

Evolution of the Rourke Baby Record as evidence mounts about food allergy prevention

Review and practical tips

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The Rourke Baby Record (RBR), first published in 1985, is a clinical tool for preventive health visits in early childhood (0 to 5 years of age) used by primary care providers across Canada.¹⁻³ Over the years, the RBR recommendations for allergenic food introduction have drastically changed, reflecting the available evidence base. From 1985 to 2011, the RBR recommended that eggs and peanuts be avoided until 12 to 13 months of age (from 2000 to 2011, the recommendation was that egg yolks could be reasonably introduced at 6 months of age). This recommendation was in keeping with the prevailing theory at the time that sensitization occurred through the gastrointestinal tract and that avoidance of allergenic solids allowed for gut maturity.⁴ The recommendation was supported by observational studies noting an increased risk of atopic disease with solid food introduction at 3 versus 6 months of age and with increased dietary diversity early in life.^{5,6}

However, after the release of these recommendations, which were in keeping with other international recommendations to avoid allergenic solid foods,⁴ studies emerged supporting early introduction of allergenic solid foods as a means of allergy prevention. As a striking example, a 2010 observational study comparing prevalence of peanut allergy in Jewish school children in the United Kingdom (where peanut introduction was delayed) versus Israel (where peanut was introduced early in infancy and is a staple of the infant diet) demonstrated a 10-fold higher rate of peanut allergy in the United Kingdom (1.85% vs 0.17%; $P < .001$).⁷ Several observational studies also noted that early introduction of wheat, egg, and cow's milk reduced the risk of food allergy.⁸⁻¹⁰ In addition, a growing body of evidence supported the concept that food allergy is caused by transcutaneous exposure to food allergens in infants with eczema in the absence of ingestion, a concept termed the *dual-allergen exposure hypothesis*.¹¹ Based on this hypothesis, early ingestion would promote tolerance while delayed ingestion (especially in the presence of eczema, which increases transcutaneous sensitization) might increase the risk of food allergy. Studies have noted that the filaggrin mutation, which is related to skin barrier dysfunction and is present in about half of infants with eczema, is also linked to the development of peanut allergy.^{12,13}

As a result of these developments, a substantial shift in the RBR occurred as of 2014, when delaying the introduction of priority food allergens was no longer recommended

for the prevention of food allergies in any infant, including those at risk of atopy.¹ After the release of the 2014 RBR, a key randomized controlled trial supported early peanut introduction as a means of peanut allergy prevention in high-risk infants.¹⁴ The LEAP (Learning Early About Peanut) study randomized 640 high-risk infants (defined as having severe eczema or egg allergy) into early (4 to 11 months) and delayed (5 years) peanut introduction, and demonstrated a significant reduction in peanut allergy with early introduction (3.2% vs 17.2%; $P < .001$).¹⁴ In addition, a randomized controlled trial of early egg introduction was so successful that it was halted prematurely. The PETIT (Prevention of Egg Allergy with Tiny Amount Intake) study demonstrated in infants with eczema that randomization to early heated egg introduction at 6 months of age versus avoidance until a year of age was associated with a significantly decreased rate of egg allergy (8% vs 38%; $P = .0001$).¹⁵ A 2016 meta-analysis noted moderate-certainty evidence (5 trials; 1915 participants) that early egg introduction (4 to 6 months) was associated with reduced egg allergy (risk ratio of 0.56; 95% CI 0.36 to 0.87) and moderate-certainty evidence (2 trials; 1550 participants) that early peanut introduction (4 to 11 months) was associated with reduced risk of peanut allergy (risk ratio of 0.29; 95% CI 0.11 to 0.74).¹⁶ As a result, the statement on and supporting evidence for early introduction of allergenic foods in the 2017 version of the RBR were even stronger: "Delaying the introduction of priority food allergens is not currently recommended to prevent food allergies, including for infants at risk of atopy."³ Guidelines around the world have also gradually adopted the most recent evidence on the introduction of complementary and allergenic foods (**Box 1**), including a recent Canadian Paediatric Society practice point recommending introduction of allergenic solids at around 6 months but not before 4 months of age in infants at risk.¹⁷

Of note, the recommendations have remained unchanged for breastfeeding mothers, for whom there is no new evidence to support the prevention of childhood allergic disease with maternal dietary restrictions.¹⁸

Practicality of early allergenic introduction to infants

The RBR provides practical advice about how to introduce solid foods (including allergenic solids) to infants, which is mirrored by the advice given by the American Academy of Allergy, Asthma & Immunology and the Canadian

Box 1. Guidelines, consensus statements, and associated resources for introduction of solid and allergenic foods

Rourke Baby Record

- Available from: www.rourkebabyrecord.ca

Canadian Paediatric Society practice point

- Summary for clinicians: <https://www.cps.ca/en/documents/position/allergenic-solids>
- Summary for parents and caregivers regarding general introduction of solids: https://www.caringforkids.cps.ca/handouts/feeding_your_baby_in_the_first_year

National Institute of Allergy and Infectious Diseases–sponsored 2017 Expert Panel Guidelines

- Available from: <https://www.niaid.nih.gov/diseases-conditions/guidelines-clinicians-and-patients-food-allergy>
- Summary for clinicians: <https://www.niaid.nih.gov/sites/default/files/peanut-allergy-prevention-guidelines-clinician-summary.pdf>
- Summary for parents and caregivers: <https://www.niaid.nih.gov/sites/default/files/peanut-allergy-prevention-guidelines-parent-summary.pdf>
- Instructions for parents and caregivers on feeding peanut protein to infants: https://www.niaid.nih.gov/sites/default/files/addendum_guidelines_peanut_appx_d.pdf

Australian Consensus on Infant Feeding Guidelines 2017 (from the Australasian Society of Clinical Immunology and Allergy, Centre for Food and Allergy Research, National Allergy Strategy, and Australian Infant Feeding Summit Consensus Group)

- Available from: <https://www.allergy.org.au/hp/papers#p7>
- Summary for clinicians: https://www.allergy.org.au/images/stories/pospapers/ASCI_HP_guide_introduction_peanut_infants_2017.pdf
- Summary for parents and caregivers: https://www.allergy.org.au/images/pcc/ASCI_PCC_How_to_introduce_solid_foods_FAQ_2018.pdf

Paediatric Society.^{17,19} In general, solid foods should be introduced around 6 months and not before 4 months. It is recommended that iron-containing foods be the first solid initiated, and that caregivers wait about 2 days between introducing new solid foods.²⁰ Once a few complementary foods have been tolerated, allergenic solids can be introduced in an age-appropriate manner to prevent choking (eg, whole nuts should be avoided until 4 years of age). Allergenic solids should be introduced one at a time at home, and if well tolerated, should be consumed regularly (although the optimal frequency is unknown). The Canadian Paediatric Society recommends that allergenic solids, if well tolerated, be ingested a few times a week.

Practical means of peanut introduction are reviewed in depth in the recently released National Institute of Allergy and Infectious Diseases (NIAID) guideline about peanut allergy prevention.²¹ As a general instruction, it is recommended that the infant is fed a peanut-containing food for the first time when they are healthy and in the presence of an adult who can observe the child for a

reaction. Age-appropriate options in infancy include thinned smooth peanut butter (peanut butter mixed with hot water and allowed to cool), smooth peanut butter mixed with pureed fruit, or peanut-containing snacks (eg, Bamba, a dissolvable peanut puff product used in the LEAP trial). Practical physician and parent resources are listed in **Box 1**. A parent handout with practical tips on introducing allergenic foods is presented in **Box 2**.^{17,19}

Ongoing controversies

There is no international guideline consensus on the definition of an infant at high risk of food allergy. While the Canadian Paediatric Society position statement defines an infant at high risk as an infant with a first-degree relative with an allergic condition or an atopic condition such as eczema,¹⁷ the NIAID guideline defines an infant at high risk of peanut allergy as an infant with severe eczema or egg allergy.²¹ High rates of atopy are found in general populations of infants; the Enquiring About Tolerance (EAT) study noted that among 1303 general population infants, 24.3% had eczema and 62.6% had a maternal history of atopy (although severity of atopic conditions might differ among populations at risk).²² As a result, the infants who would most benefit from targeted interventions remain undefined.

There are discrepancies among guidelines about whether allergy testing is required in some infants before peanut ingestion. While no guidelines recommend screening before introduction of any highly allergenic foods other than peanut, the NIAID guideline strongly recommends that infants with severe eczema or egg allergy be evaluated with peanut-specific immunoglobulin E measurement, a skin prick test, or both, before peanut introduction.²¹ In contrast, the newly released Australian consensus guidelines on infant feeding do not recommend screening before peanut introduction.²³ The Canadian Paediatric Society practice point does not mention any indication for preemptive screening either.¹⁷

Not all randomized controlled trials have supported early introduction of egg to prevent egg allergy. For those that found a lack of evidence for early introduction, pasteurized raw egg powder was used, which is a highly allergenic and impractical means of feeding egg to an infant.²⁴⁻²⁷ In addition, the degree of adherence to early allergenic introduction protocols (at 4 months old) remains to be seen—the EAT study, which examined early introduction of 6 allergenic foods at 3 months of age versus 6 months of age, noted poor adherence with very early allergenic introduction (42.8% adhered to the protocol), although early introduction in the EAT study was earlier (3 months) than currently recommended by guidelines for allergy prevention.²²

Studies are ongoing and will shed further light on early introduction of allergenic foods. Trials include the PreventADALL (Preventing Atopic Dermatitis and Allergies in Children) study, which is a European populational cohort study examining early introduction of egg, milk, wheat,

Box 2. Practical tips to introduce allergenic foods

The following are practical tips for parents to introduce allergenic foods to infants:

- Introduce allergenic solids a few weeks before or at around 6 months but not before 4 months of age if the child has eczema or parents and siblings have allergies. Otherwise, start allergenic solids at around 6 months of age
- Do not introduce a common allergenic food as the first solid food for an infant. Wait until a few complementary foods have been introduced first
- Look for signs that the baby is ready for solid foods before introducing them; these include sitting without support, good control of neck muscles, interest in food, opening the mouth when food is approaching, holding food in the mouth without immediately pushing it out with the tongue, and the ability to turn the head away or lean back when uninterested in food
- Introduce allergenic solid foods into the diet one at a time in an age-appropriate way (to prevent choking), with about 2 days between each allergenic solid, at home in the presence of an adult
- If the solid is well tolerated, keep it in the infant's diet—ideally a few times a week for cow's milk, egg, and nut products. If any reaction is noted, seek medical attention
- For egg introduction, use egg products such as hardboiled, scrambled, or steamed egg, all of which can be pureed and mixed with breast milk or boiled water to the desired consistency and cooled before serving
- Consider the following as one example of how to prepare a nut product: mix 2 teaspoons of peanut butter with 2 to 3 tablespoons of boiled water, breast milk, pureed fruit, or pureed vegetable (previously tolerated). Adjust to desired consistency and let cool before serving

Adapted from Abrams et al¹⁷ and Fleischer et al.¹⁹

and peanut by 4 months of age (trial registration number NCT02449850; ClinicalTrials.gov), and the PEAAD (Preventing Peanut Allergy in Atopic Dermatitis) study examining the association between age of peanut introduction and rate of peanut allergy in high-risk infants with eczema.²⁸

Conclusion

As evidence has evolved, so too has the RBR to reflect the best evidence-based recommendations on allergy prevention in the Canadian pediatric population. Future RBR updates will continue to appraise the latest literature to give primary care providers guidance on unresolved controversies, including which infants to preemptively screen for allergies and the optimal timing and frequency of allergenic food introduction.

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Competing interests

None declared

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References

1. Riverin B, Li P, Rourke L, Leduc D, Rourke J. Rourke Baby Record 2014. Evidence-based tool for the health of infants and children from birth to age 5. *Can Fam Physician* 2015;61:949-55 (Eng), e491-8 (Fr).
2. Rourke JT, Rourke LL. Well baby visits: screening and health promotion. *Can Fam Physician* 1985;31:997-1002.
3. Li P, Rourke L, Leduc D, Arulthas S, Rezk K, Rourke J. Rourke Baby Record 2017. Clinical update for preventive care of children up to 5 years of age. *Can Fam Physician* 2019;65:183-91 (Eng), e99-109 (Fr).
4. American Academy of Pediatrics. Committee on Nutrition. Hypoallergenic infant formulas. *Pediatrics* 2000;106(2 Pt 1):346-9.
5. Kajosaari M. Atopy prevention in childhood: the role of diet. Prospective 5-year follow-up of high-risk infants with six months exclusive breastfeeding and solid food elimination. *Pediatr Allergy Immunol* 1994;5(6 Suppl):26-8.
6. Fergusson DM, Horwood LJ, Shannon FT. Early solid feeding and recurrent childhood eczema: a 10-year longitudinal study. *Pediatrics* 1990;86(4):541-6.
7. Du Toit G, Katz Y, Sasieni P, Mesher D, Maleki SJ, Fisher HR, et al. Early consumption of peanuts in infancy is associated with a low prevalence of peanut allergy. *J Allergy Clin Immunol* 2008;122(5):984-91.
8. Poole JA, Barriga K, Leung DY, Hoffman M, Eisenbarth GS, Rewers M, et al. Timing of initial exposure to cereal grains and the risk of wheat allergy. *Pediatrics* 2006;117(6):2175-82.
9. Koplin JJ, Osborne NJ, Wake M, Martin PE, Gurrin LC, Robinson MN, et al. Can early introduction of egg prevent egg allergy in infants? A population-based study. *J Allergy Clin Immunol* 2010;126(4):807-13.
10. Katz Y, Rajuan N, Goldberg MR, Eisenberg E, Heyman E, Cohen A, et al. Early exposure to cow's milk protein is protective against IgE-mediated cow's milk protein allergy. *J Allergy Clin Immunol* 2010;126(1):77-82.e1. Epub 2010 Jun 11.
11. Lack G. Update on risk factors for food allergy. *J Allergy Clin Immunol* 2012;129(5):1187-97. Epub 2012 Mar 30.
12. O'Regan GM, Irvine AD. The role of flaggrin in the atopic diathesis. *Clin Exp Allergy* 2010;40(7):965-72.
13. Asai Y, Greenwood C, Hull PR, Alizadehfar R, Ben-Shoshan M, Brown SJ, et al. Flaggrin gene mutation associations with peanut allergy persist despite variations in peanut allergy diagnostic criteria or asthma status. *J Allergy Clin Immunol* 2013;132(1):239-42. Epub 2013 May 16.
14. Du Toit G, Roberts G, Sayre PH, Bahnsen HT, Radulovic S, Santos AF, et al. Randomized trial of peanut consumption in infants at risk for peanut allergy. *N Engl J Med* 2015;372(9):803-13. Epub 2015 Feb 23. Erratum in: *N Engl J Med* 2016;375(4):398.
15. Natsume O, Kabashima S, Nakazato J, Yamamoto-Hanada K, Narita M, Kondo M, et al. Two-step egg introduction for prevention of egg allergy in high-risk infants with eczema (PETIT): a randomised, double-blind, placebo-controlled trial. *Lancet* 2017;389(10066):276-86. Epub 2016 Dec 9.
16. Ierodiakonou D, Garcia-Larsen V, Logan A, Groome A, Cunha S, Chivinge J, et al. Timing of allergenic food introduction to the infant diet and risk of allergic or autoimmune disease: a systematic review and meta-analysis. *JAMA* 2016;316(11):1181-92.
17. Abrams EM, Hildebrand K, Blair B, Chan ES. Timing of introduction of allergenic solids for infants at high risk. *Paediatr Child Health* 2019;24(11):56-7. Epub 2019 Feb 15.
18. Chan ES, Cummings C, Canadian Paediatric Society, Community Paediatrics Committee and Allergy Section. Dietary exposures and allergy prevention in high-risk infants. A joint statement with the Canadian Society of Allergy and Clinical Immunology. *Paediatr Child Health* 2013;18(10):545-9.
19. Fleischer DM, Spergel JM, Assa'ad AH, Pongracic JA. Primary prevention of allergic disease through nutritional interventions. *J Allergy Clin Immunol Pract* 2013;1(1):29-36. Epub 2012 Nov 22.
20. Health Canada, Canadian Paediatric Society, Dietitians of Canada, Breastfeeding Committee for Canada. *Nutrition for healthy term infants: recommendations from six to 24 months*. Ottawa, ON: Government of Canada; 2014.
21. Togias A, Cooper SF, Acebal ML, Assa'ad A, Baker JR Jr, Beck LA, et al. Addendum guidelines for the prevention of peanut allergy in the United States: report of the National Institute of Allergy and Infectious Diseases-sponsored expert panel. *J Allergy Clin Immunol* 2017;139(1):29-44.
22. Perkin MR, Logan K, Tseng A, Raji B, Ayis S, Peacock J, et al. Randomized trial of introduction of allergenic foods in breast-fed infants. *N Engl J Med* 2016;374(18):1733-43. Epub 2016 Mar 4.
23. Netting MJ, Campbell DE, Koplin JJ, Beck KM, McWilliam V, Dharmage SC, et al. An Australian consensus on infant feeding guidelines to prevent food allergy: outcomes from the Australian Infant Feeding Summit. *J Allergy Clin Immunol Pract* 2017;5(6):1617-24. Epub 2017 May 9. Erratum in: *J Allergy Clin Immunol Pract* 2018;6(1):323.
24. Wei-Liang Tan J, Valerio C, Barnes EH, Turner PJ, Van Asperen PA, Kakakios AM, et al. A randomized trial of egg introduction from 4 months of age in infants at risk for egg allergy. *J Allergy Clin Immunol* 2017;139(5):1621-8.e8. Epub 2016 Oct 11.
25. Palmer DJ, Metcalfe J, Makrides M, Gold MS, Quinn P, West CE, et al. Early regular egg exposure in infants with eczema: a randomized controlled trial. *J Allergy Clin Immunol* 2013;132(2):387-92.e1. Epub 2013 Jun 26.
26. Palmer DJ, Sullivan TR, Gold MS, Prescott SL, Makrides M. Randomized controlled trial of early regular egg intake to prevent egg allergy. *J Allergy Clin Immunol* 2017;139(5):1600-7.e2. Epub 2016 Aug 20.
27. Bellach J, Schwarz V, Ahrens B, Trendelenburg V, Aksünger Ö, Kalb B, et al. Randomized placebo-controlled trial of hen's egg consumption for primary prevention in infants. *J Allergy Clin Immunol* 2017;139(5):1591-9.e2. Epub 2016 Aug 12.
28. Grimshaw K, Logan K, O'Donovan S, Kieley M, Patient K, van Bilsen J, et al. Modifying the infant's diet to prevent food allergy. *Arch Dis Child* 2017;102(2):179-86. Epub 2016 Aug 16.

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