14-18). In addition, exclusive breastfeeding for the first four to six months of life (19-22) and using extensively hydrolyzed formula (23,24) may also protect against the development of atopic dermatitis, especially in children with a family history of atopy.

Both the European Academy of Allergology and Clinical Immunology (25) and the American Academy of Pediatrics (26) published statements concluding that there is no evidence that

**La nutrition en début de vie dans la prévention des maladies allergiques : un sondage auprès des pédiatres généraux et des diététistes de l'Atlantique**

**HISTORIQUE :** Les recommandations sur le régime de la mère pendant la grossesse et l'allaitement et le moment d'introduire des aliments communément allergènes changent.

**OBJECTIF :** Déterminer comment les pédiatres généraux et les diététistes de l'Atlantique conseillent les familles au sujet de la nutrition en début de vie pour prévenir les maladies allergiques.

**MÉTHODOLOGIE :** En 2010, un sondage a été distribué aux pédiatres généraux et aux diététistes de l'Atlantique. Les chercheurs ont comparé les résultats à ceux d'une étude similaire menée en Colombie-Britannique.

**RÉSULTATS :** La plupart des répondants ne conseillaient pas de régime d'élimination maternelle pendant la grossesse ou l'allaitement. Les deux tiers des répondants conseillaient toujours ou régulièrement l'allaitement pour prévenir la dermatite atopique. La majorité des répondants conseillaient de retarder l'introduction des aliments communément allergènes après un an, notamment chez les nourrissons vulnérables à une maladie allergique.

**CONCLUSIONS :** Par rapport aux directives internationales, on constate des différences de pratique chez les pédiatres généraux et les diététistes pour ce qui est de la nutrition en début de vie afin de prévenir les maladies allergiques.

maternal elimination diets of commonly allergenic foods during pregnancy and breastfeeding or delayed introduction of commonly allergenic foods beyond four months to six months of age reduces the risk of infants and children developing allergic diseases. Furthermore, these statements recommend that exclusive breastfeeding for four to six months and the use of hydrolyzed formulas may be effective in the prevention of allergic diseases. A joint statement by Health Canada, the Canadian Paediatric Society (CPS) and the Dietitians of Canada (27) did not recommend maternal elimination diets during pregnancy and breastfeeding, and stated that exclusive breastfeeding for the first six months of life appears to have a protective effect against the development of allergic disease in infants with a family history of atopy (one or both parents or sibling with allergic disease). This joint statement was updated in 2012 and includes a recommendation that delayed introduction of commonly allergenic food beyond six months of age is not currently recommended as a way to prevent food allergies, including for infants at risk of atopy (28). Because recommendations have been changing, it is important to understand the present practices of health care providers regarding early nutrition, such as maternal elimination diets, the introduction of commonly allergenic foods and allergic disease prevention. The present study was an extension

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**TABLE 1**  
**Demographic profile of the study population**

Characteristic	Paediatrician (n=57)	Dietitians (n=44)	Total (n=101)
Practice setting			
Community	32 (56)	12 (27)	44 (44)
Hospital	21 (37)	32 (73)	53 (52)
Community and hospital	4 (7)	0 (0)	4 (4)
Length of practice, years			
0 to ≤10	17 (30)	19 (43)	36 (36)
>10	39 (68)	25 (57)	64 (63)
No response	1 (2)	0 (0)	1 (1)
Sex			
Male	19 (33)	1 (2)	20 (20)
Female	37 (65)	43 (98)	80 (79)
No response	1 (2)	0 (0)	1 (1)

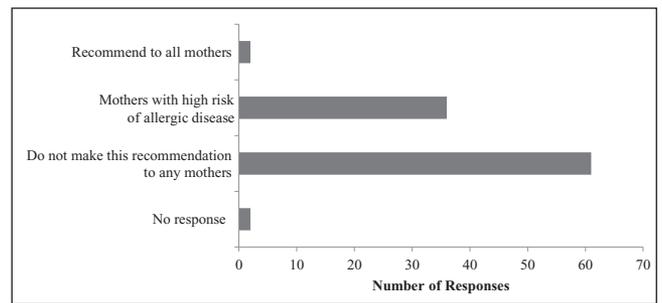
Data presented as n (%)

of a recently published study conducted in British Columbia (29). To the authors' knowledge, the British Columbia investigation is the only published study that identifies the practices of general paediatricians and dietitians with respect to early nutrition and allergic disease prevention. The results from the survey conducted in the Atlantic Canada provinces will be compared with the results from the British Columbia study to determine whether there are differences in counselling practices in different areas of Canada.

## METHODS

### Study design

A total of 107 general paediatricians, all registered with the College of Physicians and Surgeons in the provinces of Newfoundland and Labrador, Nova Scotia, New Brunswick and Prince Edward Island, were surveyed. The survey was mailed to all 107 general paediatricians using the address provided on the provincial College of Physicians and Surgeons website. A total of 1009 dietitians, who were all registered with the provincial regulatory boards in the four Atlantic Canada provinces, were also surveyed. Mailing addresses were not available for the dietitians. Dietitians were requested through an e-mail forwarded by the regulatory board to complete an online version of the survey using Survey Monkey (30). The survey design and questions were based on the survey used in a recently published study conducted in British Columbia (29). Respondents were provided with a self-administered, 14-question survey, which included questions on demographic and practice characteristics. Demographic questions, including type of practice (community, hospital based), number of years in practice and sex, were collected. For the purpose of the present survey, infants at high risk for allergic disease were defined as having at least one first-degree relative with asthma, atopic dermatitis, allergic rhinitis or food allergy (26). Commonly allergenic foods included cow's milk, egg and peanut protein. Respondents were asked to select a single statement that best reflected their practice from the list provided. The survey assessed practices on eliminating commonly allergenic foods during pregnancy and breastfeeding, the benefit of breastfeeding as a way to prevent atopic dermatitis, formula selection for infants at high risk of allergic disease and the timing of introduction of commonly allergenic foods for infants at high risk of developing allergic disease versus those without risk factors (refer to Appendix A for details on survey questions). To maximize participation, a second survey was sent to individuals who did not initially reply after three months. Responses were collected between January and April, 2011. Ethics approval was



**Figure 1**) General paediatrician and dietitian recommendations regarding maternal avoidance of allergic foods during breastfeeding

obtained from the Human Investigation Committee of Memorial University in St John's, Newfoundland and Labrador.

### Data analysis

The responses to each question were allocated according to profession (general paediatrician versus dietitian) and number of years in practice (zero to 10 years versus >10 years). Total percentages were calculated for each response, dividing groups into general paediatricians and dietitians. Responses were further dichotomized into two categories and grouped according to response type. Responses were analyzed as percentages between groups (ie, occupation and experience level within occupation).  $\chi^2$  or Fisher's exact tests were used, as appropriate, to test for significant differences between group effects for each question;  $P < 0.05$  was considered to be statistically significant. Selected questions were also compared with a similar study conducted in British Columbia in 2010 using  $\chi^2$  or Fisher's exact tests, as appropriate, to determine whether there was a significant difference between the responses from Atlantic Canada and British Columbia.

## RESULTS

### Study population

A total of 57 general paediatricians (response rate of 53%) and 44 dietitians completed the survey. Due to overlap, as the result of the same names appearing on different dietitian mailing lists and the survey reaching more than just registered dietitians (eg, students received the survey as well), it was not possible to calculate a meaningful dietitian response rate. Demographic profiles are outlined in Table 1. The majority of general paediatricians were community-based (56%) and in practice for >10 years (68%). The majority of dietitians were hospital-based (73%) and in practice for >10 years (57%).

### Recommendations for maternal elimination diets during pregnancy and breastfeeding

The majority of general paediatricians (63%) and dietitians (57%) counselled mothers that commonly allergenic foods need not be avoided during breastfeeding (Figure 1). Most general paediatricians (66%) and dietitians (70%) reported never advising mothers to abstain from eating peanut products during their pregnancy (Figure 2). Furthermore, 58% of general paediatricians and 64% of dietitians never advised mothers to abstain from eating peanut products while breastfeeding to prevent the development of peanut protein allergy in their child (Figure 2).

### Recommendations for breastfeeding to prevent atopic dermatitis

Twenty-six per cent of general paediatricians and 39% of dietitians always advised mothers that they should breastfeed for the first four months of life to prevent atopic dermatitis (Figure 3).

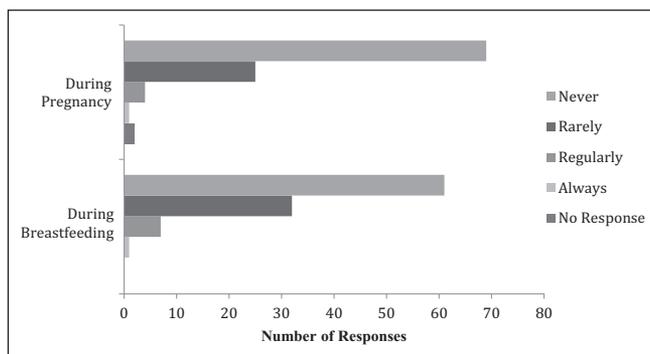


Figure 2) General paediatrician and dietitian recommendations regarding maternal peanut elimination diet during pregnancy and breastfeeding

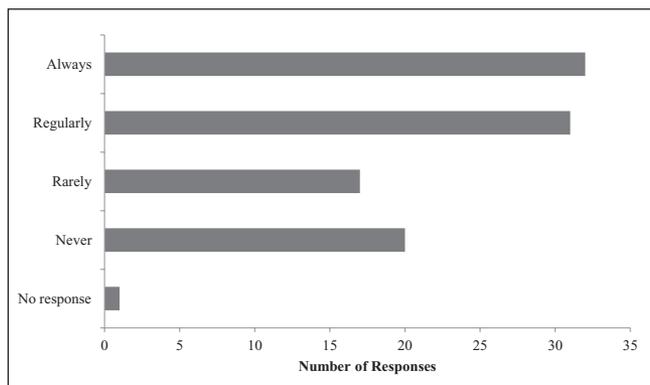


Figure 3) General paediatrician and dietitian recommendations regarding breastfeeding to prevent atopic dermatitis

**Recommended formula for an infant at high risk of developing allergic disease**

When formula was required, the most common responses from both general paediatricians (33%) and dietitians (34%) were partially hydrolyzed formula (30%), followed by extensively hydrolyzed formula (18%) (Figure 4).

**Recommendations for the age of introduction of commonly allergenic foods**

The clinical practices regarding the introduction of commonly allergenic foods are outlined in Figure 5. General paediatricians recommended delayed introduction (>1 year of age) of cow's milk (42%), egg (51%) and peanut protein (81%) for infants not at risk of allergic disease. For infants at risk of allergic disease, general paediatricians recommended delayed introduction (>1 year of age) of cow's milk (52%), egg (74%) and peanut protein (86%). Dietitians recommended delayed introduction (>1 year of age) of cow's milk (45%), egg (64%) and peanut protein (73%) for infants not at risk of allergic disease. For infants at risk of allergic disease dietitians recommended delayed introduction (>1 year of age) of cow's milk (73%), egg (89%) and peanut protein (93%).

**Comparing paediatricians versus dietitians, Atlantic Canada versus British Columbia and number of years in practice**

Survey responses were compared with a similar study completed in British Columbia (29). There were no statistical differences in any of the responses when comparing paediatricians and dietitians, or when comparing the number of years in practice (≤10 years and >10 years) for either group. For Atlantic Canada and British Columbia, survey questions that were directly compared included responses for avoiding peanuts during pregnancy and breastfeeding and breastfeeding recommendations to prevent atopic dermatitis.

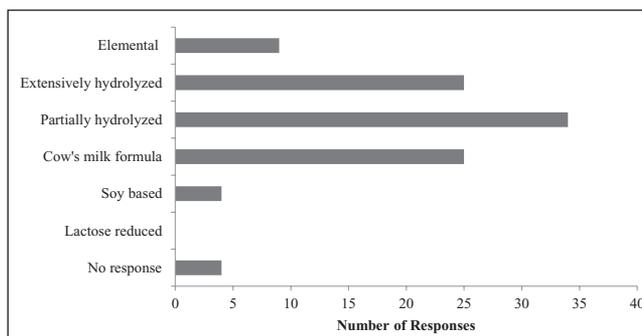


Figure 4) General paediatrician and dietitian recommendations regarding formula for an infant at high risk of developing allergic disease

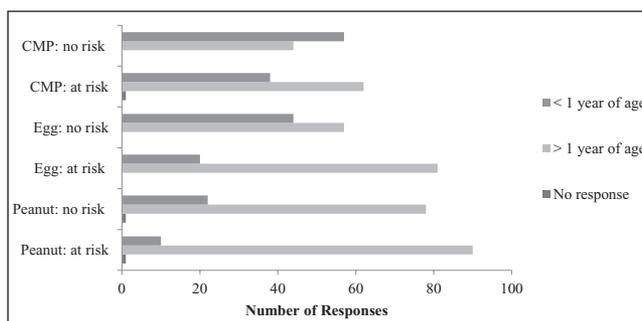


Figure 5) General paediatrician and dietitian recommendations regarding the age of introduction of commonly allergenic foods. CMP Cow's milk protein

The only statistically significant difference found was in the number of years in practice; paediatricians with >10 years experience in British Columbia were more likely to recommend breastfeeding as a way to prevent atopic dermatitis compared with paediatricians with >10 years experience in Atlantic Canada. Although direct comparisons could not be made between the responses to survey questions regarding formula and the introduction of solid foods due to differences in the survey questions, many Atlantic Canada and British Columbia paediatricians and dietitians advised delaying the introduction of commonly allergenic foods.

**DISCUSSION**

The present study demonstrated the differences between international guidelines and the advice given by general paediatricians and dietitians in Atlantic Canada with respect to early nutritional practices and allergic disease prevention. A significant portion of general paediatricians and dietitians continue to recommend maternal elimination diets during pregnancy and breastfeeding, and delayed introduction of commonly allergenic foods. The joint statement of Health Canada, the CPS and the Dietitians of Canada (27) does not recommend maternal elimination diets during pregnancy and breastfeeding and states that exclusive breastfeeding for the first six months of life appears to have a protective effect against the development of allergic disease in infants with a family history of atopy (one or both parents or sibling with allergic disease). Although not published at the time of the survey distribution, the updated joint statement from 2012 recommended that delayed introduction of commonly allergenic foods does not prevent the development of allergic disease. The differences in practice in Atlantic Canada compared with international guidelines are likely largely reflective of the lack of specific Canadian guidelines on early nutrition and allergic disease prevention at the time of the survey distribution.

The earliest possible nutritional influence on the development of allergic disease is the maternal diet during pregnancy. Studies conducted in the early 1980s raised questions regarding food antigens from the mother causing sensitization of the infant and the subsequent increased risk of developing allergic diseases in childhood. Based on this hypothesis, previous recommendations stated that women should avoid commonly allergenic foods during pregnancy and breastfeeding (8). However, current evidence does not support maternal elimination diets during pregnancy (9-11) or breastfeeding (12,13). Although it is encouraging that the majority of general paediatricians and dietitians do not advise that mothers avoid commonly allergenic foods during pregnancy and breastfeeding, approximately one-third continue to make this recommendation.

Exclusive breastfeeding has numerous benefits, including potential protection against developing allergic disease, especially atopic dermatitis (19-22). The present study found that, in Atlantic Canada, two-thirds of practitioners surveyed were regularly or always recommending breastfeeding as a way to prevent atopic dermatitis. The only statistically significant difference found between the Atlantic Canada and British Columbia studies was that paediatricians in British Columbia with >10 years experience were more likely to recommend breastfeeding as a way to prevent atopic dermatitis. Interestingly, British Columbia has one of the highest rates of breastfeeding in Canada (31). It is possible that further educating families on the benefits of breastfeeding and the possibility of allergic disease prevention may contribute to increased breastfeeding rates in Atlantic Canada. When breastfeeding is not an option, paediatricians and dietitians recommend partially and extensively hydrolyzed formulas more frequently. Recommendations for partially and extensively hydrolyzed formulas are on par with current research recommendations (23,24).

There has been a progressive delay in the timing of first exposure to commonly allergenic foods over the past 40 years. The recommendations for delayed introduction of cow's milk protein until one year of age, egg protein until two years of age and peanut protein until three years of age were largely based on expert opinion (32,33). It was previously believed that allergic sensitization occurred through oral ingestion of food and that delayed introduction of commonly allergenic foods would prevent development of food allergies. However, most food-induced allergic reactions occur with the first known oral exposure (34). This implies that allergic sensitization to food antigens may occur before oral ingestion, such as through inflamed skin (35-37). Current theories suggest that allergic sensitization occurs through skin exposure and early oral consumption of commonly allergenic foods will induce oral tolerance, thereby inhibiting the development of allergy (38,39). This is supported by lower rates of certain food allergies in countries where children have early oral exposure (40) and several published studies (14-18) have concluded that delayed introduction of commonly allergenic foods does not prevent allergic disease. A recent study (41) demonstrated an increased risk of developing egg allergy if introduction was delayed beyond one year of age compared with introduction at four to six months of age. The LEAP study (42), which is investigating the outcome of peanut allergy at five years of age in early versus delayed peanut protein introduction in 640 high-risk infants, is currently in progress. Given this recent evidence, the European Academy of Allergology and Clinical Immunology (25), the American Academy of Pediatrics (26) and the Australasian Society of Clinical Immunology and Allergy (43) are no longer recommending delayed introduction of commonly allergenic foods beyond four to six months of age. As of 2012, the joint statement by Health Canada, the CPS, the Dietitians of Canada and the Breastfeeding Committee for Canada

states there is no benefit to delayed introduction of solids beyond six months of age. According to both the Atlantic Canada and British Columbia studies, general paediatricians and dietitians continue to advise the delayed introduction of cow's milk, egg and peanut protein beyond one year of age. For the Atlantic Canada data, there was an observed difference, although not statistically significant, of more respondents advising delaying the introduction beyond one year of age in children who are at risk of allergic disease compared with those who are not at risk.

It is acknowledged that there were limitations to the present study. While the response rate for paediatricians was >50%, only 44 dietitians completed the survey. There was no method available with which to separate adult and paediatric dietitians before administering the survey. Because the survey was specific to the paediatric population, those dietitians who deal with adults may have been reluctant to complete the survey. It is also possible that an e-mail survey may have negatively affected the response rate for dietitians. These lower response rates may have had an impact on the ability to find a statistical difference between the responses from dietitians and general paediatricians. The present study was limited to Atlantic Canada and British Columbia. It would be of interest to survey other areas of Canada, as well as family physicians, to determine whether practices are consistent across the country.

## CONCLUSION

The increased rates of allergic disease over the past several decades has made the primary prevention of allergic disease in children of significant clinical importance. Research has found that early infant nutrition may have implications for the development of allergic disease. The present study highlights the differences between international guidelines and the advice given by general paediatricians and dietitians in Atlantic Canada with respect to recommendations for maternal elimination diets and the introduction of commonly allergenic foods. Some survey respondents continue to recommend maternal elimination diets and delayed introduction of commonly allergenic foods despite a growing body of recent evidence suggesting against these recommendations. These differences in practice demonstrate a need for enhanced education in this area.

**ACKNOWLEDGEMENTS:** The authors thank Marjorie Scott for distributing the survey to dietitians in Atlantic Canada and Jeff Dowden for statistical support.

## APPENDIX A: STUDY SURVEY

### TIMING OF COMPLEMENTARY FOOD INTRODUCTION

\*\* For the purpose of this survey infants at high risk of developing atopic disease are defined as having at least one first degree relative with asthma, eczema, allergic rhinitis or food allergy \*\*

For each question, please mark the box that applies to you

1. Occupation:

- Community general pediatrician
- Hospital based general pediatrician
- Community dietitian
- Hospital based dietitian

2. How long have you been in practice?

- 0 - <5 years
- 5 - <10 years
- 10 - <15 years
- ≥15 years

3. Gender:

- Male
- Female

4. Do you regularly or always advise mothers to abstain from eating peanut products during their pregnancy to prevent the development of peanut protein allergy in their child?
- Never
  - Rarely
  - Regularly
  - Always
5. Which mothers do you counsel to avoid allergenic foods during breastfeeding?
- Mothers of all infants
  - Mothers of infants with high risk of atopic disease
  - I do not counsel mothers to avoid allergenic foods during breastfeeding
6. Do you regularly or always advise mothers to abstain from eating peanut products while breastfeeding to prevent the development of peanut protein allergy in their child?
- Never
  - Rarely
  - Regularly
  - Always
7. Do you advise mothers that they should breastfeed for the first 4 months of life to prevent atopic dermatitis?
- Never
  - Rarely
  - Regularly
  - Always
8. Which of the following types of formulas are you most likely to recommend for an infant with a high risk of developing atopic disease including food allergies?
- Lactose-reduced formula
  - Partially hydrolyzed formula
  - Extensively hydrolyzed formula
  - Soy-based formula
  - Elemental formula
  - Cow's milk based formula
9. At which age do you recommend initial introduction of cow's milk protein into the diet of an infant at high risk of developing atopic disease including food allergies?
- <6 months
  - 6 months – <1 year
  - 1 year – <2 years
  - 2 years – <3 years
  - ≥3 years
10. At which age do you recommend initial introduction of cow's milk protein into the diet of an infant NOT at high risk of developing atopic disease including food allergies?
- <6 months
  - 6 months – <1 year
  - 1 year – <2 years
  - 2 years – <3 years
  - ≥3 years
11. At which age do you recommend initial introduction of egg into the diet of an infant at high risk of developing atopic disease including food allergies?
- <6 months
  - 6 months – <1 year
  - 1 year – <2 years
  - 2 years – <3 years
  - ≥3 years
12. At which age do you recommend initial introduction of egg into the diet of an infant NOT at high risk of developing atopic disease including food allergies?
- <6 months
  - 6 months – <1 year

- 1 year – <2 years
- 2 years – <3 years
- ≥3 years

13. At which age do you recommend initial introduction of peanut protein into the diet of an infant at high risk of developing atopic disease including food allergies?

- <6 months
- 6 months – <1 year
- 1 year – <2 years
- 2 years – <3 years
- ≥3 years

14. At which age do you recommend initial introduction of peanut protein into the diet of an infant NOT at high risk of developing atopic disease including food allergies?

- <6 months
- 6 months – <1 year
- 1 year – <2 years
- 2 years – <3 years
- ≥3 years

Thank you for completing this survey

Please return the survey in the self-addressed stamped envelope to:

Dr. Alison Haynes  
c/o Janeway Pediatric Research Unit  
Room 448, Janeway Hostel  
Memorial University of Newfoundland  
300 Prince Phillip Drive St. John's, NL A1B 3V6

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