

# Dietary exclusion for childhood atopic dermatitis

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## Abstract

**Question** Atopic dermatitis (AD) (eczema) is very common in childhood. Parents are often concerned that food allergy plays a role in their child's eczema presentation and practise elimination diets for symptom control. Should I recommend that children with AD eliminate cow's milk or eggs from their diets?

**Answer** There is insufficient evidence about the benefit of eliminating cow's milk in unselected patients with AD. Some evidence suggests that egg elimination might benefit those children with AD who are suspected of being allergic to eggs and who are sensitized to eggs; however, more research is needed in this population to guide the use of food elimination. Prolonged elimination diets that are not physician guided also put patients at risk of nutritional deficiencies and failure to thrive, and might actually contribute to the development of clinical food allergy.

## Exclusions alimentaires pour la dermatite atopique chez l'enfant

### Résumé

**Question** La dermatite atopique (eczéma) est très fréquente durant l'enfance. Les parents s'inquiètent souvent qu'une allergie alimentaire joue un rôle dans l'eczéma de leur enfant et procèdent à l'élimination d'aliments pour contrôler les symptômes. Faudrait-il que je recommande d'éliminer le lait de vache ou les œufs de l'alimentation des enfants souffrant de dermatite atopique?

**Réponse** Il n'y a pas de données probantes suffisantes démontrant les bienfaits de l'élimination du lait de vache chez des patients souffrant de dermatite atopique. Selon certaines données factuelles, l'élimination des œufs pourrait être bénéfique aux enfants chez qui on soupçonne une allergie aux œufs ou qui sont allergiques à cet aliment; toutefois, il faudrait plus de recherche dans cette population pour mieux guider le recours à l'élimination d'aliments. Des régimes d'élimination prolongés sans la supervision d'un médecin mettent les patients à risque de carences nutritionnelles, pourraient nuire à leur croissance et contribuer en fait au développement d'une allergie alimentaire clinique.

The management of childhood eczema is a source of great concern for both parents and health care providers. The prevalence of atopic dermatitis (AD) has tripled over the past 3 decades and affects 15% to 30% of children in industrialized countries.<sup>1,2</sup> Food elimination is also increasingly common.<sup>3</sup> In Canada, the prevalence of AD is estimated to be 8.5% for children aged 6 to 7 years and 9.4% for children aged 13 to 14 years.<sup>4</sup> The total cost of AD in Canada is estimated to be \$1.4 billion annually—most of which is borne by patients and employers.<sup>4</sup>

### Food allergy and AD

Since the first documented report of food allergy provoking AD in 1915,<sup>5</sup> parents and patients with AD continue to implicate food in disease flares,<sup>6</sup> an idea supported by the fact that food allergy is more common in children with AD—30% of them are affected compared with 4% to 10% in the general pediatric population.<sup>7</sup> However, it is possible that epidermal barrier dysfunction in AD acts as a

prerequisite to the penetration of food proteins and subsequent sensitization.<sup>1</sup> Therefore, it might be more likely that AD is involved in the pathogenesis of food allergy rather than oral consumption leading to AD exacerbation.

The diagnosis of eczematous food reactions is clinically challenging. Parental report of eczematous reactions might be a poor indicator of clinically relevant food allergy. In one study, among 64 children 1 to 10 years old with mild to moderate AD who visited a German outpatient dermatology clinic, the positive predictive value (PPV) of parental history for immediate reactions was 85%, while the PPV for eczematous reactions was 33%.<sup>8</sup> Delayed symptom onset might be one factor complicating the differentiation of eczematous food reactions from other confounding variables.<sup>6</sup> While noneczematous immunoglobulin E (IgE)-mediated food reactions, including urticaria and angioedema, tend to occur immediately after ingestion, eczematous reactions tend to be "late events," occurring 2 to 6 hours

after ingestion; they occur less frequently and might follow immediate reactions.<sup>9</sup> Immunoglobulin E-mediated reactions do not cause immediate exacerbation of AD.

Furthermore, positive results of allergy tests, such as elevated serum-specific IgE levels, or skin-prick tests in children with AD might not be clinically relevant. In fact, 40% to 90% of infants with moderate to severe AD are food sensitized based on positive results of skin-prick tests to 1 or more food allergens.<sup>9</sup> Similarly, nearly 80% of children with AD have elevated food- or pollen-specific IgE levels. However, only 35% to 40% of food-sensitized children with AD have clinical signs and symptoms of food allergy according to multiple double-blind, placebo-controlled food challenge studies.<sup>6</sup> Serum-specific IgE levels and skin-prick test results have a negative predictive value of more than 95% to exclude food allergy,<sup>7</sup> but the PPV for ruling in food allergy is only 30% to 50% for skin-prick testing and 20% to 60% for food-specific IgE levels.<sup>6,7</sup> Thus, test results have little clinical use if the child has been consuming and tolerating the food in question.

### Eczematous food reactions

Isolated eczematous reactions, especially in the absence of an immediate-type allergic reaction, are uncommon. Rowlands et al studied 19 children hospitalized for AD between 1986 and 2003. Out of 58 double-blind, placebo-controlled food challenges, only 1 eczematous food reaction was observed.<sup>10</sup> In a retrospective study, Breuer et al reported a total of 106 food challenges for cow's milk, hen's egg, wheat, and soy in 64 children with mild to severe AD. Most children (64%) were reported to have a positive reaction to at least 1 type of food. Isolated eczematous reaction was documented in 6% of all challenges. Combined immediate-type reaction followed by delayed eczematous reaction was documented in 21% of all challenges.<sup>8</sup> Among 501 children and 992 controlled oral challenges to cow's milk, hen's egg, wheat, and soy, Celik-Bilgili et al found 45% of all challenges ended in a clinical reaction but isolated eczematous reaction was observed in 6% of all challenges, and there were combined reactions in 7% of all challenges.<sup>11</sup> In the latter 2 studies,<sup>8,11</sup> the authors did not report the proportion of participants in which isolated eczematous reactions occurred.

### Cow's milk and egg exclusion diets

Cow's milk and egg exclusion diets are common. Johnston et al reported that among children with AD seen in a dermatology clinic in Leicester, United Kingdom, 75% had tried food elimination; 48% of subjects had excluded all dairy products, 27% excluded eggs, and 25% excluded cow's milk. As much as 39% of families reported subjective improvement of AD symptoms with elimination.<sup>3</sup>

However, objective evidence for exclusion diets in unselected children with AD is lacking. A 2008 Cochrane review including 6 randomized controlled trials (RCTs) on egg and cow's milk exclusion did not support the use of dietary eliminations, and specifically showed no benefit of cow's milk or egg exclusion in children with AD. Primary outcome measures were change in parent-rated symptoms of atopic eczema within 6 weeks and the degree of long-term control, such as reduction in number of flares or reduced need for other treatments over 6 months.<sup>12</sup> One of the studies reported benefit specifically in egg-sensitized infants, when treated with an egg exclusion diet for 4 weeks, with adjusted mean affected surface area improvement of 9% in the diet group and 2.8% in the control group.<sup>13</sup>

In another single-blind crossover RCT, Leung et al studied 15 children with AD and compared the effects of using an amino acid-based elemental formula with those of a cow's milk-based formula. There were no differences in severity scores for AD, affected surface area, intensity of pruritus, sleep loss components, or global health scores during the active or placebo phase. When analyzed for sensitized children, results remained insignificant.<sup>14</sup>

A 2011 double-blind RCT from Shanghai, China, reported that nonsensitized infants with mild to moderate AD had significantly reduced AD severity scores when 58 of them were fed partially hydrolyzed cow's milk formula, compared with 30 children in the control group (cow's milk formula).<sup>15</sup> Severity scores were significantly reduced at weeks 4, 8, and 12 compared with time of enrolment ( $P < .05$ ). However, almost a quarter of the patients dropped out early in this study. More studies are needed to clarify the role of cow's milk and egg exclusion in AD management.

### Elimination diet risks

Perceived food reactivity and exclusion diets are not without harm. Marklund et al studied adolescents with perceived food allergy-like conditions and found affected adolescents had lower health-related quality-of-life scores on 7 out of 8 scales in the 36-Item Short Form Health Survey, including limits on work and daily activities, personal evaluation of general and mental health, energy, and social activities. Results were unaffected by formal diagnosis of food allergy.<sup>16</sup> Moreover, as most patients eliminate multiple foods and only 51% consult with a physician or dietitian,<sup>3</sup> elimination can place patients at risk of nutritional deficiencies. Liu et al reported 12 cases of kwashiorkor in children 1 to 22 months of age in 7 tertiary referral centres across the United States, most of which were secondary to "nutritional ignorance, perceived milk intolerance, or food faddism."<sup>17</sup> Christie et al showed that more than 25% of children on strict elimination diets consumed less than 67% of the daily recommended intake of calcium, vitamin D, and vitamin E. Children who eliminated more than 2 types of food were shorter than those who eliminated only 1 type of food.<sup>18</sup>

Prolonged elimination diets might lead to loss of tolerance and development of clinical food allergy. Flinterman et al studied 11 children with AD on a prolonged cow's milk elimination diet secondary to asymptomatic sensitization. In a double-blind, placebo-controlled oral cow's milk challenge, all subjects developed immediate reactions, despite having tolerated cow's milk before elimination. No eczematous reactions following challenge were documented.<sup>19</sup> This finding might support the dual-allergen-exposure hypothesis, in which early low-dose cutaneous exposure to food allergens leads to allergic sensitization, whereas early oral consumption of food proteins induces immune tolerance.<sup>19</sup>

A carefully thought-out clinical approach and parent education is key to avoiding unnecessary eliminations. In one such clinical algorithm, placing emphasis on stringent adherence to topical therapies and parent education, allergy tests should be conducted only in children with a clear history of immediate reaction to a particular food. Children with moderate to severe symptoms, refractory to topical therapies, should have a short elimination trial (3 to 4 weeks) with close monitoring if eczematous food allergy is strongly suspected. Double-blind, placebo-controlled oral food challenge is the criterion standard for diagnosing delayed eczematous reactions.<sup>20</sup>

## Conclusion

Current evidence does not support eliminating cow's milk or eggs in unselected children with AD. Such exclusion might play a role in AD management in infants sensitized to those foods; however, more research is needed to determine a protocol to do so. It is best to focus on topical treatments and consider allergy testing only in children with a clear history of immediate reaction. 🌿

### Competing interests

None declared

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