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The effect of eczema, environment and sociodemographic factors on the development of food allergy

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Disclosures

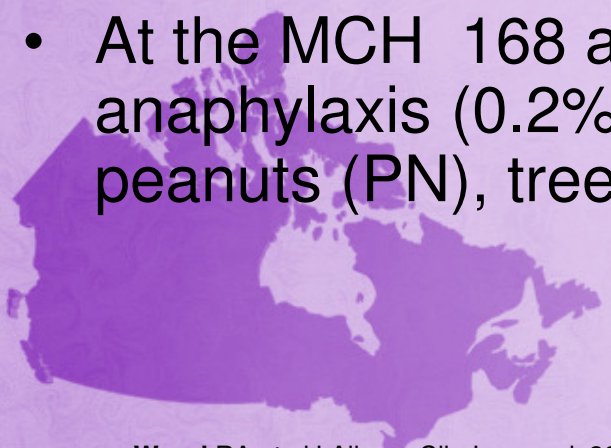
- Consultant Sanofi
- Consultant Novartis.

Outline

- Background: food allergy definition, prevalence.
- Is food allergy increasing ?
- Why ? Assessing potential determinants of food allergy: eczema , demographics and lifestyle factors
- Knowledge gaps
- Future ditrections

Prevalence and burden

- Food allergy affects up to 2.5% of the adult population and 6–8% of children less than 3 years of age in the US.
- The prevalence of anaphylaxis in the general population is at least 1.6% and probably higher.
- The rate of anaphylaxis-related hospitalizations increased from 21.0 to 25.1 per million population between 1999 and 2009 .
- At the MCH 168 among 81,677 yearly ED visits are related to anaphylaxis (0.2%) and 85% of these due to foods [mainly peanuts (PN), tree nuts (TN)].



Wood RA et alJ Allergy Clin Immunol. 2014 Feb;133(2):461-7. **Ben-Shoshan** et al. J Allergy Clin Immunol. 2013 Sep;132(3):739-741
Ma L et al .J Allergy Clin Immunol. 2013 Dec 12. pii: S0091-6749(13)016

Classification

Adverse reaction to food

An abnormal Rx resulting from food ingestion

- Immune mediated
  - IgE mediated
  - Non-IgE
- Non immune Mediated (food intolerance)

Majority of Rx

- enzymatic — Lactase def-(10% of caucasian)
- pharmacologic
- Toxic — Salmonella toxin
- undefined

(EAACI 1995 Lomabrdo 2006, NIAID-Sponsored Expert Panel, JACI 2010
)


EpiPen Jr 2-Pak
EpiPen 2-Pak
EpiPen
Epinephrine Auto-Injector
Twinject

Diagnosis

SPT (skin prick test)

- Most infants have a sig detectable SPT at 3 months
- Skin tests may be false positive in 50% of cases

Specific IgE level

- Specific cut off levels were published for specific food allergens.

- Keet et al. J Allergy Clin Immunol. 2012 Nov;130(5)

Food challenge

- Types: -open challenge
  -single blind
  - Double Blind Placebo Controlled

Diagnosis of specific food allergy relies on a careful history supplemented by confirmatory testing

- What is the prevalence of food allergy in Canada?
- Is prevalence increasing ?
- If yes why?

The SCAAALAR study (**S**urveying **C**anadians to **A**ssess the Prevalence of Common Food **A**llergies and **A**ttitudes towards Food **LA**belling and **R**isk)

A population-based study on peanut, tree nut, fish, shellfish, and sesame allergy prevalence in Canada

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Study Aims

- Prevalence of common food allergies
  - Peanut, tree nut
  - Shellfish, fish
  - Sesame.
- To identify potential demographic predictors of food allergies in Canada.

Methods

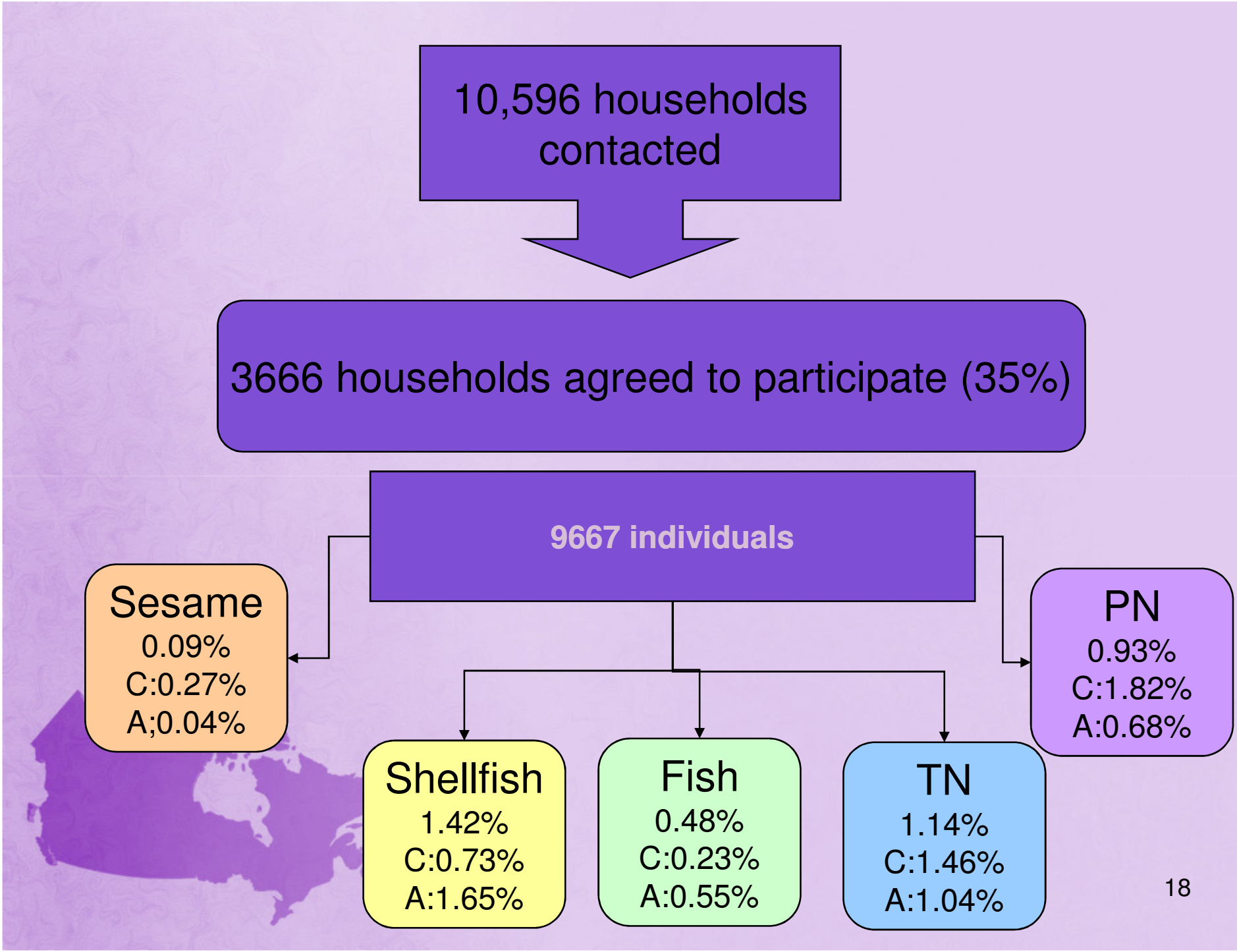
- Cross-sectional, nationwide, random telephone survey .
- Comparable methodology to Sicherer et al in the US (*JACI 2003;112:1203 & JACI 2004;114:159*).
- Eligible respondents : 18 years or older, living in the household, no language-mental-hearing barrier.
- At least ten attempts to contact households and calling done on different days and at different times during the day.

Food Allergy: Definitions

1. **Perceived:** **Self-reported food allergy**

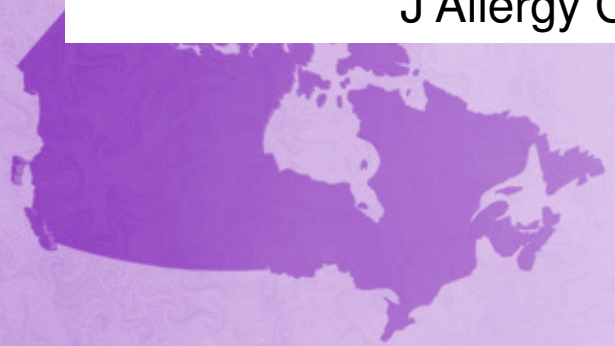
2. **Probable:** **Self report of convincing history and/ or physician diagnosis**

3. **Confirmed:** **Clinical history with confirmatory tests provided by treating MD**


10,596 households contacted
3666 households agreed to participate (35%)
9667 individuals
Sesame
0.09%
C:0.27%
A;0.04%
Shellfish
1.42%
C:0.73%
A:1.65%
Fish
0.48%
C:0.23%
A:0.55%
TN
1.14%
C:1.46%
A:1.04%
PN
0.93%
C:1.82%
A:0.68%

- The overall prevalence for all foods in Canada was 8.07%(6.2%-7.2%)

Soller L, **Ben-Shoshan** M, Harrington DW, Fragapane J, Joseph L, St Pierre Y, Godefroy SB, La Vieille S, Elliott SJ, Clarke AE.
J Allergy Clin Immunol. 2012 Oct;130(4):986-8



			Diff	(95% CI)
PN (perceived)	1.00	0.62%	0.2%	(0.02%, 0.52%)
Children	1.77	0.83	0.88%	(0.24%, 1.52%)
Adults	0.78	0.59	-0.05	(-0.30, 0.20)
TN (perceived)	1.22	0.66	0.44	(0.18, 0.71)
Children	1.73	0.51	1.15	(0.55, 1.76)
Adults	1.07	0.74	0.17	(-0.10,0.50)
Fish	0.48	0.39	0.07	(-0.10, 0.23)
Shellfish (probable)	1.42	2.03	-0.69	(-0.37, -1.01)
Children	0.50	0.52	0.26	(-0.20,0.70)
Adults	1.69	2.54	-0.96	(-0.56, -1.37)

- Is the prevalence of food allergy increasing ?

Methods

- Random sample of K – Gr 3 children
- Public and private schools
- Same methodology for 2000/2002 and 2005/2007

- Survey
- Skin prick tests
- Peanut specific IgE levels
- Food challenge

Methods

Grouping by questionnaire

- 1. PN tolerant
- 2. Never ingested
- 3. Convincing Hx
- 4. Uncertain Hx

Methods

Convincing Hx of PN allergy

- + SPT
- IgE ≥0.35kU/L
- Positive FC

Methods

Never/rarely ingested PN

- + SPT **AND** IgE ≥15kU/L
- +SPT **AND** + FC

Uncertain Hx of PN allergy

- +SPT **AND** IgE ≥15kU/L
- +SPT **AND** + FC

Results

	Diff (00/02 and 05/07)	95% CI
Full responders	0.13%	-0.38%, 0.63%
Full and partial responders	0.30%	-0.27%, 0.87%
Full, partial and non-responders	0.28%	-0.15%, 0.70%

Conclusion

- Prevalence has remained relatively stable (1.6%)in Montreal school children between 2000/2002 and 2005/2007.

- Our findings are consistent with recent reports suggesting that the prevalence of eczema and asthma might have stabilized or decreased in developed countries which already have a relatively high prevalence of atopic conditions.

What factors are associated with the increased prevalence of food allergy?

Sex

- Anaphylaxis is more common in adult females potentially due to the effect of estrogens that enhance mast cell activation and allergic sensitization, and progesterone that inhibits histamine release, but potentiates IgE induction.
- Lower rate of physician diagnosis in males as adult males are known to be less likely to have a regular doctor.

Age

- PN allergy is usually manifested prior to age 2 yrs.
- Generally PN allergy is lifelong, but 20% may resolve.
- In North America shellfish allergy is the leading cause for food allergy in adults, while in in Asia shellfish allergy is reported to be the leading cause in children as well . Shellfish are introduced to the children's in Canada after age 5 .

Sampson 2004, Leung TF et al 2007

Education

- Education level may be associated with family lifestyle corresponding with less bacterial exposure.
- High health literacy .
- Increased endorsement of previous AAP recommendation.

Urban versus rural

- A higher prevalence in urban settings of asthma and eczema.
- Individuals living in a city consume more shellfish compared to non-urban areas.
- Studies in inner city reveal high levels of exposure to to cockroach (40%) and mites (in 19%) proteins. These cross-react with shellfish.

Wood et al. J Allergy Clin Immunol. 2011 Apr;127(4):913-9, Shafique RH et al.Allergy Rhinol (Providence). 2012 Fall;3(2):e74-90

Immigrants

- Recent studies suggest increased prevalence of allergic diseases that commensurate with length of stay in Westernized countries regardless of age at arrival, sex or atopic status.

- Asthma symptoms in Chinese adolescents were lowest among residents of mainland China, were greater for those in Hong Kong and those who had immigrated to Canada, and were highest among those born in Canada.

- Possibly due to western dietary habits and lifestyle

Wang HY ey al 2008

Foods and Atopic dermatitis

- 3 patterns of cutaneus reactions to food in pt with AD:
- 1.Immediate type IgE mediated.
- 2. pruritus occuring soon after ingestion of food with scratching leading to exacerbation of AD.
- 3.Exacerbations of AD 6-48h after exposure to food (may occur also after an immediate raction).

Breuer et al 2004, Wuthrich et al1993

Tolerance

(Lack JACI 2008)

- low-dose exposure to environmental foods (on tabletops, hands, and dust) through skin leads to TH2 responses

- Early high-dose oral consumption induces tolerance,

J Allergy Clin Immunol. 2011 March; 127(3-4): 661–667.
doi: 10.1016/j.jaci.2011.01.031
PMCID: PMC3081065

Loss-of-function variants in the filaggrin gene are a significant risk factor for peanut allergy

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Hygiene hypothesis

- Smaller family size, decreased exposure to pets and livestock, fewer infections during infancy, increased use of antibiotics and Vx.

•In animal models : certain bacterial components may repress the development of allergic reactions potentially through the induction of T regulatory.

Thorburn A et al . Pneumococcal conjugate vaccine-induced regulatory T cells suppress the development of allergic airways disease. Thorax 2010; 65(12):1053-60.

Hygiene hypothesis

- No correlation between the increase in allergic disorders and decrease in infection with pathogenic organisms.
- Unfortunate speculations that vaccinations would increase the risk for allergies.
- Updated hypothesis: dietary factors and their interaction with commensal, non-pathogenic microorganisms early in life may be protective against food allergies.

Frei Ret al . Microbiota and dietary interactions - an update to the hygiene hypothesis? Allergy 2012; 67(4):451-61

Genes

Atopy
(Eczema)

Lifestyle habits

(food introduction)

Demographics
(age, sex)

Conclusion

- Food allergy is common in Canadians and world wide (up to 8%)
- Timing of food introduction, presence of eczema and life style habits may affect the development of food allergies.

- Randomized controlled trials are required to establish the role of environmental factors and eczema in the development of food allergies.

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