Prevalence and determinants of food allergy in the era of early allergen introduction

The EarlyNuts Population-Based Study

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Full-text here:

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Why food allergy

- Food allergy is an abnormal immune response to foods.
- 9 common allergens: Milk, eggs, peanuts, tree nuts, fish, shellfish, wheat soybean, sesame
- Eating some of these foods early in life can prevent food allergies. Eg, peanut and egg.
- Infant feeding guidelines in Australia changed (2016): introduce common allergy-causing foods by age 1 year!
- Although most Australian infants now eat peanut and egg by age 6 months, some still develop food allergy despite the early introduction of allergens.

Aim

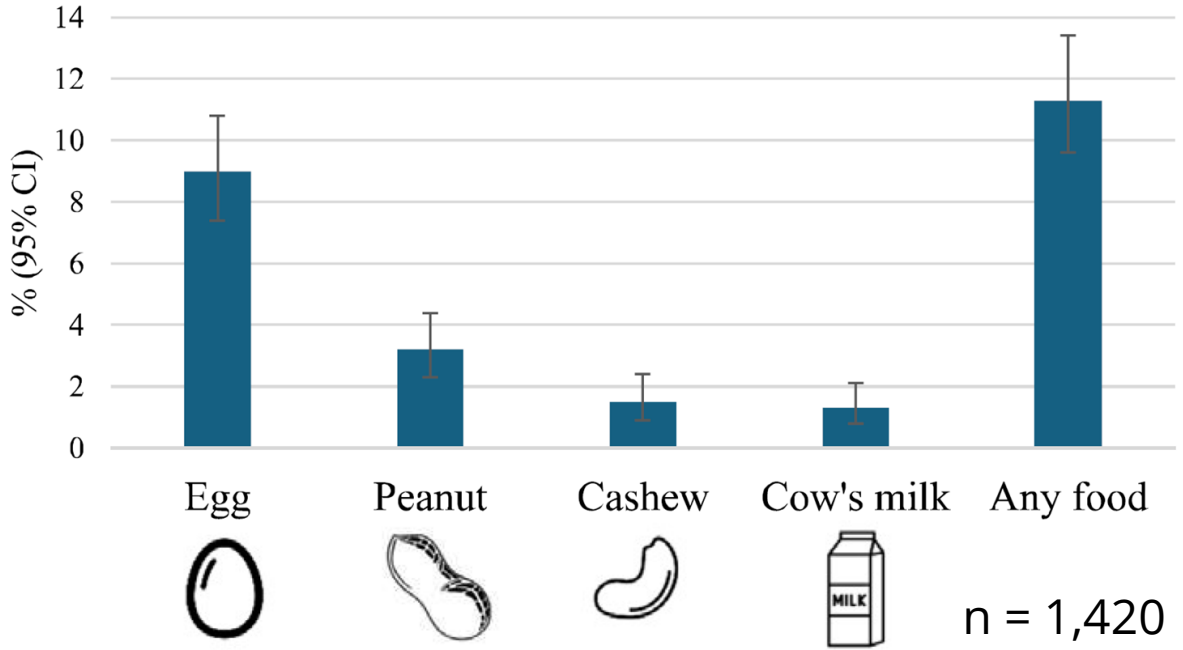
1. Identify **characteristics of infants who developed allergy** despite early introduction of allergens;
2. Estimate the causal **effect of modifiable exposures on food allergy** prevalence and whether this differed between infants who were introduced to allergens before or after age 6 months.

Methods

- Population-based sample
- 12-month-old infants
- Melbourne, Australia.
- Questionnaires and infant allergy testing
    - Gold-standard allergy tests: skin prick tests to four foods (peanut, egg, milk, cashew) and oral food challenges.
- Prevalence estimates were adjusted using inverse probability weighting.

Prevalence of food allergy

Any food: 11.3% (95% CI, 9.6-13.4)



n = 1,420

Who developed allergy despite early introduction of allergens

Parents born in Asia

Parental history of food allergy

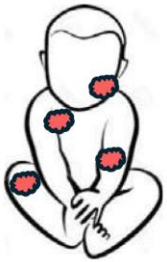
aOR 5.5 (95% CI 1.7-18.6)

	Peanut allergy			Egg allergy			Milk allergy		
Characteristic	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***
Parents' country of birth									
Australia	3/339 (0.9)	1.0		23/363 (6.3)	1.0		2/461 (0.4)	1.0	
One or both East Asia	7/64 (10.9)	12.54 (3.42-45.98)	**<.001**	14/96 (14.6)	2.55 (1.27-5.11)	**.009**	8/144 (5.6)	11.45 (2.76-47.49)	**.001**
Other	2/152 (1.3)	1.60 (0.31-8.19)	.574	11/205 (5.4)	0.86 (0.41-1.77)	.677	2/310 (0.6)	1.49 (0.26-8.65)	.657

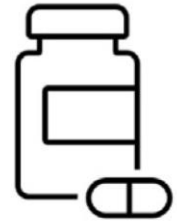
Effect of modifiable exposures on food allergy

Among infants who were introduced to X food ≤ 6 months…

Exposure	Food allergy n/N (%)	aOR (95% CI)	*P*
Eczema diagnosis			
No eczema	51/913 (5.6)	1.0	
7-12 mo	9/77 (11.7)	2.74 (1.30-5.79)	**.008**
0-6 mo and no topical steroid use	11/105 (10.5)	1.81 (0.90-3.64)	**.095**
0-6 mo and topical steroid use	47/153 (30.7)	6.55 (4.07-10.55)	**<.001**



Early-onset eczema



Antibiotic use

Antibiotic use by age 6 months

aOR 6.03; 95% CI, 1.15-31.60

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Funded by the NHMRC since 2013

Conclusion

- The prevalence of food allergy remained high, even though most children were given potential allergens early in life.
- Infants with Asian parents and early-onset eczema were more likely to have a food allergy irrespective of eating the allergen by age 6 months.
- Antibiotic use in the first year of life increased the risk of peanut allergy.
- New interventions are needed for infants with a phenotype of food allergy that is not amenable to early allergen introduction.

Full-text:

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Full-text here:

Appendix

TABLE IV. Effect estimates for association between potentially modifiable exposures and any food, peanut, or egg allergy

	Food allergy			Peanut allergy			Egg allergy		
Exposure	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***
Eczema diagnosis									
No eczema	51/913 (5.6)	1.0		14/928 (1.5)	1.0		38/916 (4.1)	1.0	
7-12 mo	9/77 (11.7)	2.74 (1.30-5.79)	**.008**	2/82 (2.4)	2.33 (0.59-9.27)	.228	8/77 (10.4)	3.26 (1.47-7.22)	**.004**
0-6 mo and no topical steroid use	11/105 (10.5)	1.81 (0.90-3.64)	**.095**	4/111 (3.6)	2.14 (0.70-6.49)	.180	7/105 (6.7)	1.73 (0.75-3.96)	.198
0-6 mo and topical steroid use	47/153 (30.7)	6.55 (4.07-10.55)	**<.001**	20/165 (12.1)	7.04 (3.32-14.91)	**<.001**	30/151 (19.9)	5.08 (2.92-8.83)	**<.001**
Pet dogs									
None	93/842 (11.0)	1.0		28/873 (3.2)	1.0		62/843 (7.4)	1.0	
Inside the home	17/273 (6.2)	0.58 (0.33-1.02)	**.057**	6/278 (2.2)	0.96 (0.39-2.36)	.934	14/274 (5.1)	0.71 (0.38-1.32)	.278
Outside the home	11/149 (7.4)	0.69 (0.36-1.32)	.260	6/151 (4.0)	1.59 (0.64-3.94)	.320	8/149 (5.4)	0.74 (0.35-1.58)	.442
Pet cats									
None	101/1,092 (9.2)	1.0		36/1128 (3.2)	1.0		67/1,093 (6.1)	1.0	
Inside the home	10/97 (10.3)	0.97 (0.45-2.08)	.933	2/99 (2.0)	0.76 (0.18-3.28)	.714	9/98 (9.2)	1.24 (0.55-2.82)	.602
Outside the home	10/75 (13.3)	1.71 (0.84-3.50)	.139	2/75 (2.7)	1.05 (0.24-4.58)	.945	8/75 (10.7)	1.97 (0.90-4.32)	**.092**
Childcare									
No	86/809 (10.6)	1.0		27/839 (3.2)	1.0		57/814 (7.0)	1.0	
Yes	35/454 (7.7)	0.74 (0.48-1.14)	.168	13/462 (2.8)	1.12 (0.55-2.25)	.760	27/451 (6.0)	0.86 (0.52-1.42)	.548
Antibiotic use									
Never used	71/801 (8.9)	1.0		18/820 (2.2)	1.0		49/802 (6.1)	1.0	
≤6 mo	31/243 (12.8)	1.50 (0.88-2.55)	.133	13/254 (5.1)	2.59 (1.12-5.98)	**.026**	21/242 (8.7)	1.52 (0.83-2.78)	.170
7-12 mo	21/242 (8.7)	1.05 (0.60-1.84)	.859	10/250 (4.0)	2.65 (1.12-6.24)	**.026**	15/243 (6.2)	1.06 (0.56-2.03)	.855

aOR, adjusted odds ratio.

P values less than .1 are bolded. Pet dog or cat was adjusted for parent country of birth and socioeconomic status (SES); childcare was adjusted for parent country of birth, siblings, sex, and SES; antibiotic use was adjusted for parent country of birth, family history of allergy, eczema, and SES; eczema was adjusted for parent country of birth and family history of allergy.

Appendix

TABLE III. Odds ratios of different food allergies for infant characteristics in those introduced to the allergen at age 6 mo or less

	Peanut allergy			Egg allergy			Milk allergy			Cashew allergy		
Characteristic	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***	**n/N (%)**	**aOR (95% CI)**	***P***
Sex												
Male	6/304 (2.0)	1.0		29/375 (7.7)	1.0		6/528 (1.1)	1.0		1/52 (1.9)	1.0	
Female	8/293 (2.7)	1.37 (0.49-3.85)	.553	26/350 (7.4)	0.96 (0.56-1.66)	.881	6/463 (1.3)	1.14 (0.38-3.41)	.812	2/40 (5.0)	2.23 (0.28-17.61)	.447
Parents' country of birth												
Australia	3/339 (0.9)	1.0		23/363 (6.3)	1.0		2/461 (0.4)	1.0		1/56 (1.8)	1.0	
One or both East Asia	7/64 (10.9)	12.54 (3.42-45.98)	**<.001**	14/96 (14.6)	2.55 (1.27-5.11)	**.009**	8/144 (5.6)	11.45 (2.76-47.49)	**.001**	1/ 9 (11.1)	6.53 (0.61-70.23)	.122
Other	2/152 (1.3)	1.60 (0.31-8.19)	.574	11/205 (5.4)	0.86 (0.41-1.77)	.677	2/310 (0.6)	1.49 (0.26-8.65)	.657	1/19 (5.3)	3.00 (0.29-30.64)	.354
Siblings, per sibling												
0	9/292 (3.1)	1.0		32/346 (9.2)	1.0		4/450 (0.9)	1.0		1/47 (2.1)	1.0	
1	3/204 (1.5)	0.50 (0.14-1.79)	.287	14/245 (5.7)	0.63 (0.33-1.21)	.166	8/351 (2.3)	2.41 (0.75-7.73)	.141	2/30 (6.7)	2.26 (0.27-18.61)	.449
≥2	0/60 (0.0)	0.20 (0.01-3.67)	.280	3/77 (3.9)	0.47 (0.15-1.48)	.199	0/127 (0.0)	0.39 (0.02-7.31)	.526	0/ 7 (0.0)	1.96 (0.06-61.55)	.702
Family history of allergy*,†												
Parents: not allergic	7/219 (3.2)	1.0		20/280 (7.1)	1.0		3/412 (0.7)	1.0		1/33 (3.0)	1.0	
Parents: allergic	7/365 (1.9)	0.72 (0.23-2.25)	.568	34/426 (8.0)	1.39 (0.74-2.60)	.308	9/562 (1.6)	1.81 (0.52-6.29)	.353	2/54 (3.7)	0.97 (0.11-8.27)	.975
Siblings: not allergic	3/159 (1.9)	1.0		9/199 (4.5)	1.0		5/296 (1.7)	1.0		2/27 (7.4)	1.0	
Siblings: allergic	0/105 (0.0)	0.09 (0.00-1.91)	.122	8/123 (6.5)	1.36 (0.51-3.60)	.537	3/182 (1.6)	0.76 (0.19-3.07)	.703	0/10 (0.0)	0.45 (0.02-11.51)	.628
Family history of food allergy†												
Parents: not allergic	13/531 (2.4)	1.0		52/640 (8.1)	1.0		8/874 (0.9)	1.0		3/78 (3.8)	1.0	
Parents: allergic	1/53 (1.9)	1.24 (0.21-7.35)	.811	2/66 (3.0)	0.52 (0.14-1.93)	.332	4/100 (4.0)	5.53 (1.65-18.56)		0/ 9 (0.0)	1.16 (0.05-26.75)	.928
Siblings: not allergic	3/242 (1.2)	1.0		16/296 (5.4)	1.0		7/441 (1.6)	1.0		2/34 (5.9)	1.0	
Siblings: allergic	0/22 (0.0)	1.06 (0.05-25.05)	.969	1/26 (3.8)	0.96 (0.16-5.74)	.965	1/37 (2.7)	1.63 (0.26-10.35)	.604	0/ 3 (0.0)	6.43 (0.11-379.65)	.371

aOR, adjusted odds ratio.

Values are presented as % allergic (n/N). *P* values less than .1 are bolded. Odds ratio are adjusted via inverse probability weighting. Firth logistic regression was used to calculate odds ratios when there were zero cells.

*Family history of eczema, asthma, hay fever, or food allergy.

†Odds ratio adjusted for parent country of birth.