

Effects of maternal and infant diets on allergic disease development outcomes

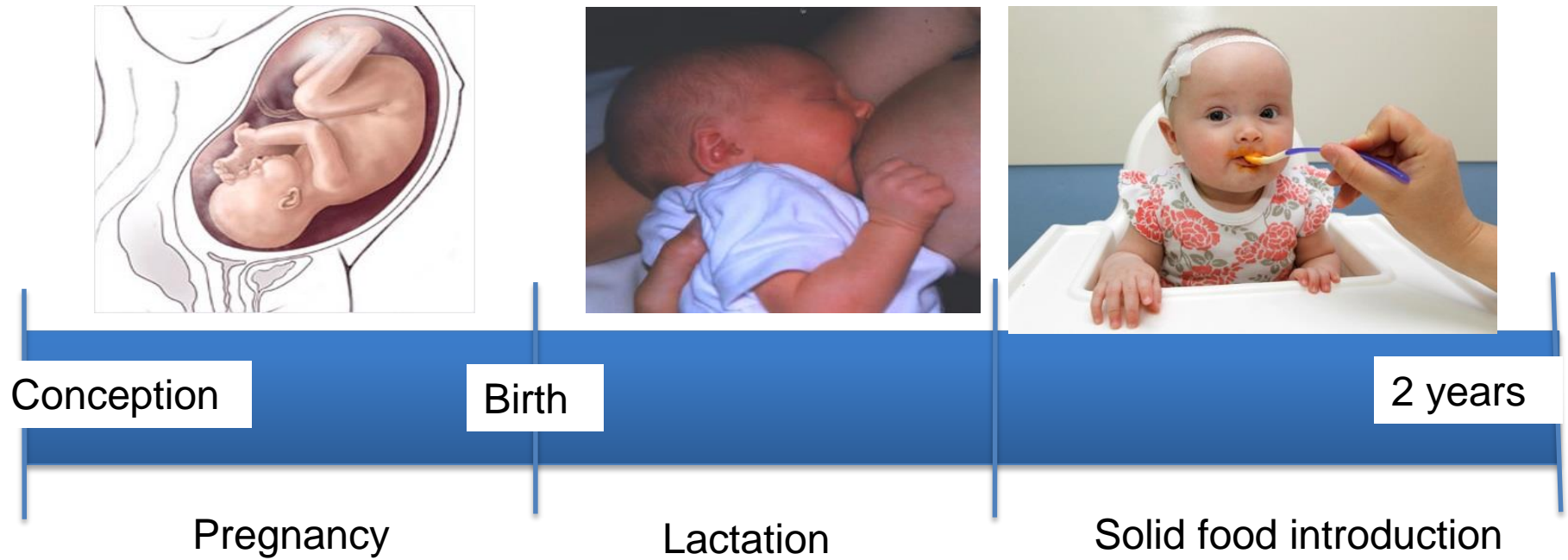
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The critical window in allergy prevention

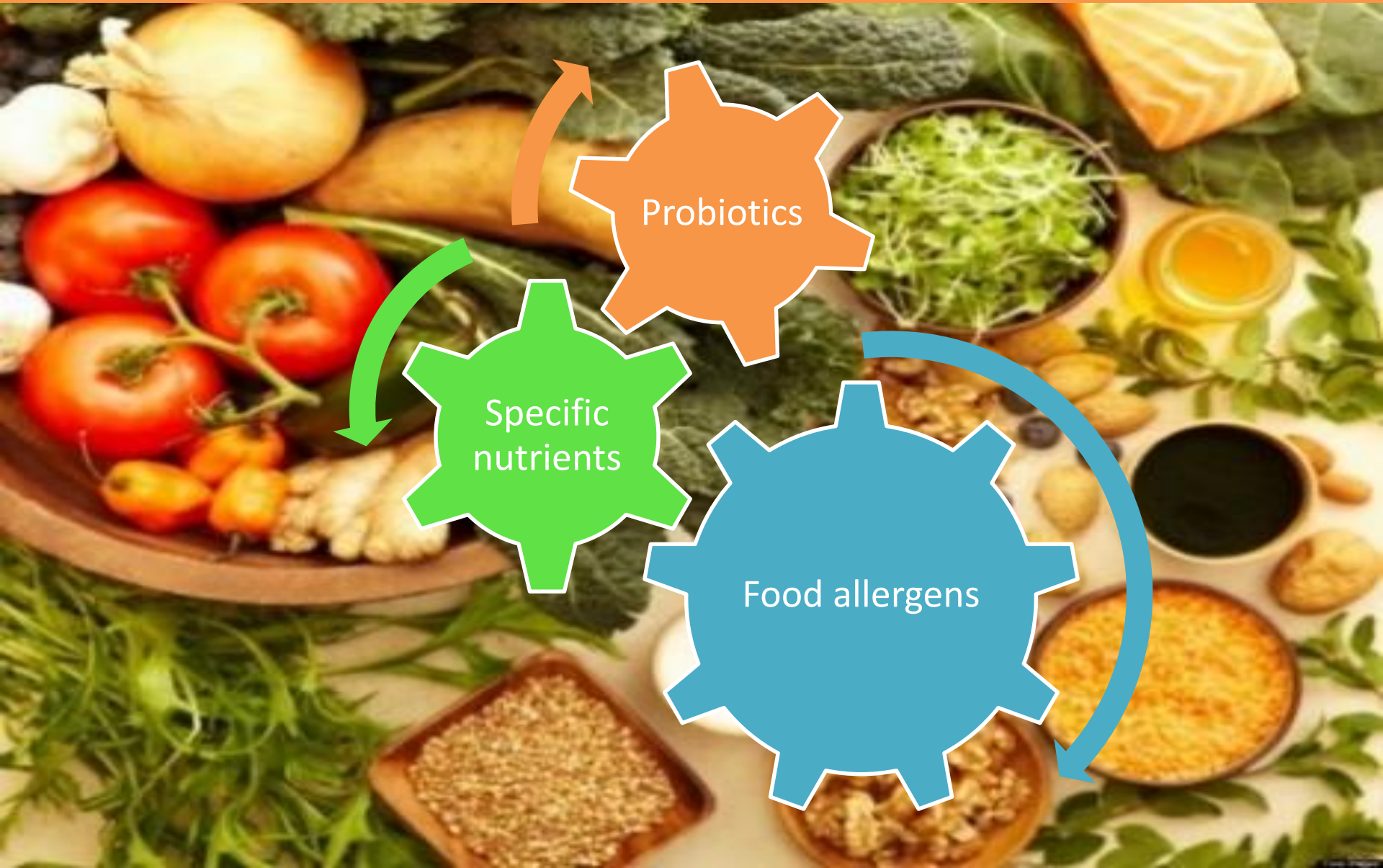


First 1000 days (conception to 2 years of age) is thought to be a particular critical period for allergy prevention

Maternal and infant diets play a likely role in infant immune development



Maternal and infant diets play a likely role in infant immune development





Possible “protective” specific nutrients for allergy prevention

- Omega-3 polyunsaturated fatty acids (n-3 PUFA)
- Antioxidant vitamins (A, E and C)
- Vitamin D
- Prebiotics

**Immunomodulatory
effects**

**Observational study associations with
reduced risk of allergic disease**

RESEARCH ARTICLE

Diet during pregnancy and infancy and risk of allergic or autoimmune disease: A systematic review and meta-analysis

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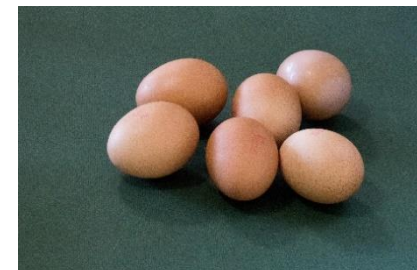
Possible “protective” specific nutrients for allergy prevention

- **Omega-3 polyunsaturated fatty acids (n-3 PUFA):**

Six trials suggest that fish oil supplementation during pregnancy and lactation



- ✓ may reduce risk of **allergic sensitisation to egg** (RR 0.69, 95% CI 0.53–0.90; Absolute Risk Reduction 31 cases per 1,000) with **supplementation during pregnancy more effective** (4 RCT: RR 0.55 95% CI 0.40–0.76) than during lactation (2 RCT: RR 0.92 95% CI 0.65–1.28).





Possible “protective” specific nutrients for allergy prevention

- **Omega-3 polyunsaturated fatty acids (n-3 PUFA):**

Six trials suggest that fish oil supplementation during pregnancy and lactation



✓ may reduce risk of **allergic sensitisation to peanut** with **supplementation during pregnancy more effective** (2 RCT: RR 0.62 95% CI 0.40–0.96).



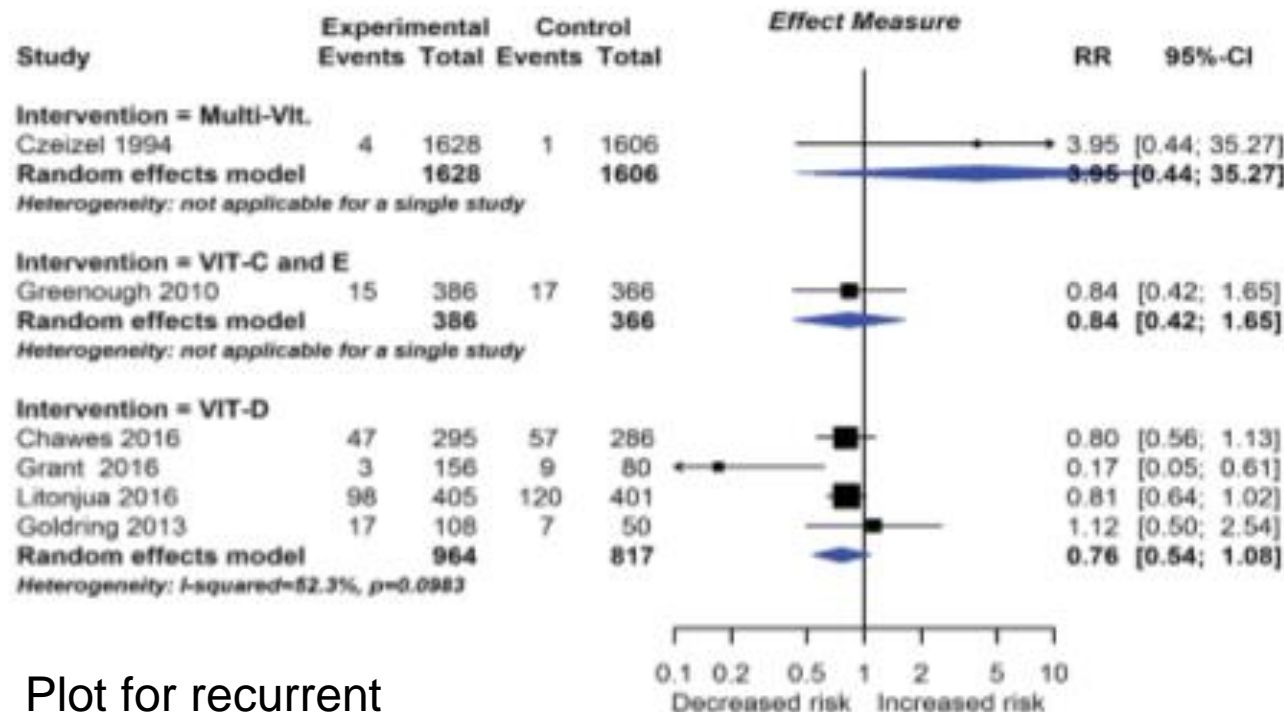
➤ There were no significant associations with any other allergic outcomes.



Specific
nutrients

Possible “protective” specific nutrients for allergy prevention

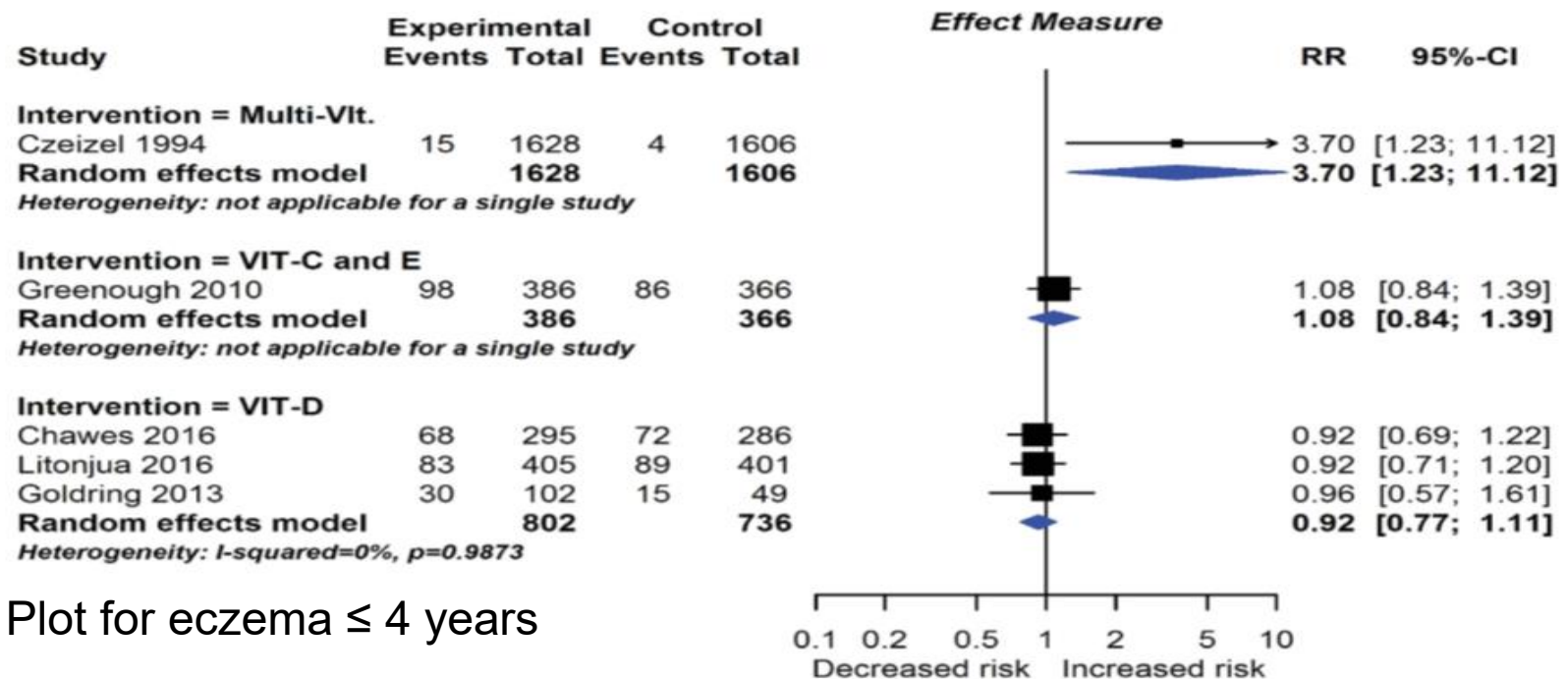
- Antioxidant vitamins (A,E and C) & Vitamin D: no beneficial effects on recurrent wheeze



Specific nutrients

Possible “protective” specific nutrients for allergy prevention

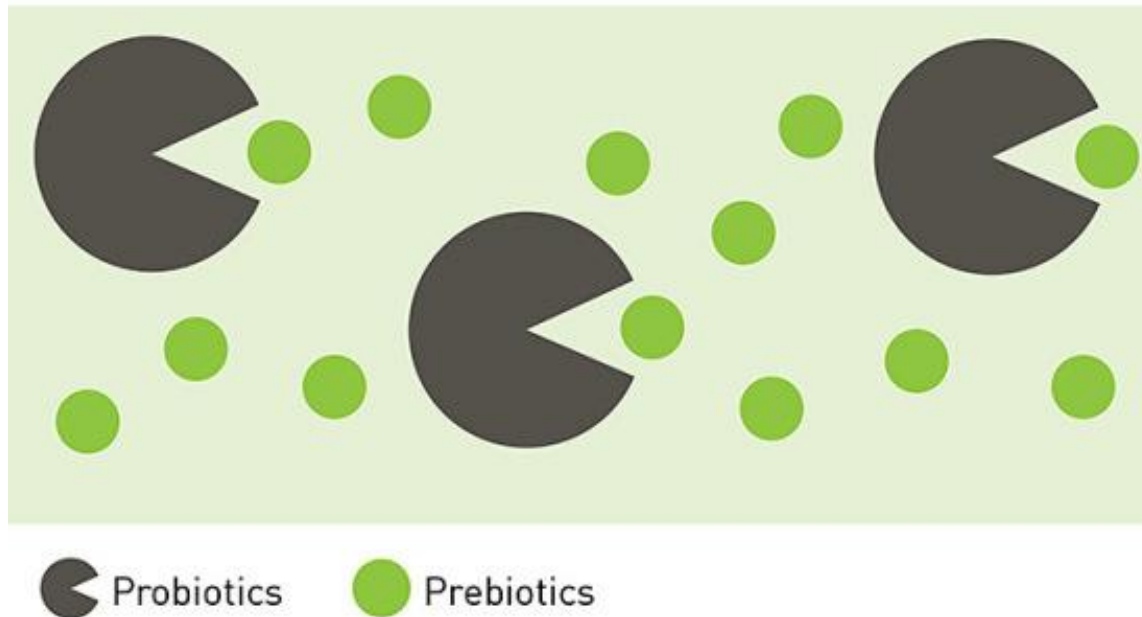
- Antioxidant vitamins (A,E and C) & Vitamin D: no beneficial effects on eczema outcomes





Possible “protective” specific nutrients for allergy prevention

- **Prebiotics:** soluble fermentable fibre (oligosaccharides), food for gut bacteria



Post-natal prebiotic infant supplementation

Nine studies involved comparison of an **infant formula milk with versus without prebiotic**. Meta-analysis showed no clear evidence that prebiotic supplementation reduces eczema at age 4 years (7 studies; RR 0.75; 95% CI 0.56–1.01)

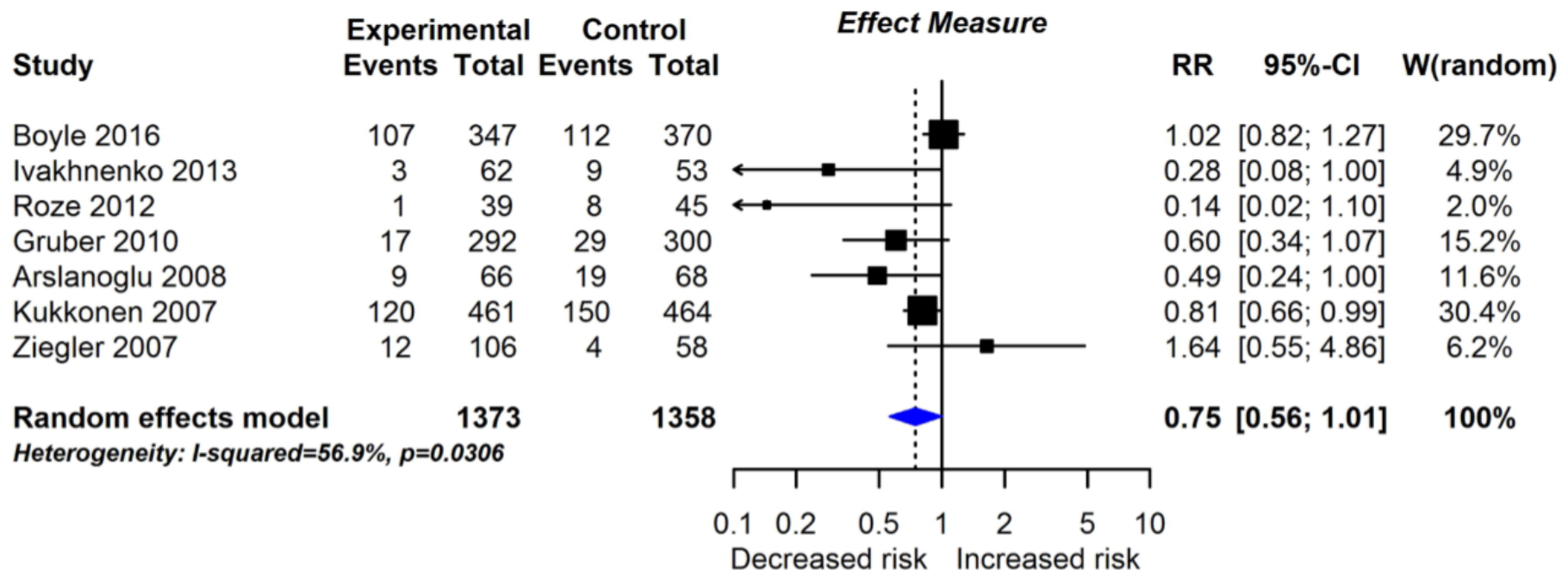
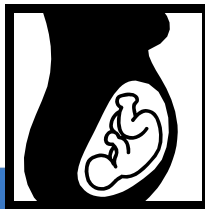


Fig 6. RCT findings for prebiotic supplementation compared with no prebiotics and risk of eczema at age ≤ 4 years. CI, confidence interval; RCT, randomised controlled trial; RR, risk ratio; W, weight.

Maternal prebiotic supplementation (The SYMBA Study): current RCT

Registered with the Australian New Zealand Clinical Trials Registry (ANZCTR): ACTRN12615001075572

Family
History of
Allergy

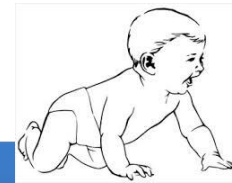


18 weeks
gestation

Birth



6 mths



12 mths

Aim
n=652

Maternal Intervention period
during pregnancy and
lactation

Follow-up of
offspring



Prebiotics: galacto-oligosaccharides
(GOS) & fructo-oligosaccharides (FOS)

Primary outcome:
eczema at 12 months



Meta-analysis showed an association between probiotic supplementation and:



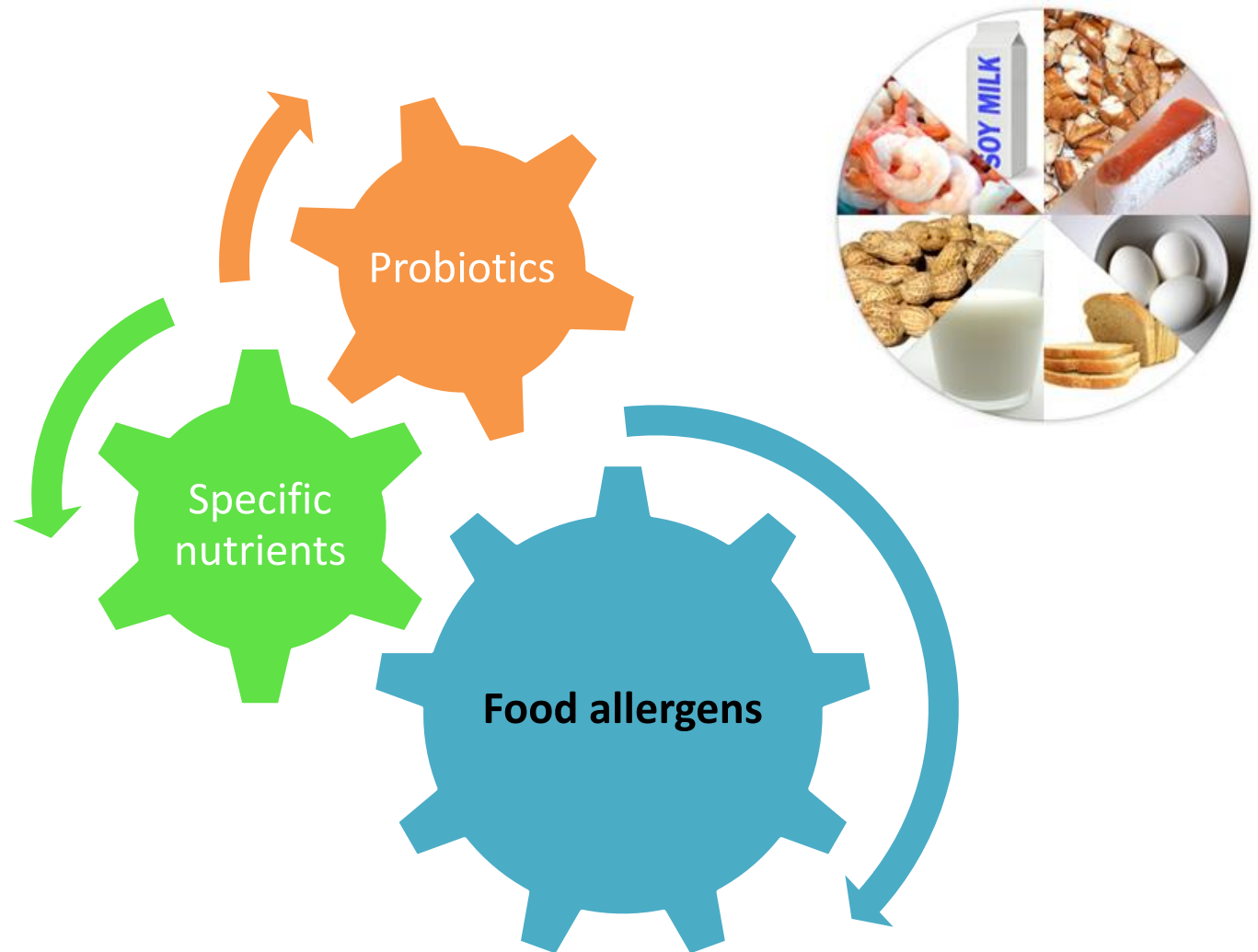
- ✓ reduced eczema (19 studies; RR 0.78; 95% CI 0.68–0.90)

Subgroup analysis for eczema showed a significant difference between

- ✓ **supplementing mothers during the postnatal period** (9 interventions, RR 0.64; 95% CI 0.51–0.80)
- studies that just supplemented infants during the postnatal period (11 interventions, RR 0.93; 95% CI 0.81–1.06)



Maternal and infant diets play a likely role in infant immune development





Trials investigating when to introduce 'more allergenic' foods into infant diets.



LEAP Trial: UK (n=640)
Du Toit et al,
N Engl J Med 2015

EAT Trial: UK (n=1303)
cow's milk, egg, fish, wheat,
sesame and peanut
Perkin et al, N Engl J Med 2016

HEAP Trial:
Germany (n=383)
Bellach et al,
J Allergy Clin Immunol 2017

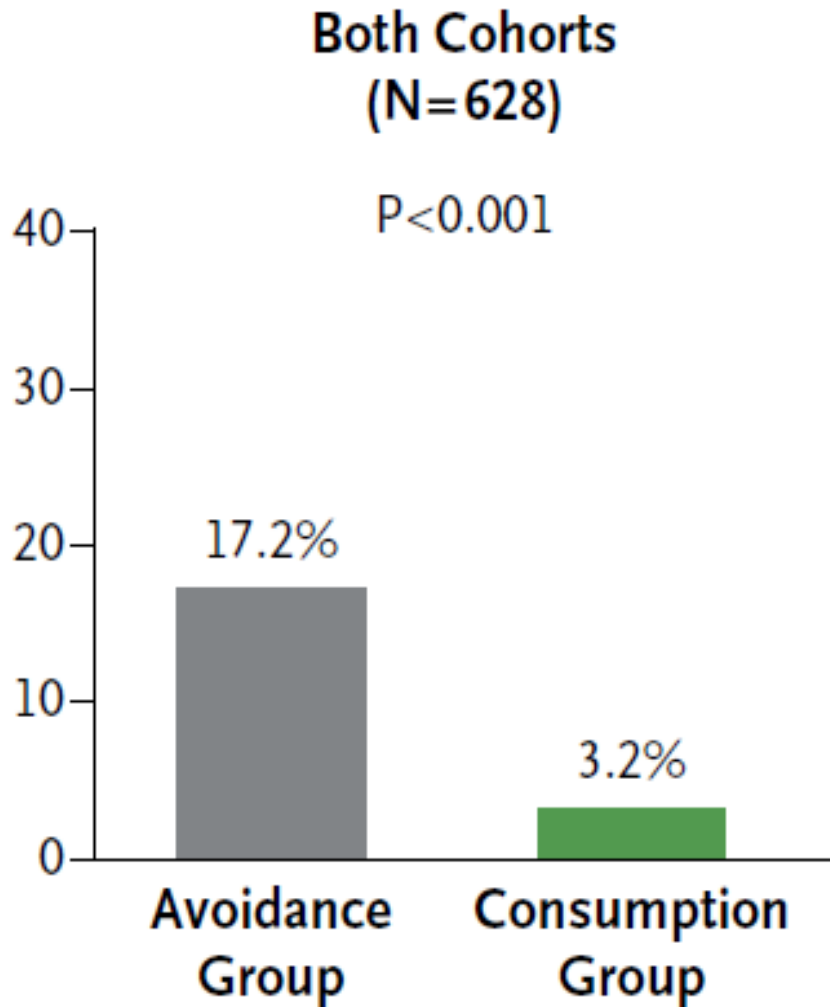
STEP Trial: Australia (n=820)
Palmer et al,
J Allergy Clin Immunol 2017

STAR Trial: Australia (n=86)
Palmer et al,
J Allergy Clin Immunol 2013

BEAT Trial: Australia
(n=319) *Tan et al,*
J Allergy Clin Immunol 2017

PETIT Trial: Japan
(n=147) *Natsume et al,*
Lancet 2017

LEAP (Learning Early About Peanut Allergy) Study



The regular consumption at least 3 times per week of peanut protein between 1 to 5 years of age significantly decreased the frequency of the development of peanut allergy among children at high risk for peanut allergy

LEAP (Learning Early About Peanut Allergy) Study

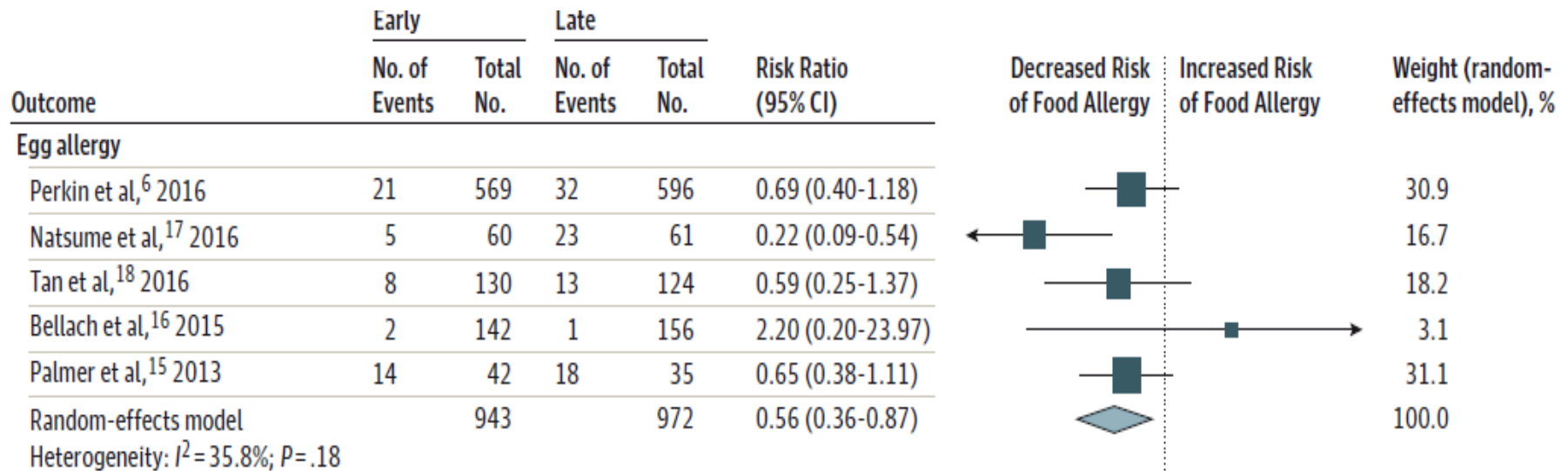
- Infants who were **sensitised to peanut (SPT >4mm) = 9%** infants screened were **never included in the LEAP Study** and were advised to avoid peanut
- Unknown effect if these infants were included in the LEAP RCT



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):1181-1192



5 trials (1915 participants) that early egg introduction at 4 to 6 months was associated with **reduced egg allergy (risk ratio 0.56; 95%CI 0.36-0.87; $P = 0.009$).**

STEP Trial (Palmer et al. J Allergy Clin Immunol 2017) with n=820 infants is not included: RR 0.75; 95% CI 0.48-1.17; $P=0.20$

STEP Trial

Palmer *et al*, 2017
J Allergy Clin Immunol



STAR Trial

Palmer *et al*, 2013
J Allergy Clin Immunol

Confirmed allergic reactions to the uncooked egg powder

STEP Trial (no eczema):

6% (25/407) egg group

Urticaria, facial/lip swelling
and vomiting

no anaphylactic reactions

STAR Trial (eczema):

31% (15/49) egg group

Urticaria, facial/lip swelling
and vomiting

1 anaphylactic reaction

Egg-specific IgE level

5% (18/357) - >0.35

7.5% (27/357) - 0.1-0.35

**Sensitized to egg
prior to any
known ingestion
of egg in solid
foods**

Egg-specific IgE level

36% (24/67) - >0.35

12% (8/67) - 0.1-0.35



What Next?

Is introduction of food allergens in solid foods early enough – what about regular exposure during pregnancy and breastfeeding?





Food
allergens

The PrEggNut Study - Maternal diet rich in eggs and peanuts to reduce food allergies: a randomised controlled trial (2018-2023)

Registered with the Australian New Zealand Clinical Trials Registry (ANZCTR): 12618000937213

n=2136 women
and their babies

NHMRC Project Grant ID: 1147576

22 weeks
gestation

Birth

4 months

12 months

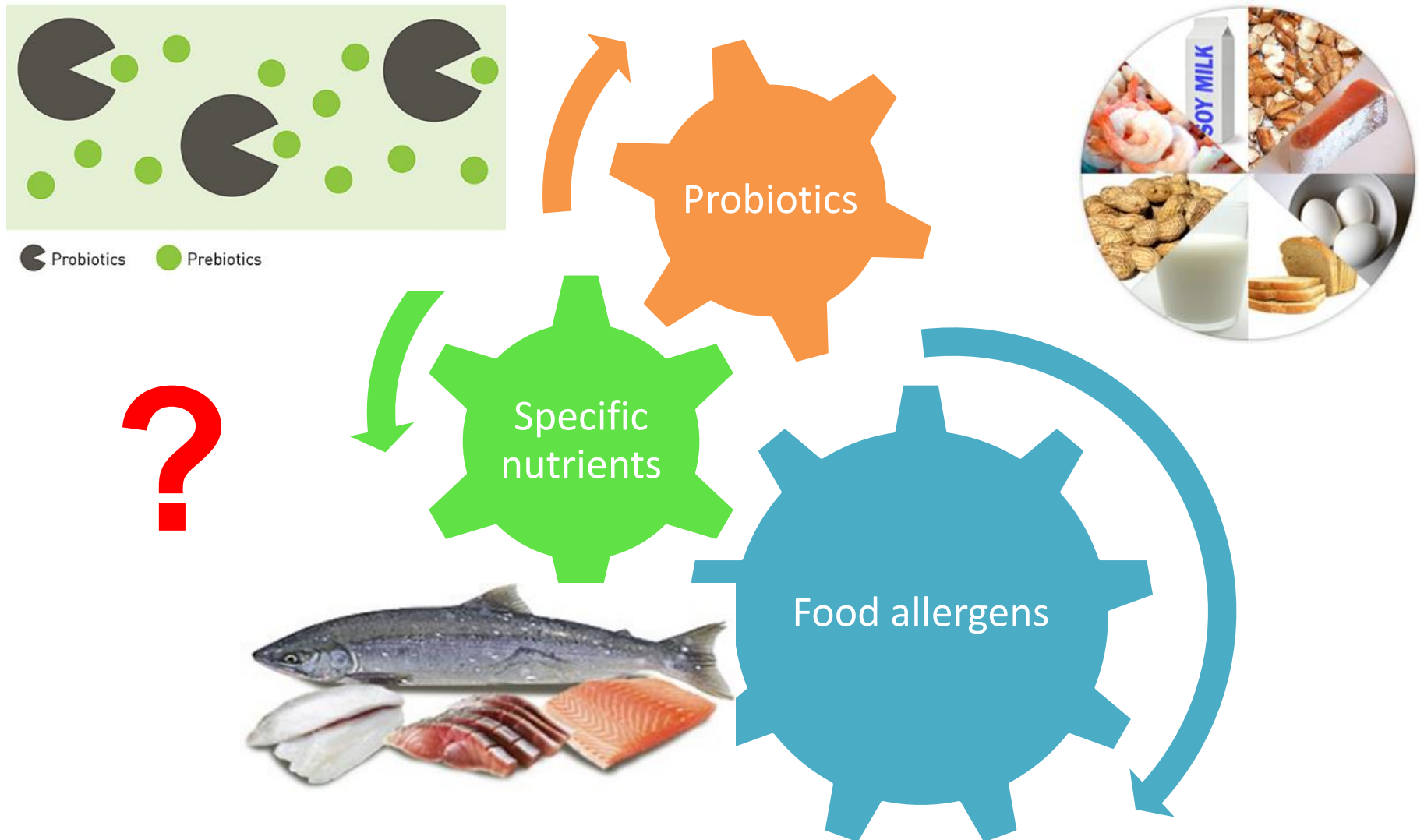
Maternal Intervention RCT

Aim: to investigate higher regular egg and peanut maternal dietary intakes during pregnancy and lactation as a strategy for infant egg and peanut allergy prevention.

Primary outcome: IgE mediated egg and/or peanut allergy at 1 year.

PrEggNut study website is www.telethonkids.org.au/PrEggNut

Questions remain with regard to maternal and infant diets and allergy prevention strategies



In summary: evidence to date



Conception



Birth



1 year

Pregnancy

**Maternal
Omega-3**

reduced risk of
**allergic sensitisation
to egg and peanut**

Post-natal

**Maternal
Probiotics**

reduced risk of
eczema

Solid food introduction

**Peanut and
egg food
allergens**

reduced risk of **egg
and peanut allergy**