Food & Asthma

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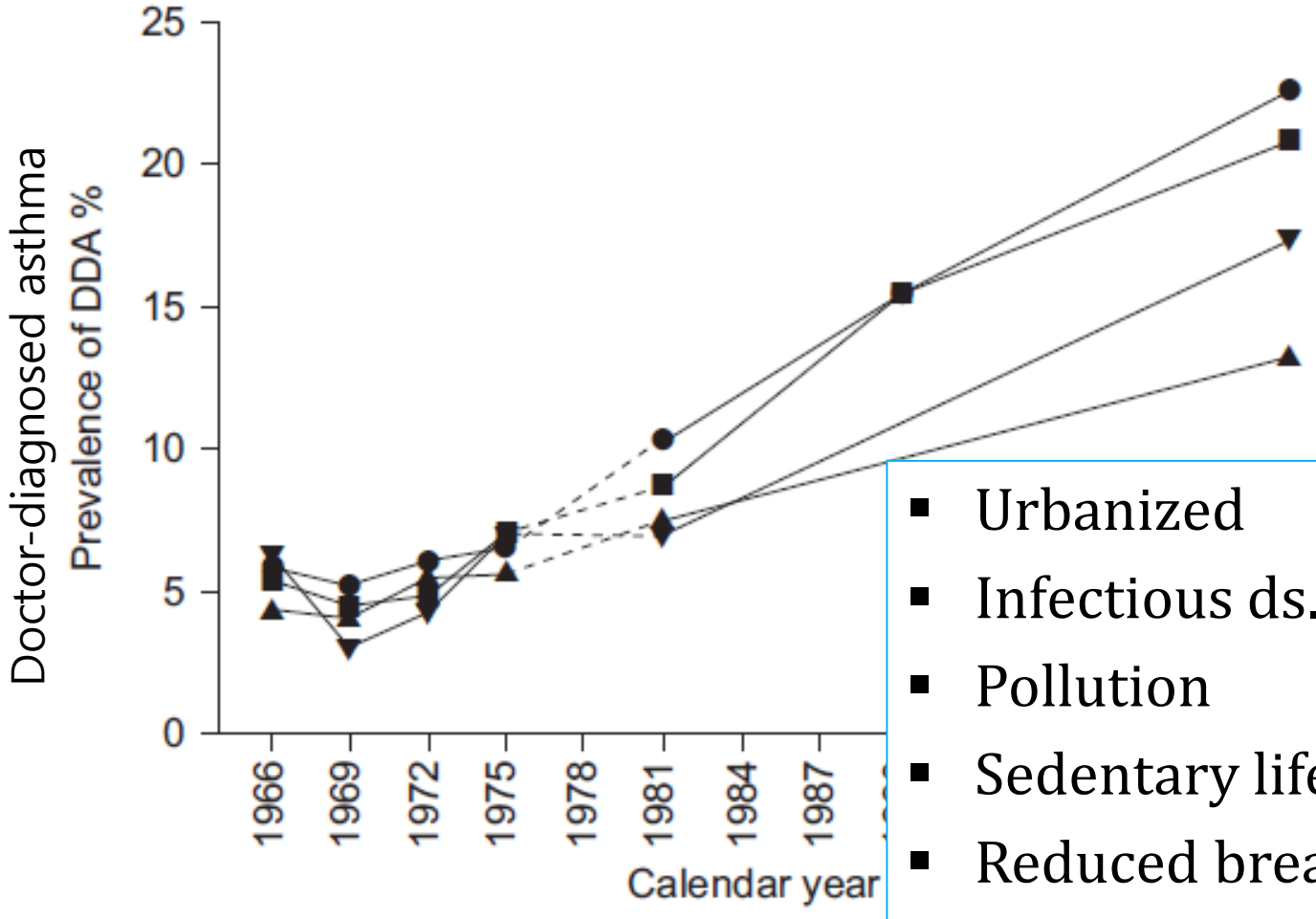
김 현 정

Increasing prevalence of asthma

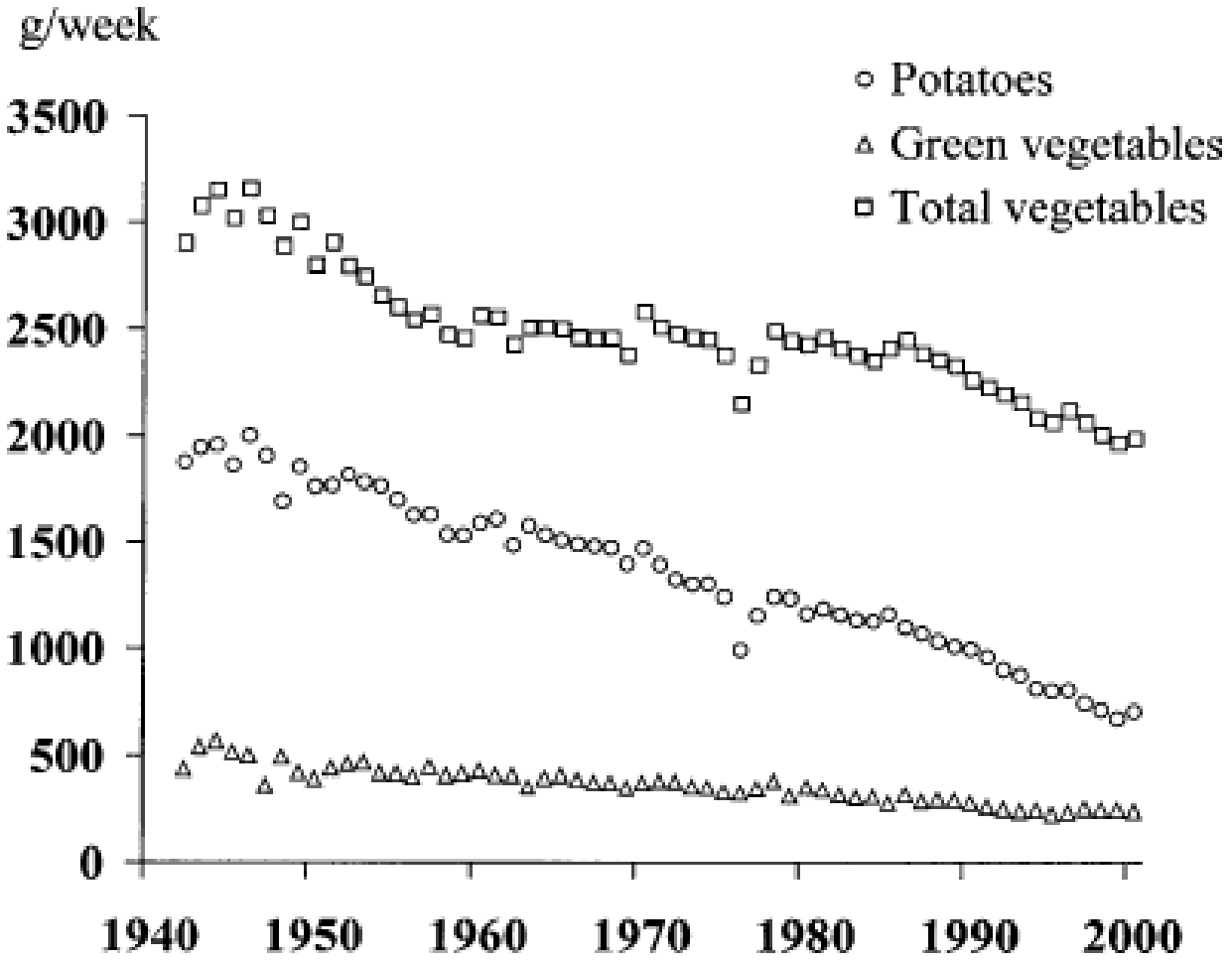


- Urbanized
- Infectious ds. ⇩
- Pollution
- Sedentary lifestyle
- Reduced breastfeeding

Eur Respir J 2010;35:273-278

Decreasing consumption of vegetables

Trends in UK consumption of vegetables



J Allergy Clin Immunol 2005

CONTENTS

- Dietary pattern
- Primary prevention
  - Maternal food, infant food (Breastfeeding)
- Nutrient ; vitamin A,B,C,D,E & FishOil
- Gut-lung axis (microbiome) and obesity

Food & Allergic disease

- Dietary pattern

  Mediterranean diet vs. Western diet

Diet and Asthma:
Is it time to adapt our message?

Mediterranean diet

Sweets
Potato
Processed meats
Red meats

White meat, seafood, fish
Legumes, eggs
Dairy (low-fat preferably)
Nuts, seeds, olives

Fruit, vegetables
Cereals (wholegrain preferably)
Olive oil

Western diet

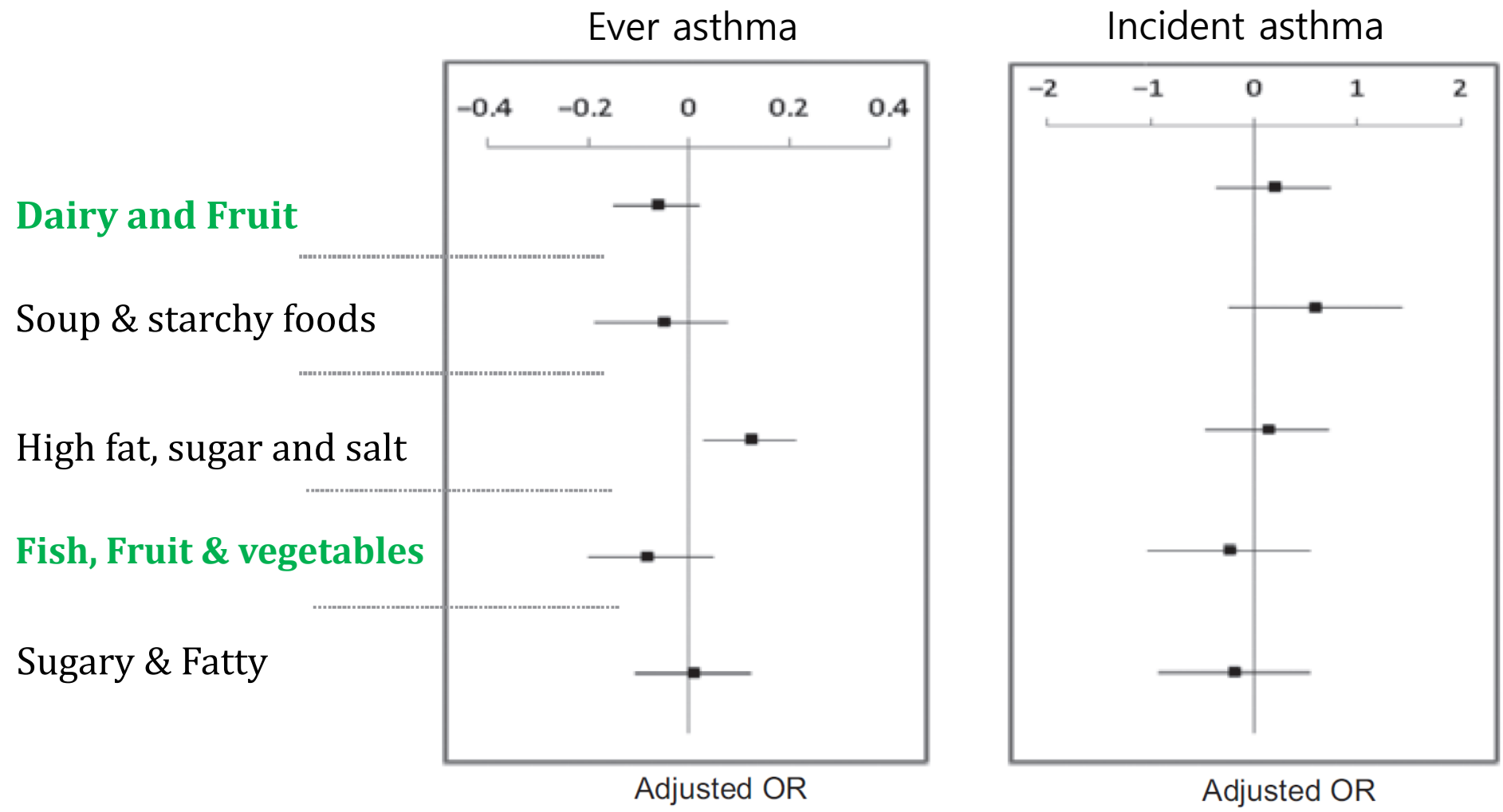
Desserts / sweets
Processed meats
Red meats
Highly processed foods

Dairy products (high-fat)
Refined grains
Potato

Wholegrains
Vegetables
Legumes
Fruit

doi: 10.1111/cea.12544

Dietary patterns and asthma prevalence, incidence and control



doi: 10.1111/cea.12544

Dietary patterns and asthma prevalence, incidence and control

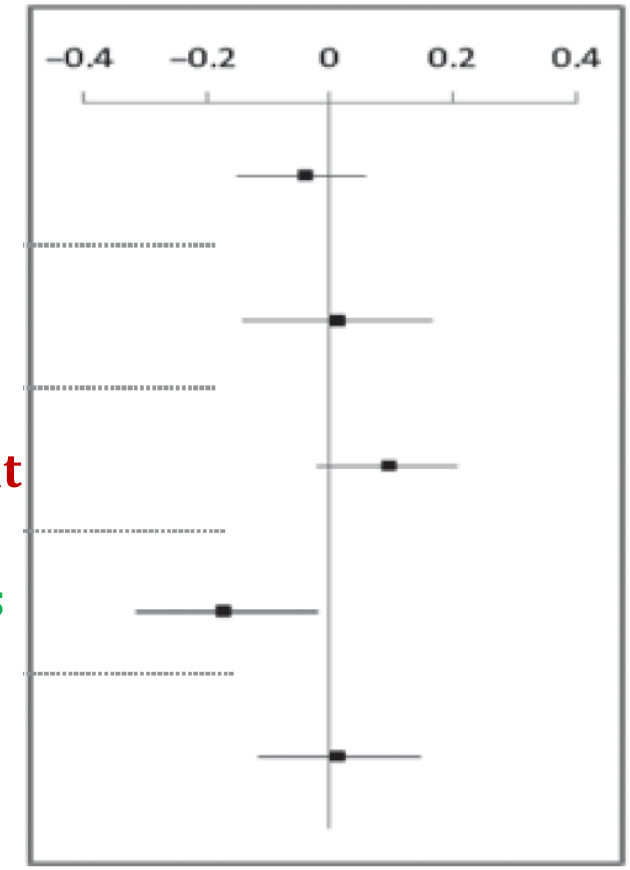
Dairy and Fruit

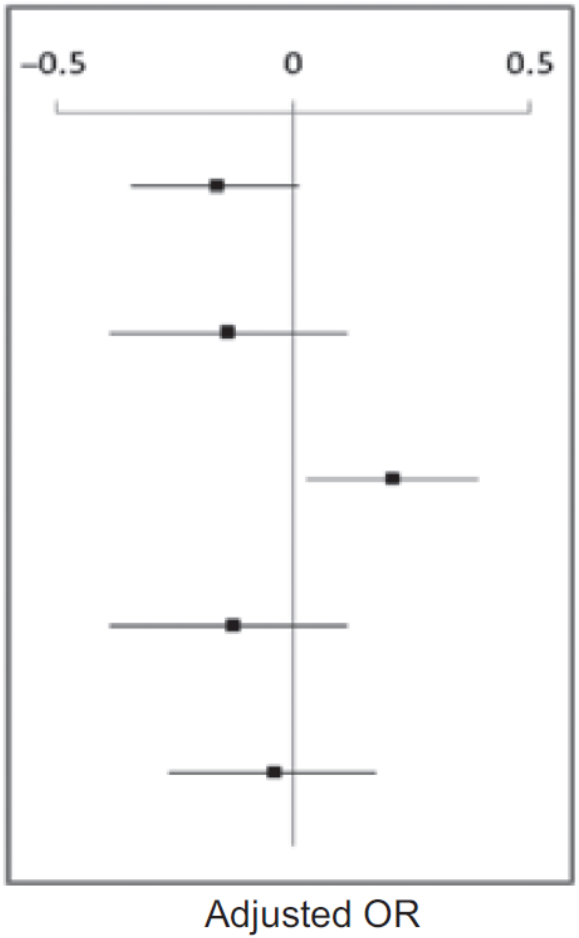
Soup & starchy foods

High fat, sugar and salt

Fish, Fruit & vegetables

Sugary & Fatty





The Effect of Lifestyle on Wheeze, Atopy, and Bronchial Hyperreactivity in Asian and White Children

OLIVER J. CAREY, JOHN B. COOKSON, JOHN BRITTON, and ANNE E. TATTERSFIELD

Department of Medicine, Glenfield General Hospital, Leicester, United Kingdom, and Division of Respiratory Medicine, University of Nottingham, Nottingham City Hospital, Nottingham, United Kingdom

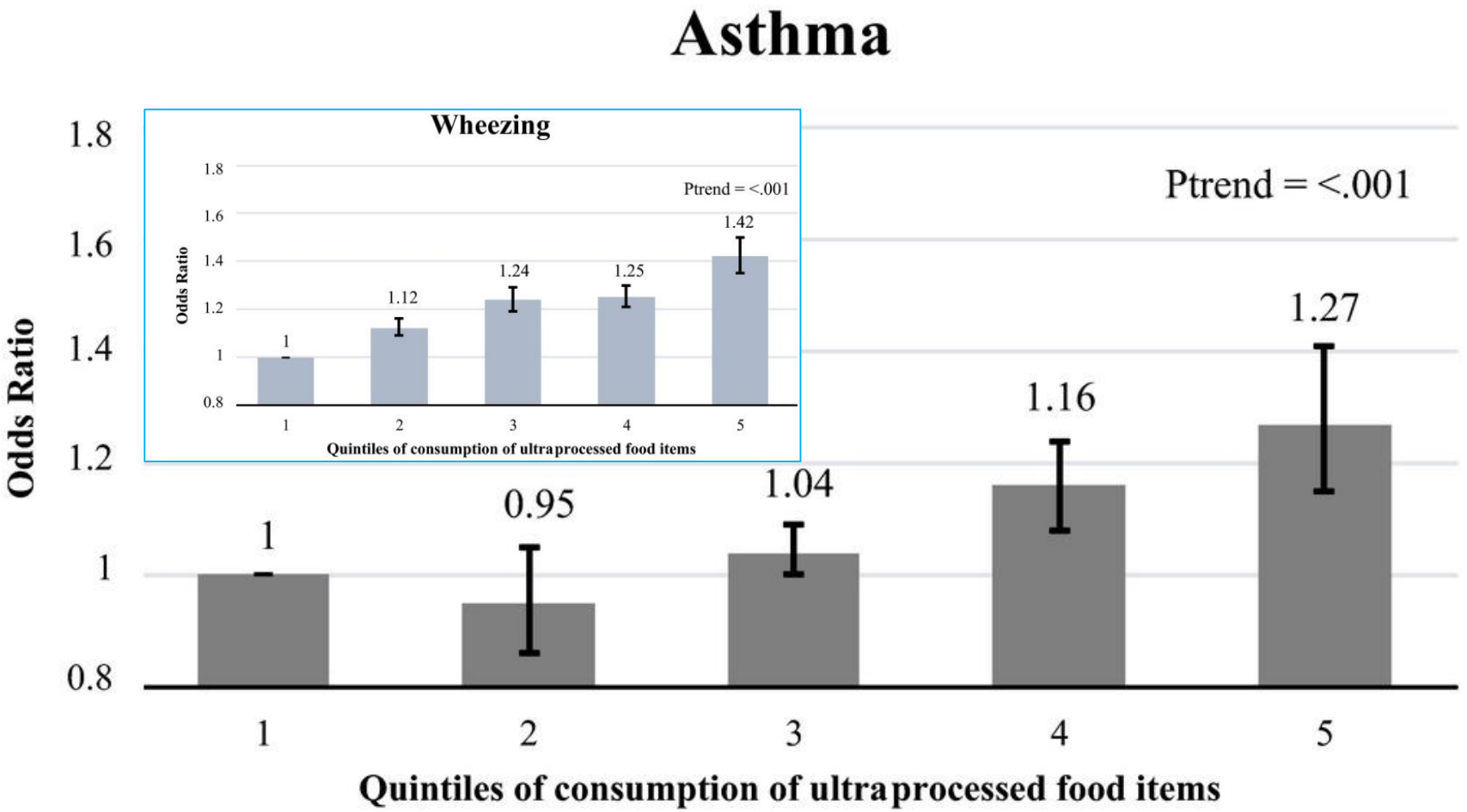
ODDS RATIOS, CONFIDENCE INTERVALS, AND P VALUE FOR THE INDEPENDENT EFFECTS OF AGE, SEX, ATOPY, FEV_1, AND DIET ON BRONCHIAL HYPERREACTIVITY*

	Odds Ratio	95% CI	p Value
Constant	3.36	0.75–15.10	0.013
Age, per yr	1.02	0.85–1.22	0.865
Female sex	0.74	0.52–1.04	0.085
Atopy	5.31	3.75–7.53	< 0.001
FEV_1, per L	0.24	0.13–0.44	< 0.001
Diet			
Asian	0.31	0.15–0.62	
Mostly Asian	0.88	0.56–1.37	0.003
Mixed	0.99	0.65–1.49	

* The odds are relative to a nonatopic male child, 8 yr of age, on an English diet.

AM J RESPIR CRIT CARE MED 1996;154:537-40

Ultra-processed food and drink products with asthma and wheezing



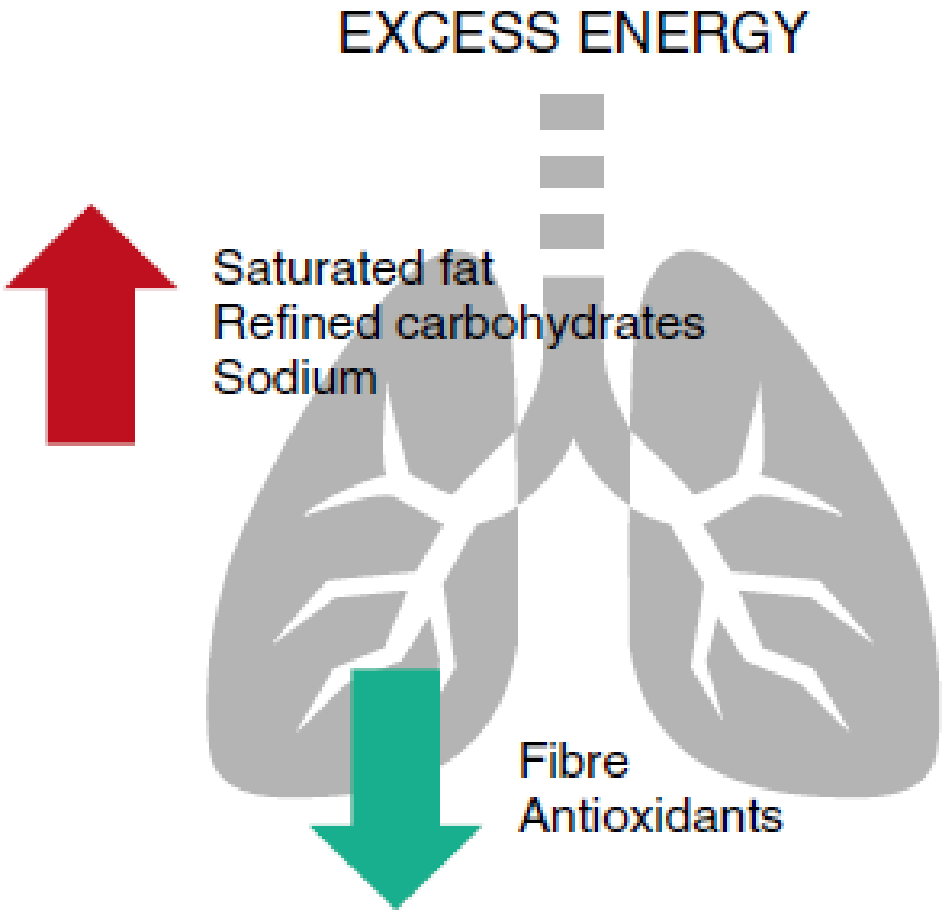
Pediatr Allergy Immunol. 2018 Aug;29(5):504-511

Fast food consumption in pregnancy and subsequent asthma symptoms in young children

Maternal consumption of fast food and risk of asthmatics

		Once/month	Once/week	3-4/week	Everyday	
Outcome	Case N	(95% CI)	(95% CI)	(95% CI)	(95% CI)	p Value
Current asthma†						
Unadjusted	73	1.17 (0.43, 3.21)	1.56 (0.62, 3.94)	2.84 (1.09, 7.41)	7.47 (2.72, 20.48)	0.0025
Adjusted‡	69	0.99 (0.36, 2.75)	1.26 (0.47, 3.34)	2.17 (0.77, 6.12)	4.46 (1.36, 14.60)	
Severe asthma§						
Unadjusted	71	1.77 (0.60, 5.16)	2.05 (0.74, 5.69)	3.03 (1.03, 8.87)	7.06 (2.16, 23.12)	0.0236
Adjusted‡	68	1.71 (0.58, 5.03)	1.77 (0.64, 4.93)	2.59 (0.87, 7.71)	4.34 (1.22, 15.43)	
Asthma¶						
Unadjusted	118	1.09 (0.52, 2.31)	1.33 (0.67, 2.65)	2.28 (1.12, 4.64)	4.55 (2.04, 10.13)	0.0162
Adjusted‡	113	0.93 (0.44, 1.98)	1.05 (0.51, 2.13)	1.66 (0.78, 3.51)	2.47 (0.97, 6.29)	
Asthma¶ and dry cough**						
Unadjusted	56	1.17 (0.43, 3.21)	0.85 (0.32, 2.29)	2.78 (1.07, 7.23)	3.90 (1.13, 13.41)	0.0634
Adjusted‡	53	1.07 (0.40, 2.87)	0.73 (0.26, 2.03)	2.24 (0.82, 6.11)	3.01 (0.67, 13.53)	
Asthma medication††						
Unadjusted	190	1.14 (0.64, 2.05)	1.68 (0.99, 2.86)	1.86 (1.05, 3.29)	2.92 (1.45, 5.88)	0.0027
Adjusted‡	184	1.19 (0.65, 2.17)	1.73 (0.99, 3.03)	1.83 (1.00, 3.37)	2.38 (1.10, 5.14)	

Obesogenic diet = inflammatory diet
Ultra-processed food, fast food, western style food



Ann Am Thorac Soc 14(5) S332-338

Healthy Diet = anti-inflammatory Diet

- Encourage patients with asthma to consume a diet high in **fruit and vegetables** for its general health benefits. (GINA 2019, A)

건강한 식단

과일과 야채가 풍부한 식단은 전반적인 건강에 도움이 될 수 있다(근거수준 A).

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- Dietary pattern
- Primary prevention
  - Maternal food, infant food (Breastfeeding)
- Nutrient ; vitamin A,B,C,D,E & FishOil
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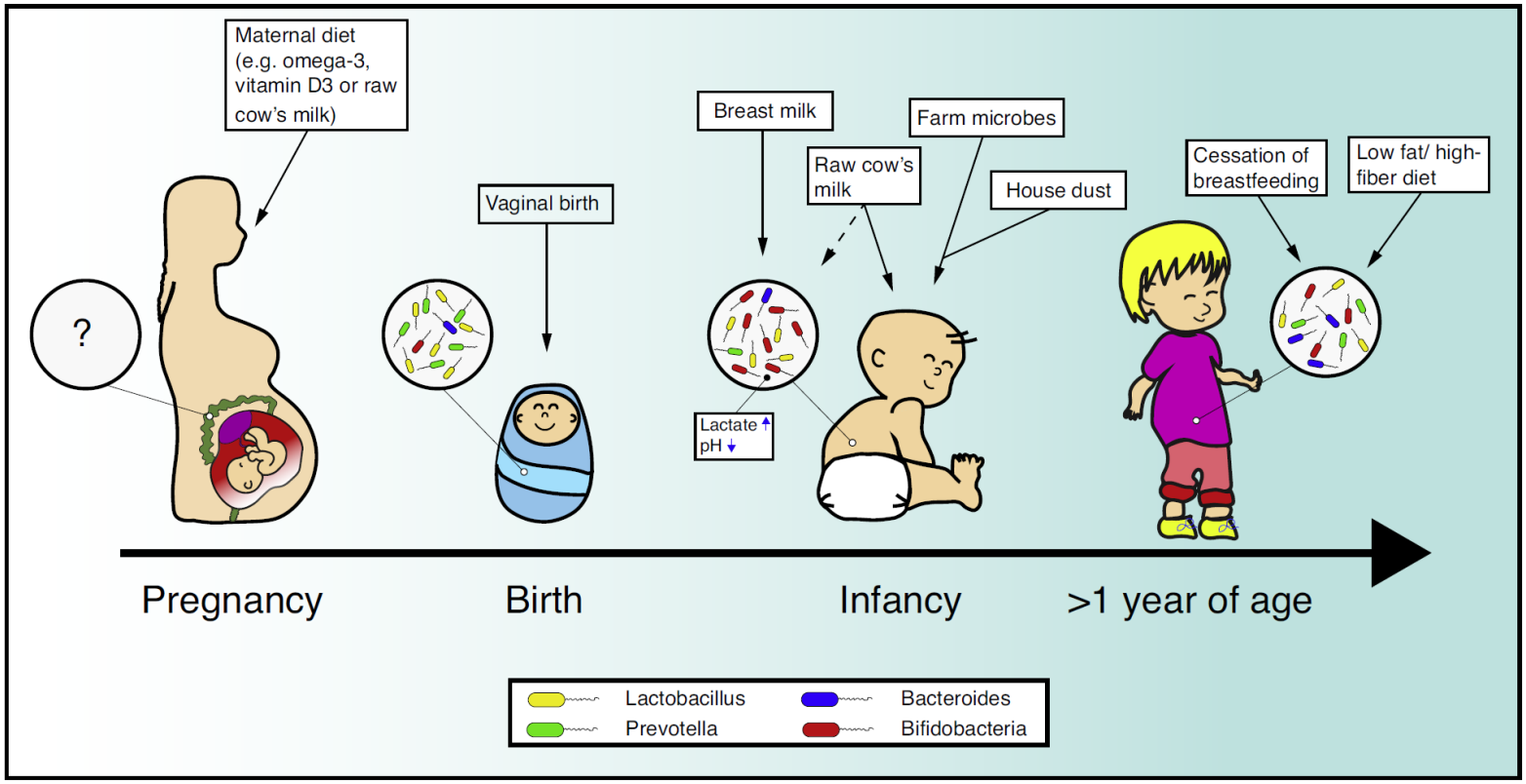
Primary Prevention

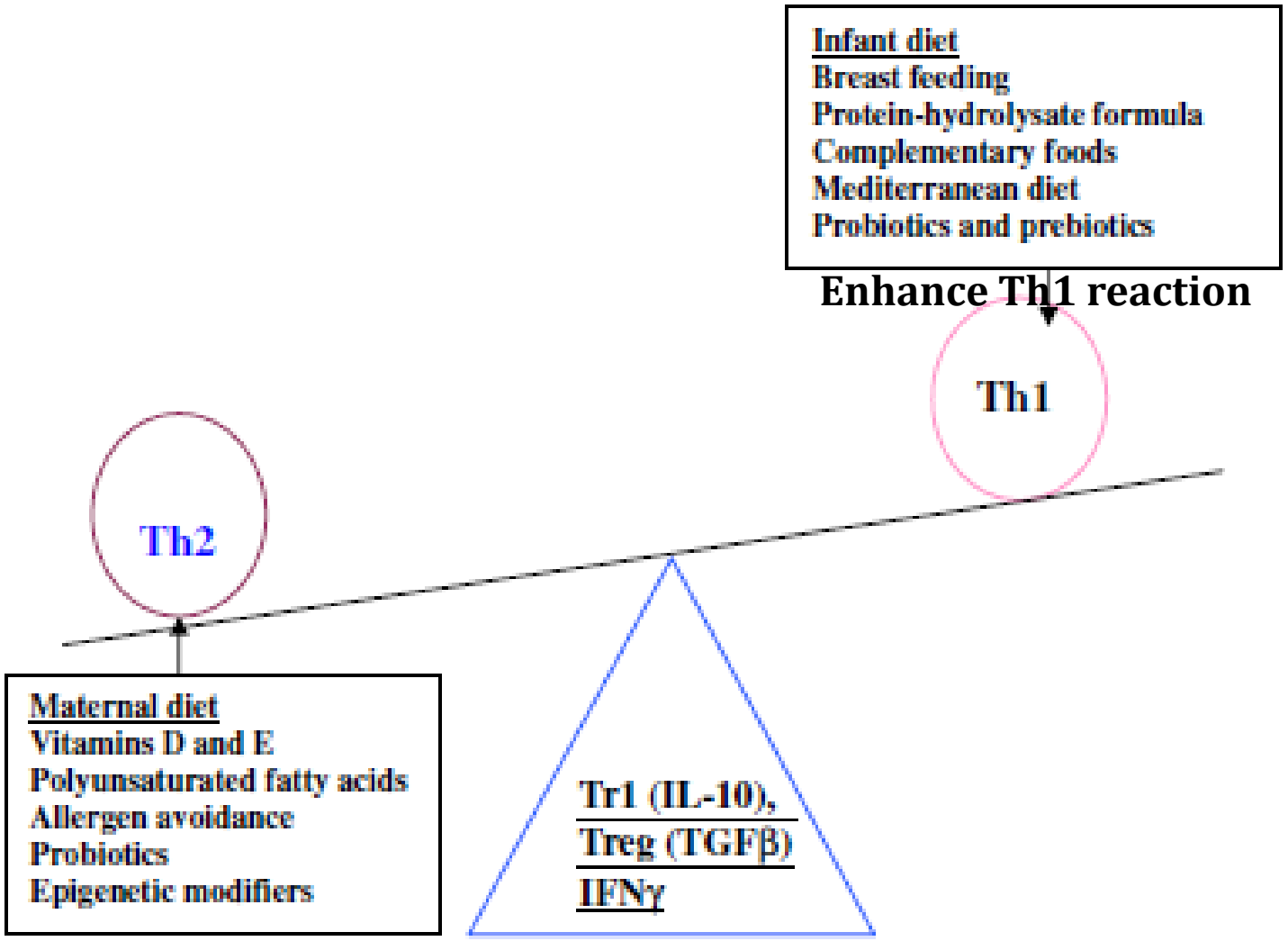
- "Window of opportunity" to prevent asthma

- in utero & in early childhood life

- but, intervention studies are limited

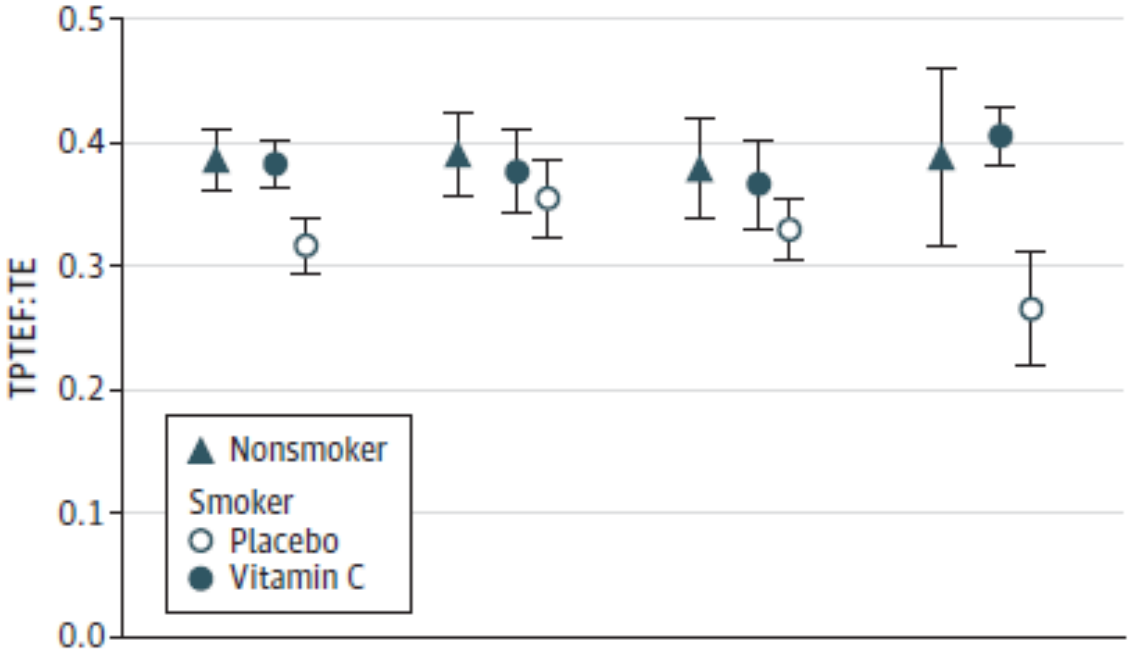


Influence and Mechanisms of maternal and infant diets on the development of childhood asthma



Pediatrics and Neonatology (2012) 54, 5-11

Vitamin C supplementation for pregnant smoking women and pulmonary function in their newborn infants



No.				
Nonsmoker	49	26	18	5
Smoker				
Vitamin C	58	29	26	3
Placebo	66	34	28	4

JAMA 2014;311(20):2064-2082

Vitamin D supplementation in primary allergy prevention
- Pregnant women -

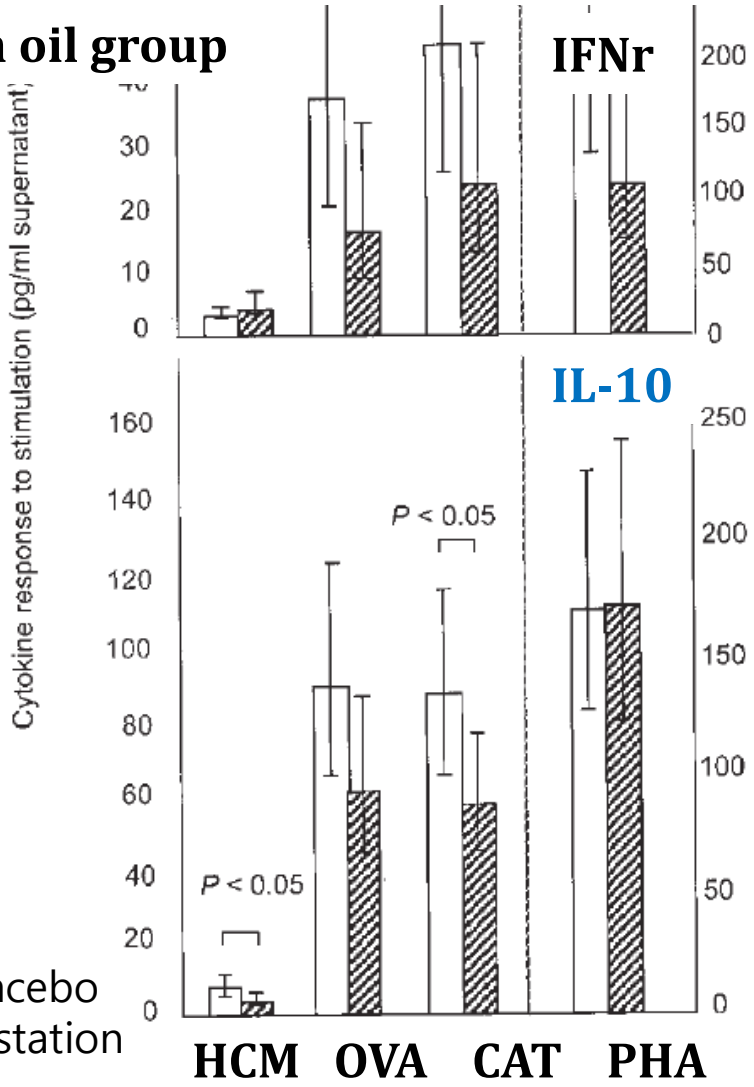
Outcomes	No of participants (studies)	Certainty in the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects: Risk with no vitamin D	Anticipated absolute effects: Risk difference with vitamin D
Allergic rhinitis **Follow-up: 3 years**	150 (1 RCT)	⊕◯◯◯ VERY LOW[a,b,c]	**RR 0.76** (0.31 to 1.85)	**Study population** 143 per 1000 **Moderate** 146 per 1000	**34 fewer per 1000** (99 fewer to 121 more) **35 fewer per 1000**[f] (101 fewer to 124 more)
Asthma/wheezing **Follow-up: 3 years**	158 (1 RCT)	⊕◯◯◯ VERY LOW[a,b,c]	**RR 1.12** (0.50 to 2.54)	**Study population** 140 per 1000 **Moderate** 94 per 1000	**17 more per 1000** (70 fewer to 216 more) **11 more per 1000**[g] (47 fewer to 145 more)
Asthma/wheezing	2478 (1 observational study)	⊕◯◯◯ VERY LOW[c]	**OR 0.65**[i] (0.46 to 0.92)	**Moderate** 94 per 1000	**31 fewer per 1000**[g] (48 fewer to 7 fewer)

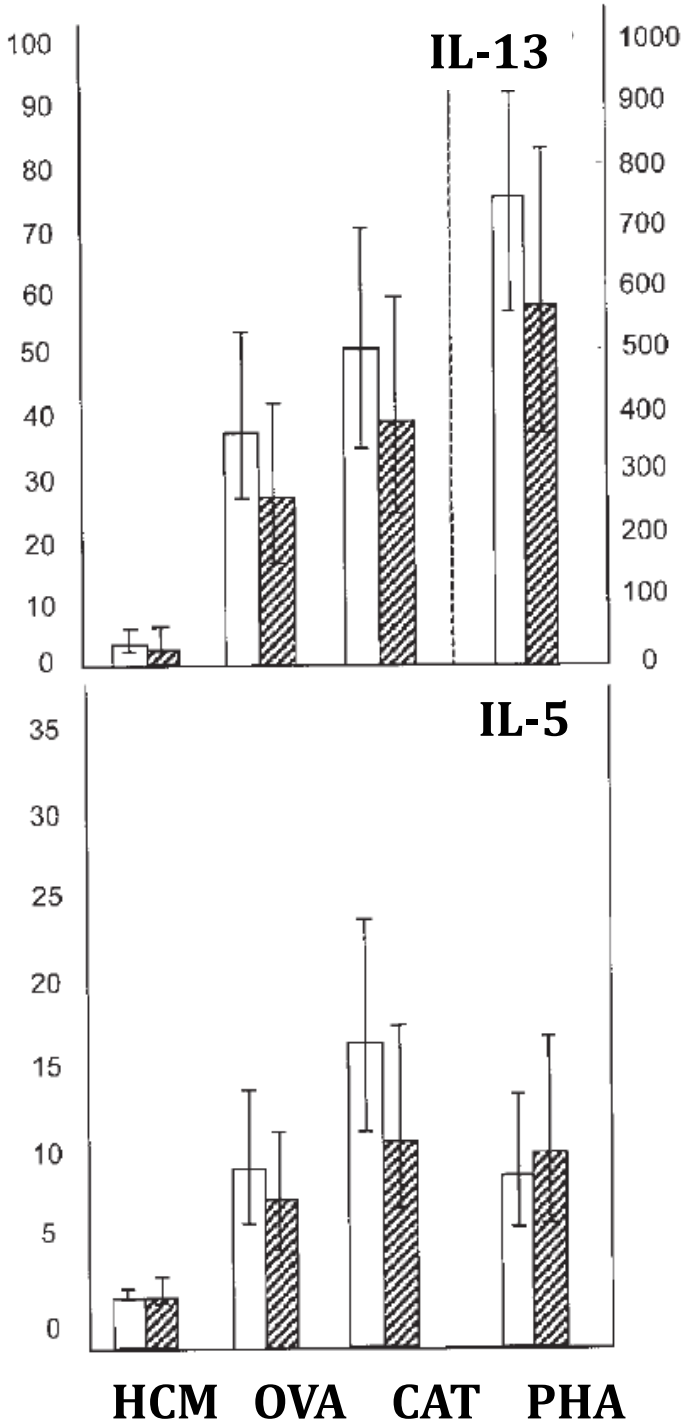
Allergy. 2018;73:37-49

Fish oil supplementation in pregnancy modifies neonatal allergen-specific immune responses and clinical outcomes in infants at high risk of atopy: A randomized, controlled trial

Placebo vs. Fish oil group

n-3 polyunsaturated fatty acids (n-3 PUFAs)

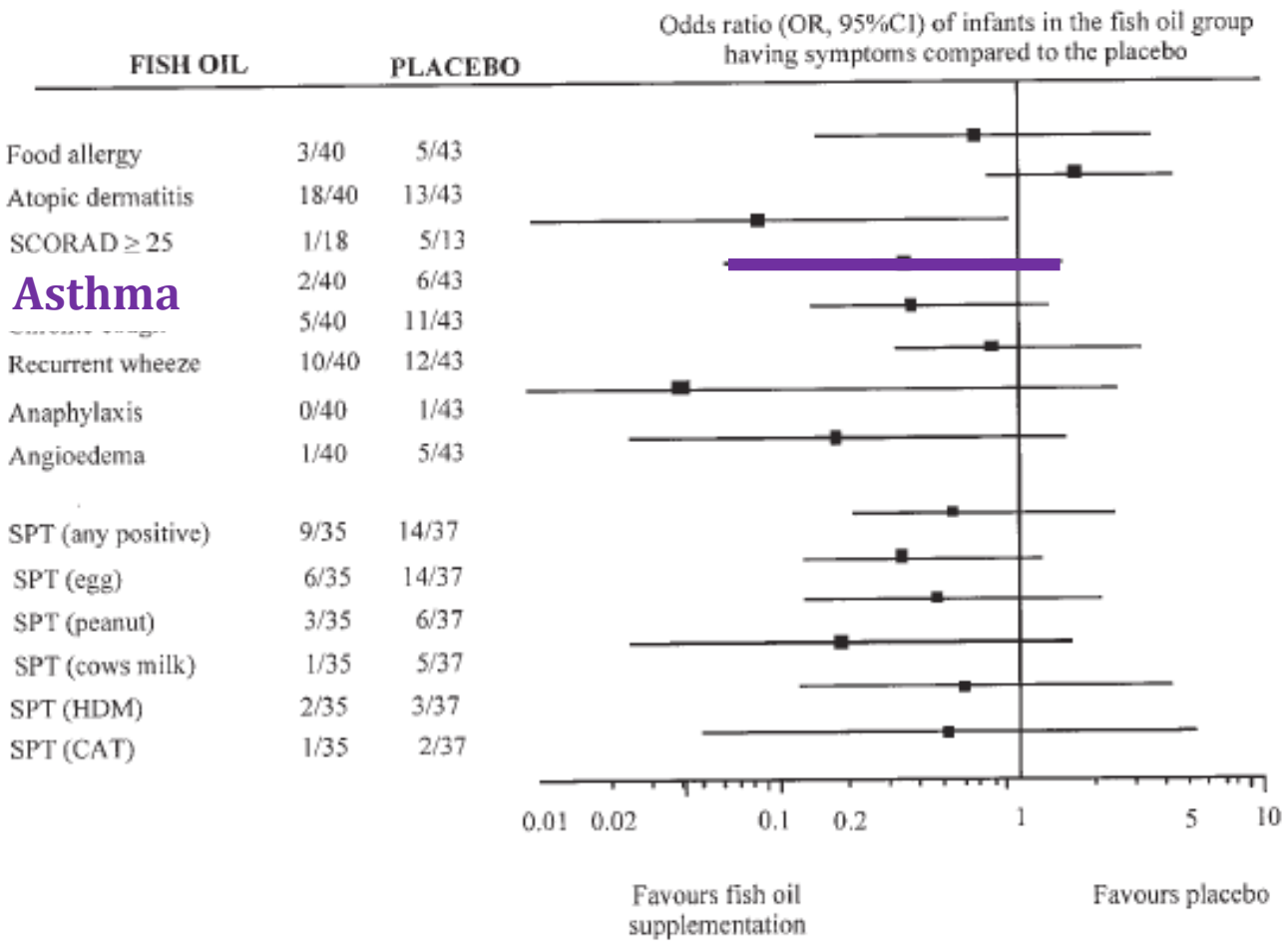




Fish oil 3.7g vs. placebo from 20 weeks' gestation

Fish oil supplement in pregnancy

OR (95% CI) of infants in the fish oil group being skin prick test-positive or having symptoms of allergic disease at 1year of age



J Clin Allergy and Immunol 2003;112(6):1178-84

Peanut, milk, and wheat intake during pregnancy is associated with reduced allergy and asthma in children

- N=1277 mother-child pairs, 1st and 2nd trimeter
- Food frequency questionnaires
- 7.9 years childhood; food allergy, asthma, allergic rhinitis, atopic dermatitis
- Food allergy(5.6%), Peanut allergy (OR 0.53), Milk (asthma, OR 0.83)
  Mild (allergic rhinitis OR 0.85) wheat (atopic dermatitis OR 0.64)
- Peanut, wheat, and soy allergy
  → Risk of other allergic disease (OR 3.6-8.1)

- The relationship between maternal diet and childhood allergy and asthma ; controversial

J Allergy Clin Immunol 2014:133:1373-82

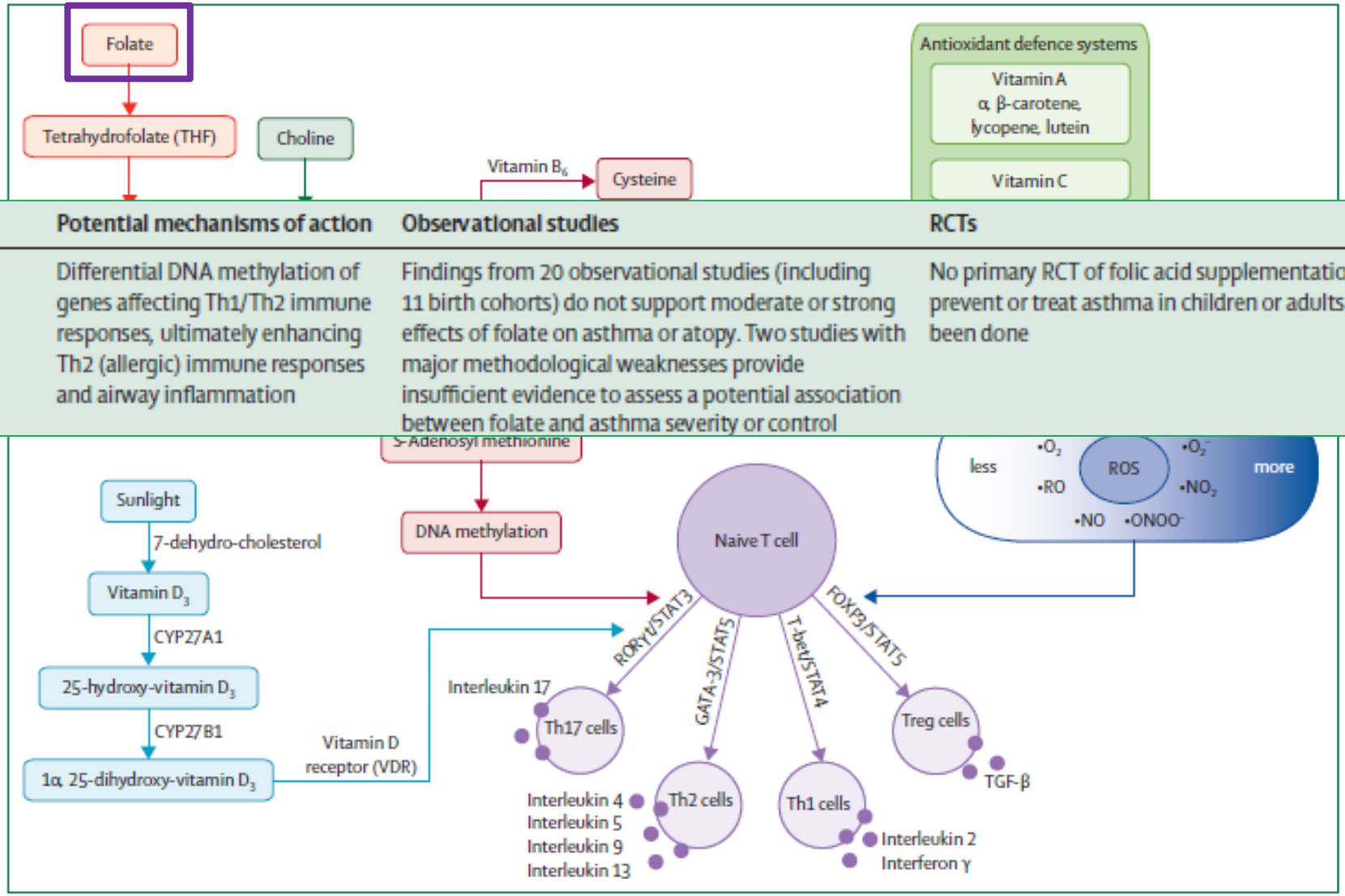
Maternal folate levels in pregnancy and asthma in children at age 3 years

Odds ratios for asthma at 3 years of age according to maternal levels of Plasma folate in the second trimester of pregnancy in 507 children with asthma(case) And 1455 control children

Maternal plasma folate† in pregnancy (nmol/L)	Control children	Case children	Asthma at age 3 y				
			Crude OR	(95% CI)	Adjusted OR	(95% CI)	*P* value
<5.54	293	83	1		1		
5.54-7.68	294	98	1.18	(0.84-1.64)	1.16	(0.80-1.66)	.44
7.68-10.60	283	105	1.31	(0.94-1.82)	1.48	(1.03-2.11)	.03
10.60-17.84	292	96	1.16	(0.83-1.62)	1.28	(0.89-1.85)	.18
>17.84	293	125	1.51	(1.09-2.08)	1.66	(1.16-2.37)	<.01
P trend			.03		.006		

Modest association of maternal plasma folate level & respiratory ds. in early childhood
Should higher folate in pregnancy pose a slight increased risk of respiratory illness in the child.
Even though these associations, Do not negate the value of folate supplementation in pregnancy

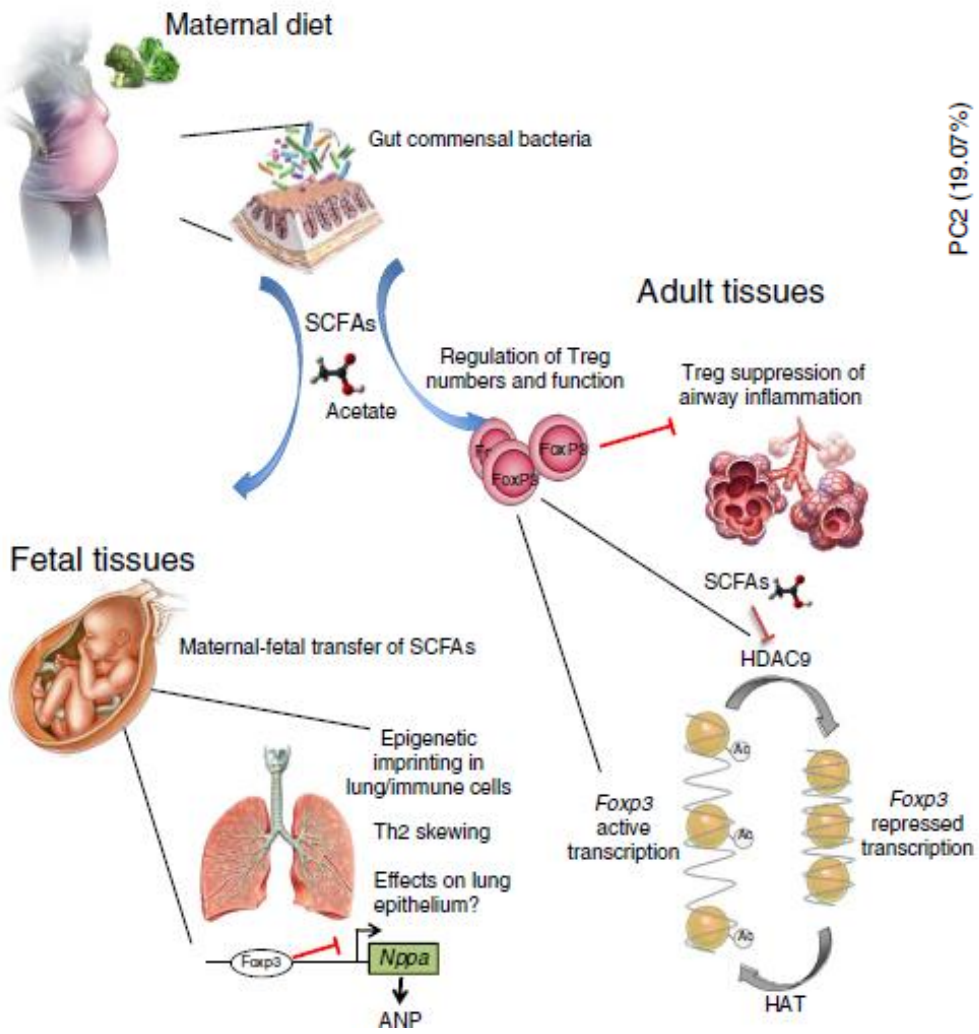
Potential mechanisms of action of methyl donors and vitamins on Th1 and Th2 immune response

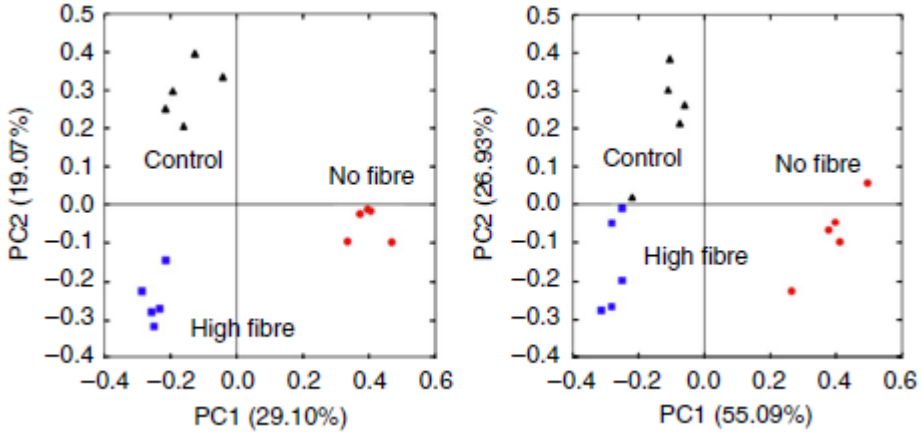


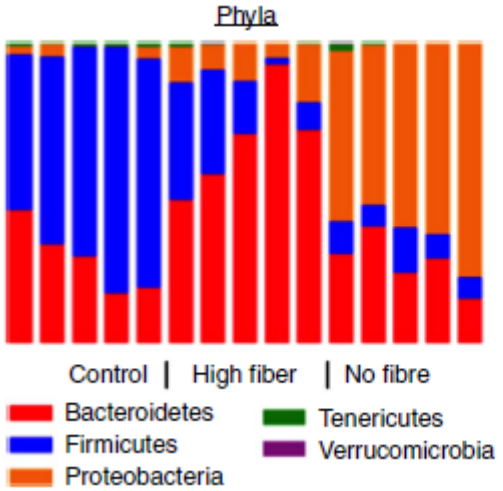
	Potential mechanisms of action	Observational studies	RCTs
Folate	Differential DNA methylation of genes affecting Th1/Th2 immune responses, ultimately enhancing Th2 (allergic) immune responses and airway inflammation	Findings from 20 observational studies (including 11 birth cohorts) do not support moderate or strong effects of folate on asthma or atopy. Two studies with major methodological weaknesses provide insufficient evidence to assess a potential association between folate and asthma severity or control	No primary RCT of folic acid supplementation to prevent or treat asthma in children or adults has been done

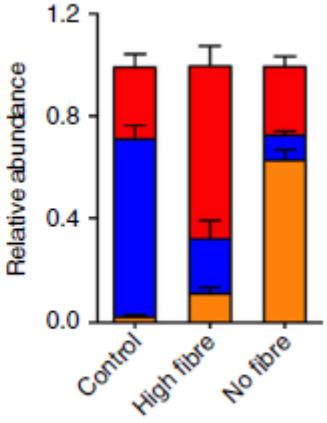
Lancet Respiratory Medicine 2013;1:813-22

Asthma is a developmental origin disease influenced by maternal diet and bacterial metabolites



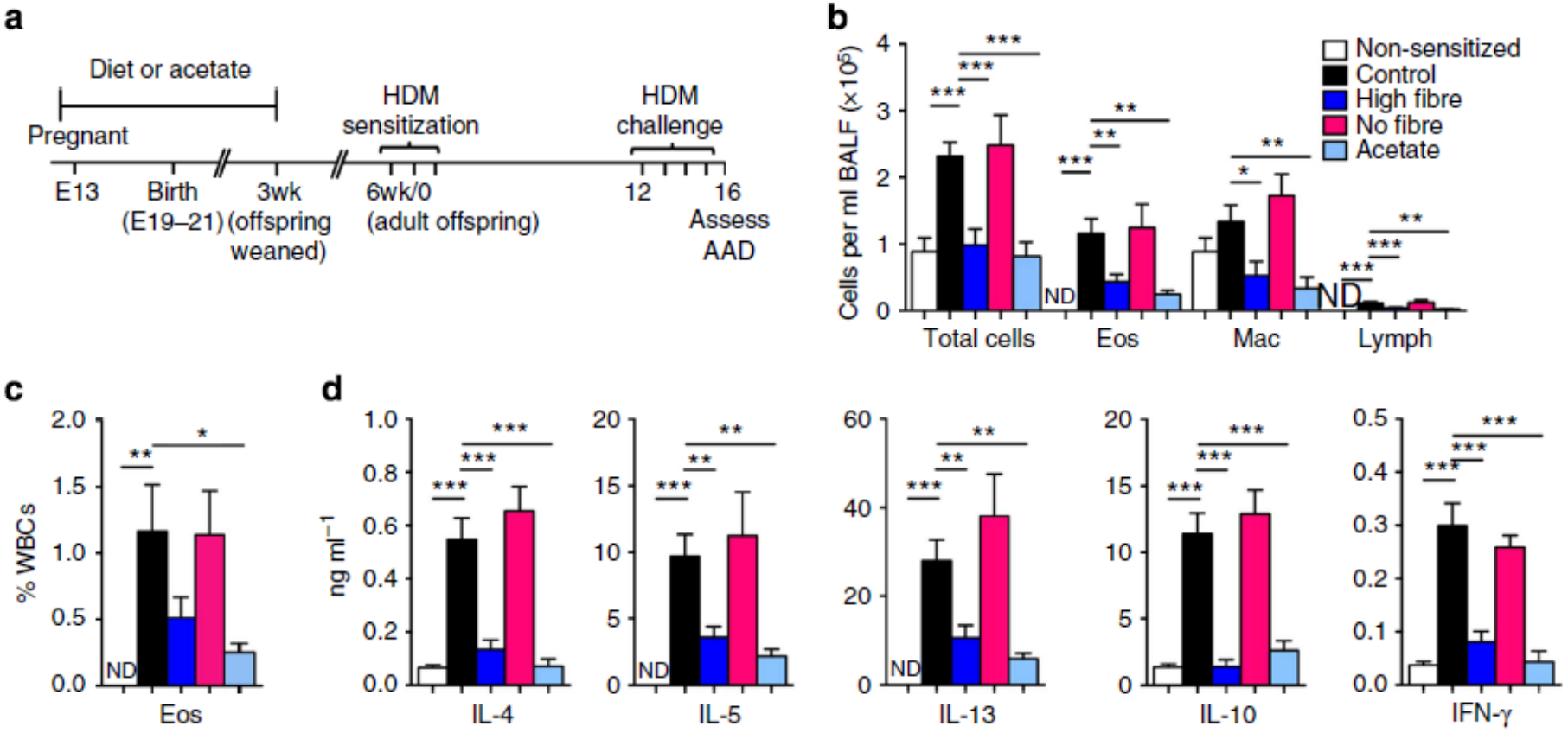






Nature Communications DOI: 10.1038/ncomms8320

The effect of maternal intake of high-fiber diet and acetate on the development of AAD in the offspring



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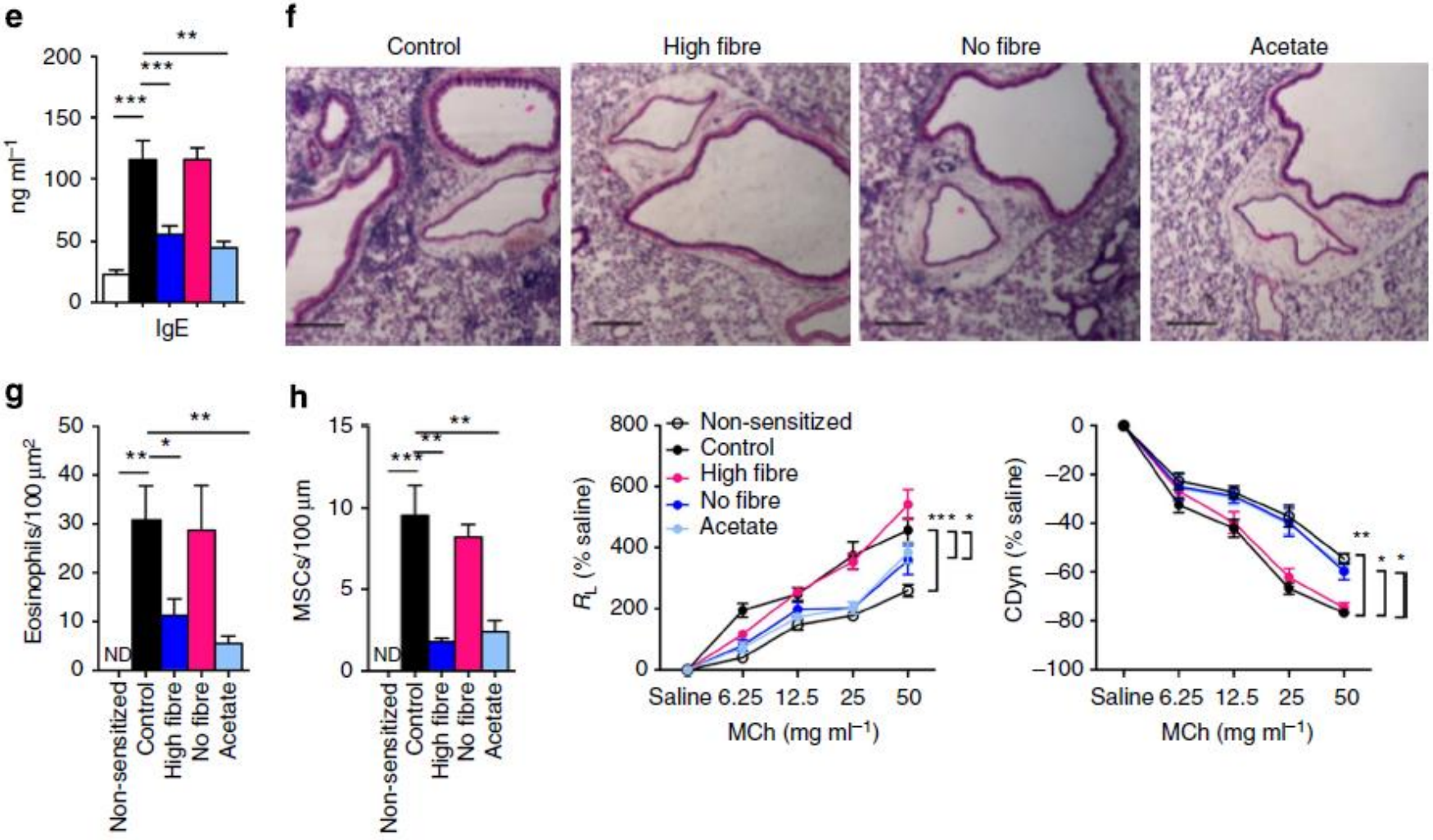


Nature Communications DOI: 10.1038/ncomms8320

Maternal diet and allergic disease

Table 1 Mechanisms of maternal diets that affect the perinatal programming of allergic diseases.

Diets	Potential mechanisms	Effects
Folic acid	Donation of CH_3 group, which causes DNA methylation and suppresses RunX3 expression[11–13]	Increased risk of allergy
Vitamin D	Cellular metabolism and differentiation via its nuclear receptor (VDR) that may enhance epigenetic modification enzymes[16–18]	Protects against allergy
Vitamin E	Antioxidant effect, which may switch from Th2 to Th1 immunity[21–24]	Less allergic reaction
Prebiotics and probiotics	Increase Treg cells and IL-10 secretion[53–55]	Better immune regulatory function
n-3 PUFAs and n-6 PUFAs	Decrease and increase prostaglandin E2[5,26–28]	Switch from Th2 to Th1 immunity

n-3 PUFAs = omega-3 polyunsaturated fatty acids; n-6 PUFAs = omega-6 polyunsaturated fatty acids; VDR = vitamin D receptor.

Table 2 Mechanisms by which infant diets can affect the development of asthma.

Infant diets	Potential mechanism	Effects and functions
Protein-hydrolysate formula	Avoidance of foreign allergens	Immune tolerance[39–44]
Complementary food	Induction of food tolerance by early allergen exposure	Decrease of sensitization[48–50]
Mediterranean diet	Antioxidants	Switch from Th2 to Th1 immunity[51,52]

Dietary restrictions for pregnant and lactating women

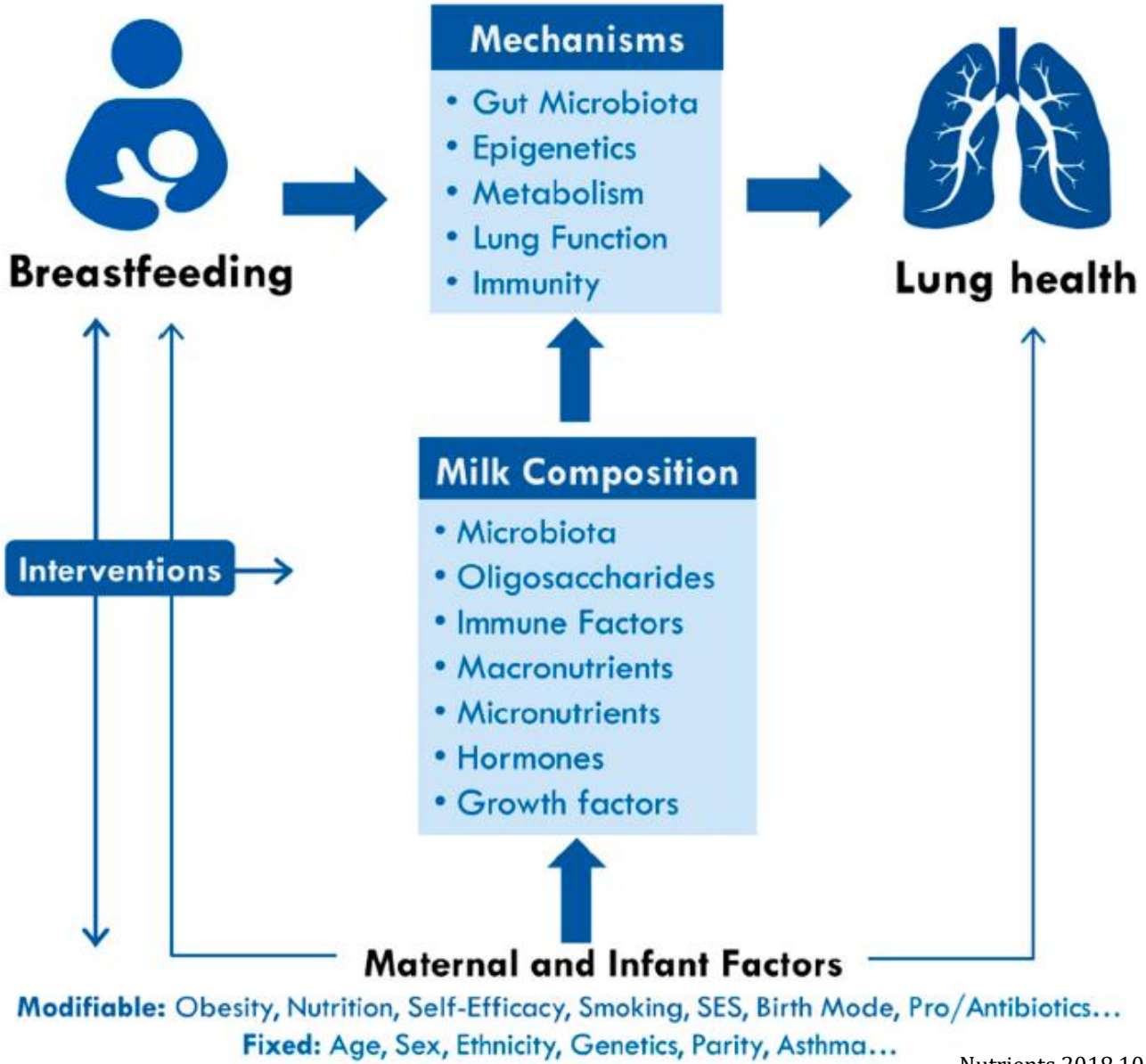
- Antioxidant, Vitamin D, (probiotics)

➔ May less allergic reaction, switch from Th2 to Th1 reaction

- Maternal exclusion diet (cow's milk, eggs, peanuts…)

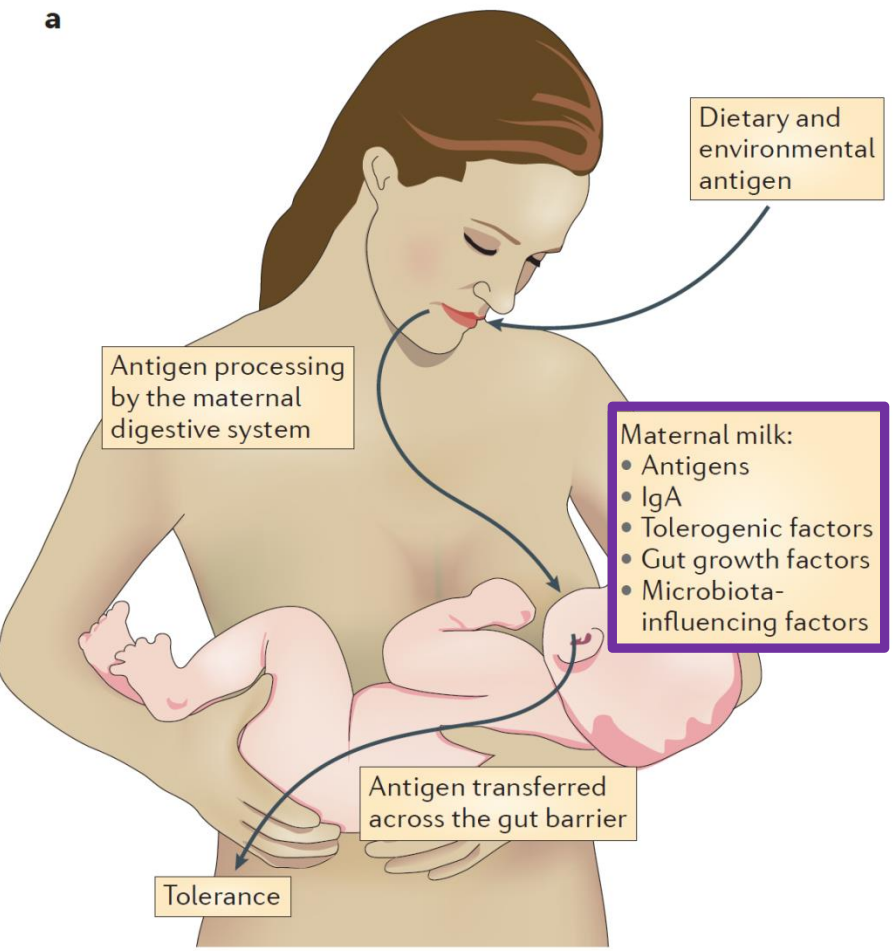
➔ Lack of evidence to prevent atopic disease

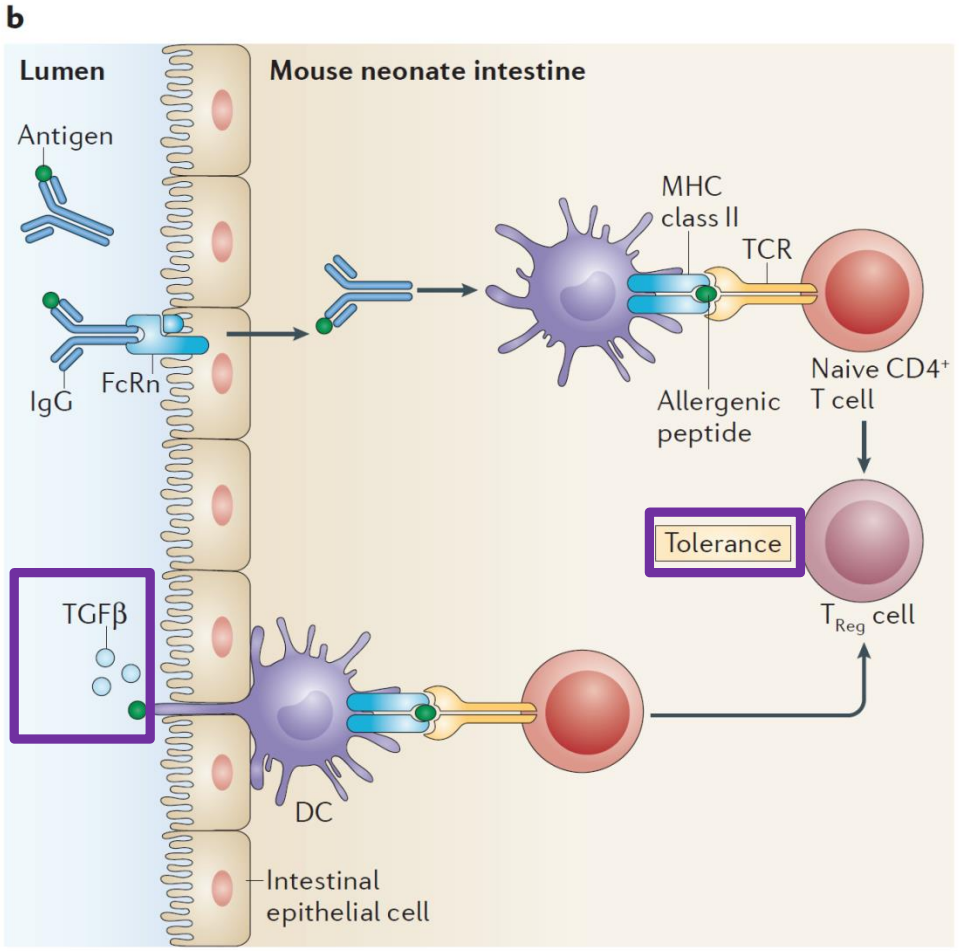
How could Breastfeeding Protect against asthma?



Nutrients 2018,10,995; doi:10.3390/nu1008095

Possible mechanisms of mother-to-child transfer of protection against allergic airway inflammation



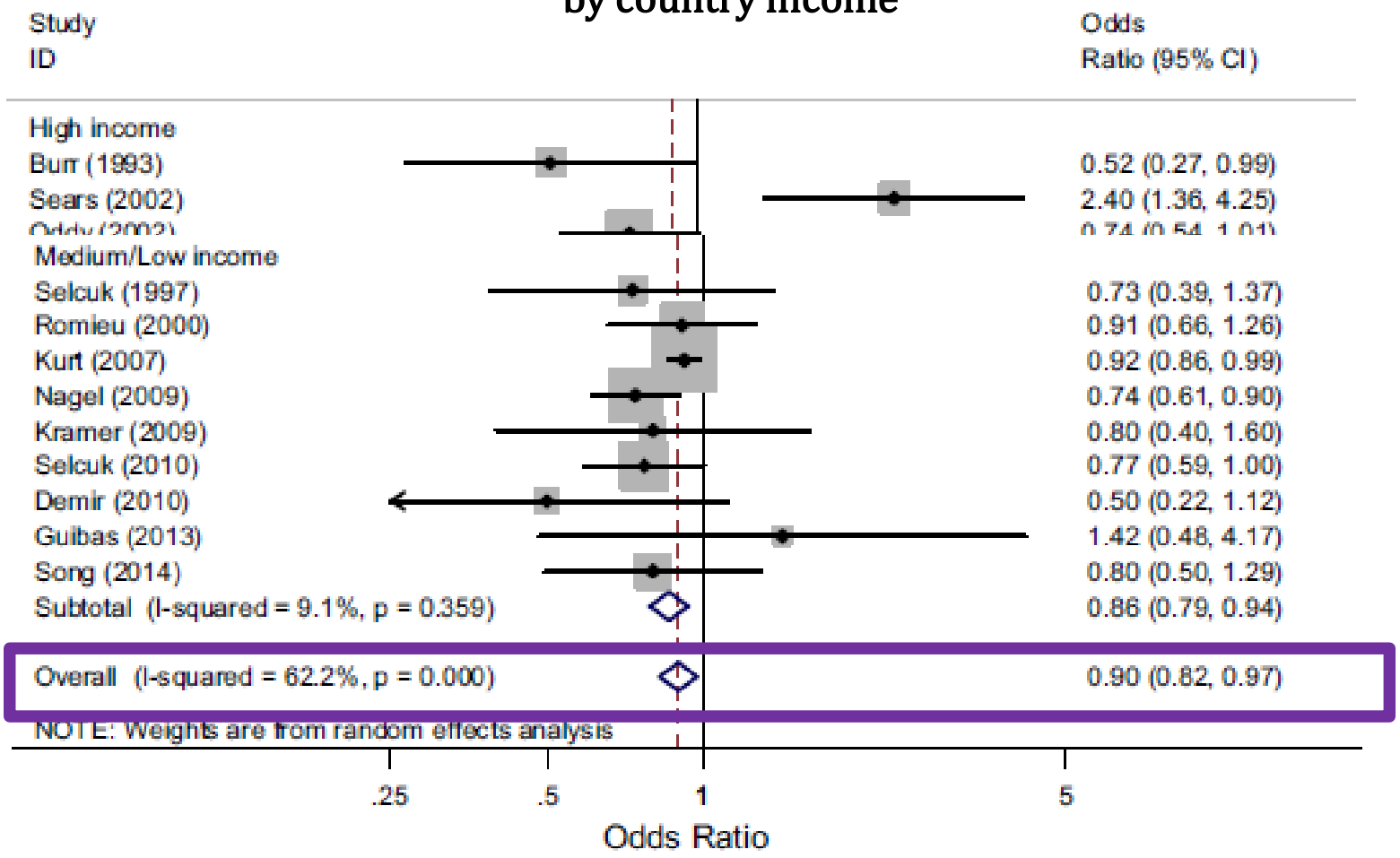


Tolerogenic factor (IL-10, TGF-β, lactoferrin, antioxidant, gut growth factor)

Nature Immunology review

Impact of breast feeding on the development of atopic disease

More vs. Less breastfeeding and the risk of wheeze/asthma 5-18 years by country income



doi: 10.1111/j.1365-2222.2008.03169.x

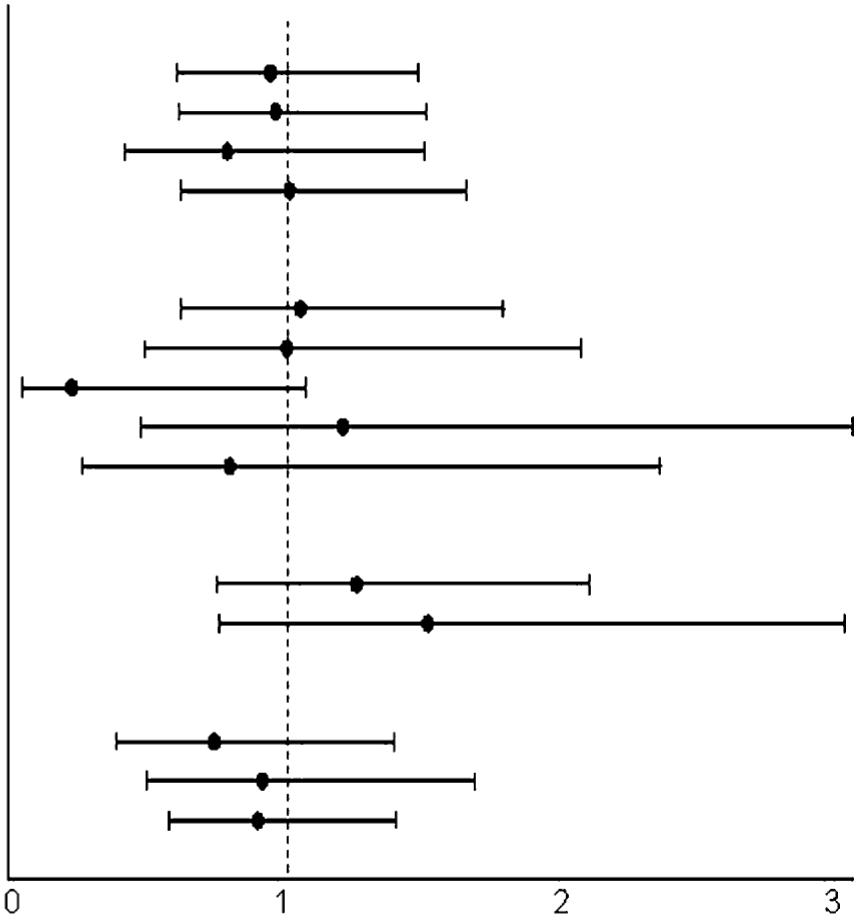
Fast food consumption counters the protective effect of breastfeeding on asthma in children?

The interactive role of exclusive breastfeeding and fast food consumption

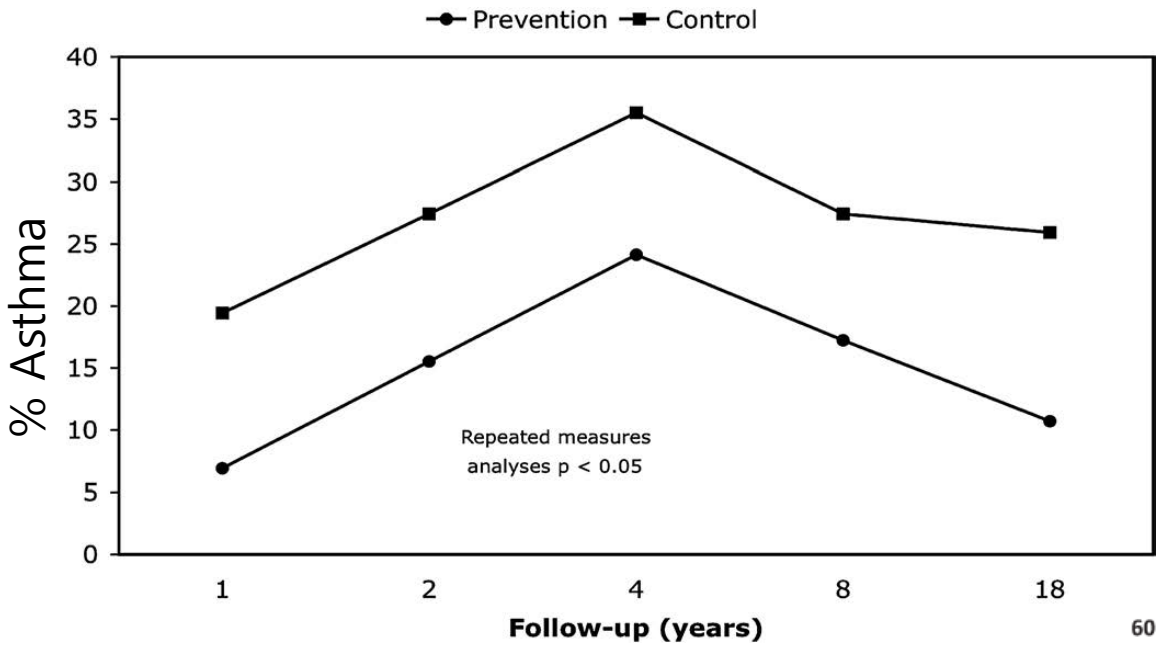
	Exclusive breastfeeding (weeks)	Fast food	Cases		Controls		Adjusted OR* (95% CI)
			n	%	*n*	%	
All	⩾12	No	42	18.0	137	30.5	1.00
	<12	No	39	16.7	69	15.4	1.87 (1.08–3.23)
	⩾12	Yes	76	32.5	125	27.8	1.96 (1.23–3.11)
	<12	Yes	77	32.9	118	26.3	2.32 (1.44–3.73)
Boys	⩾12	No	21	15.1	73	30.8	1.00
	<12	No	24	17.3	39	16.5	2.09 (1.00–4.34)
	⩾12	Yes	44	31.7	67	28.3	2.24 (1.17–4.27)
	<12	Yes	50	36.0	58	24.5	3.91 (2.01–7.61)
Girls	⩾12	No	21	22.1	64	30.2	1.00
	<12	No	15	15.8	30	14.2	1.53 (0.65–3.59)
	⩾12	Yes	32	33.7	58	27.4	1.83 (0.92–3.64)
	<12	Yes	27	28.4	60	28.3	1.26 (0.61–2.57)

Postnatal Fish Oil Supplementation in High-Risk Infants to Prevent Allergy: RCT

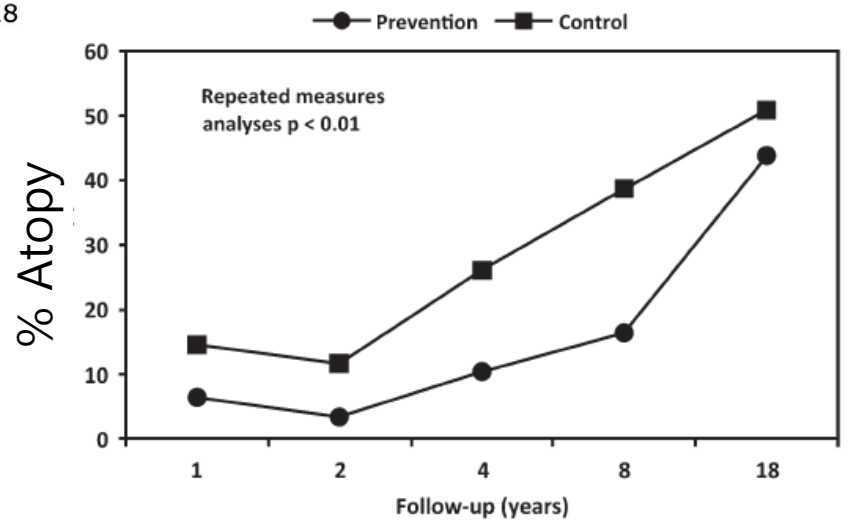
Fish oil	Placebo	
59/156 (37.8%)	66/167 (39.5%)	12m any diagnosed allergic disease
61/156 (39.1%)	68/167 (40.7%)	12m diagnosed eczema
19/156 (12.2%)	25/167 (15.2%)	12m diagnosed food allergy
44/156 (28.2%)	46/163 (28.2%)	12m sensitization
35/156 (22.4%)	36/163 (22.0%)	12m SPT+ egg
16/156 (10.3%)	17/163 (10.4%)	12m SPT+ peanut
2/156 (1.3%)	9/163 (5.5%)	12m SPT+ milk
10/156 (6.4%)	9/163 (5.5%)	12m SPT+ house dust mite
6/156 (3.8%)	8/163 (4.9%)	12m SPT+ cat
42/154 (27.3%)	38/163 (23.3%)	12m parent reported persistent cough
21/115 (18.3%)	16/126 (12.7%)	12m parent reported recurrent wheeze
19/155 (12.3%)	27/168 (16.1%)	6m parent reported persistent cough
23/155 (14.8%)	27/168 (16.1%)	6m parent reported recurrent wheeze
83/155 (53.5%)	95/168 (56.5%)	6m parent reported red, scaly skin



Multifaceted allergen avoidance during infancy reduces asthma during childhood with the effect persisting until age 18 years

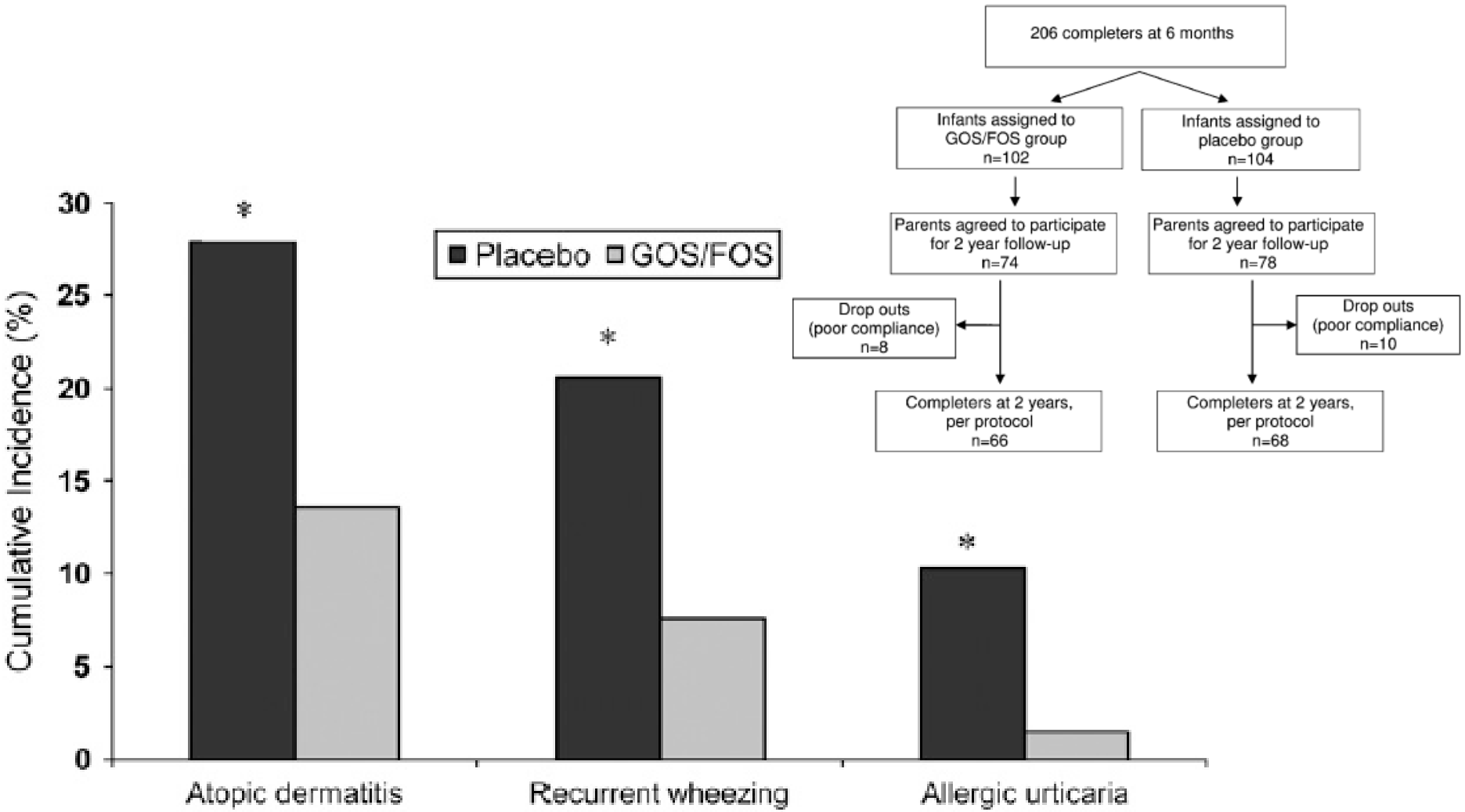


High risk of allergic disorder
N=120
Single-blinded RCT.
Breast feeding or lower allergen diet
Exposure to house dust mite allergen ⇩



Thorax 2012;67:1046-1051

Early Dietary intervention with a mixture of prebiotic Oligosaccharides reduces the incidence of allergic manifestations and infections during the first two years of life



Prebiotics supplement to infant Infant diet

Outcomes	Anticipated absolute effects (95% CI) Risk with no prebiotics	Risk with prebiotics	Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)
Eczema (general) Assessed as: physician-diagnosed eczema. Follow-up: range 3 to 24 mo	187 per 1000	**127 per 1000** (75 to 215)	**RR 0.68** (0.40 to 1.15)	2030 (6 RCTs)	⊕⊕◯◯ LOW[a,b,c]
Allergic rhinitis—not reported in any study	–	–	–	–	–
Asthma Defined as: "recurrent wheezing," as reported by parents or physician-diagnosed. Follow-up: range 18 to 24 mo	174 per 1000	**64 per 1000** (30 to 139)	**RR 0.37** (0.17 to 0.80)	249 (2 RCTs)	⊕◯◯◯ VERY LOW[c,d,e]
Food allergy Assessed with: symptoms of "self-reported	170 per 1000	**48 per 1000** (14 to 170)	**RR 0.28** (0.08 to 1.00)	115 (1 RCT)	⊕◯◯◯ VERY LOW[c,f,g]

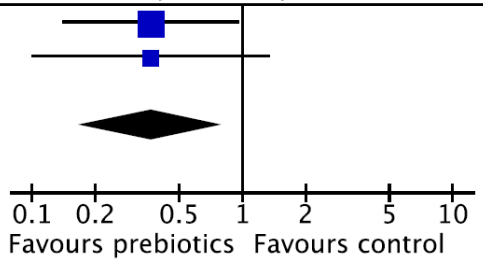
Currently available evidence on prebiotic supplementation to reduce the risk of developing allergies is very uncertain.

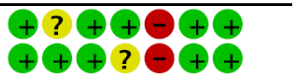
Follow-up: 12 mo

(B) Asthma/wheezing

Study or subgroup	Prebiotics Events	Total	Control Events	Total	Weight	Risk ratio M–H, Random, 95% CI
Arslanoglu (2008)	5	66	14	68	64.6%	0.37 [0.14, 0.96]
Ivakhnenko (2013)	3	62	7	53	35.4%	0.37 [0.10, 1.35]
Total (95% CI)		**128**		**121**	**100.0%**	**0.37 [0.17, 0.80]**
Total events	8		21			

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 0.00$, $df = 1$ ($P = 1.00$); $I^2 = 0\%$
Test for overall effect: $Z = 2.53$ ($P = .01$)





weight gain. Follow-up: range 1 to 12 mo

Nutrients and foods for the primary prevention of asthma and allergy: Systematic review and meta-analysis

Ulugbek Nurmatov, MD, PhD,[a] Graham Devereux, MD, PhD, FRCP,[b] and Aziz Sheikh, MD, FRCGP, FRCP[a] *Edinburgh and Aberdeen, United Kingdom*

- Epidemiologic evidence ; weak

  ➔ nonetheless suggestive in relation to vitamins D and E; fruits and vegetables; and Mediterranean diet, particularly in relation to asthma outcomes
- Need for well designed RCT
- A balanced healthy diet in relation to a Mediterranean diet and fruit and vegetables.

CONTENTS

- Dietary pattern
- Primary prevention
  - Maternal food, infant food (Breastfeeding)
- Nutrient ; vitamin D, E & FishOil
- Gut-lung axis (microbiome) and obesity

Diet and risk of asthma/wheezing

Diet	Diet During Life Stages					
	Pregnancy		Childhood		Adulthood	
	Effect	Evidence	Effect	Evidence	Effect	Evidence
Post-natal breast feeding			✓ [56]	Very strong	− [57]	Low
Mediterranean diet	− [58–63]	Low	− [59,63–68]	Low	− [69–71]	Low
Fruit	− [58,61,63,72–77]	Low	✓ [78–81]	Low	✓ [69,82,83]	Low
Vegetables	− [58,61,63,72–77]	Low	✓ [78–81]	Low	✓ ** [70,83–85]	Very low
Fast food	− [60,63,86,87]	Low	✗ [63,88,89]	Low	− [90]	Low
"Western" diet	− [91–93]	Low	✗ [88,94–97]	Very low	− [90,98–100]	Low
Meat	− [62,101]	Low	✗ [63]	Low	− [90]	Low
Fish	− [74,77,92,102–108]	Low	✓ * [95,105,108–113]	Low	− [69–71]	Low
Vitamin A	− [114–116]	Low	− [117,118]	Low	?	?
Vitamin B	− [114,119,120]	Low	?	?	?	?
Vitamin C	− [75,114,115,121,122]	Low	?	?	?	?
Vitamin D	✓ [101,123–125]	Very Strong	− [126]	Low	?	?
Vitamin E	✓ [75,101,115,121,122,127]	Low	?	?	✓ *** [128,129]	Low
LC *n*-3 PUFA (Fish oil)	✓ [130–132]	Strong	− [133–135]	Very Strong	− [113,136,137]	Low

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Diet and control of asthma

Diet	Childhood		Adulthood	
	Effect	Evidence	Effect	Evidence
Mediterranean diet	✓ [153,154]	Low	− [170,171]	Strong
Fruit	✓ [155,156]	Very low	✓ [174]	Strong
Vegetables	✓ [156]	Very low	✓ [174]	Strong
Fast food	✗ [156,158,159]	Very low	✗ [183]	Very low
"Western" diet	?	?	✗ [181]	Very low
Meat	?	?	✗ [182]	Low
Fish	?	?	?	?
Vitamin A	?	?	?	?
Vitamin B	?	?	?	?
Vitamin C	✓ [166]	Low	− [176]	Strong
Vitamin D	✓ [167]	Strong	− [178]	Strong
Vitamin E	?	?	− [177]	Strong
LC *n*-3 PUFA (Fish oil)	− [160–163]	Strong	− [161]	Very strong

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FEV_1 % by quartiles of antioxidant vitamins

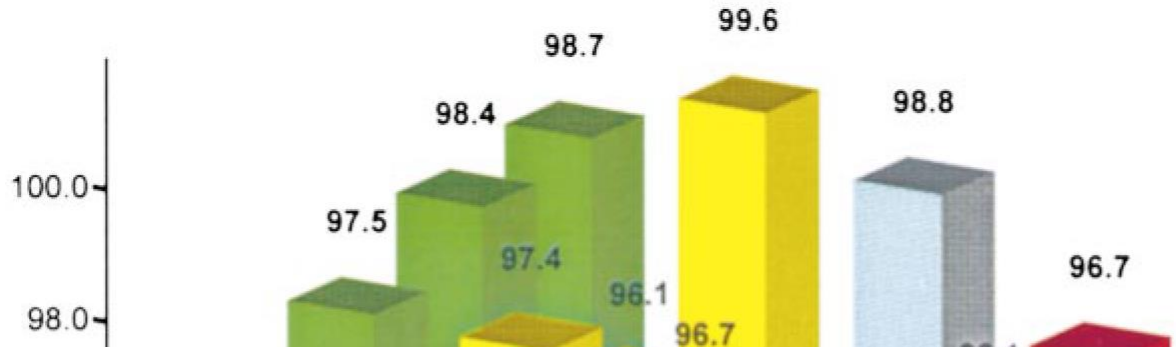


TABLE 3a. FEV_1% (MEAN ± SD*) BY QUARTILES OF ANTIOXIDANT VITAMINS

	Quartile Mean* (± SD)				
	I	II	III	IV	p for Linear Trend
Vitamin C	93.7 ± 16.9	96.9 ± 16.1	96.3 ± 16.5	99.1 ± 15.6	< 0.001
Vitamin E	94.3 ± 16.7	95.7 ± 16.3	97.4 ± 16.1	98.7 ± 16.1	< 0.001
β-cryptoxanthin	92.1 ± 17.9	97.9 ± 14.4	96.2 ± 15.6	99.6 ± 16.4	< 0.001
Lutein/zeaxanthin	93.5 ± 16.2	97.5 ± 16.0	97.5 ± 16.9	97.4 ± 15.9	0.001
β-carotene	94.9 ± 16.5	95.1 ± 15.4	96.7 ± 16.5	99.3 ± 16.6	< 0.001
Lycopene	95.4 ± 16.8	96.5 ± 16.4	96.8 ± 16.9	97.3 ± 15.2	0.096
Retinol	95.2 ± 17.5	95.1 ± 16.5	98.1 ± 15.3	97.6 ± 15.9	0.006

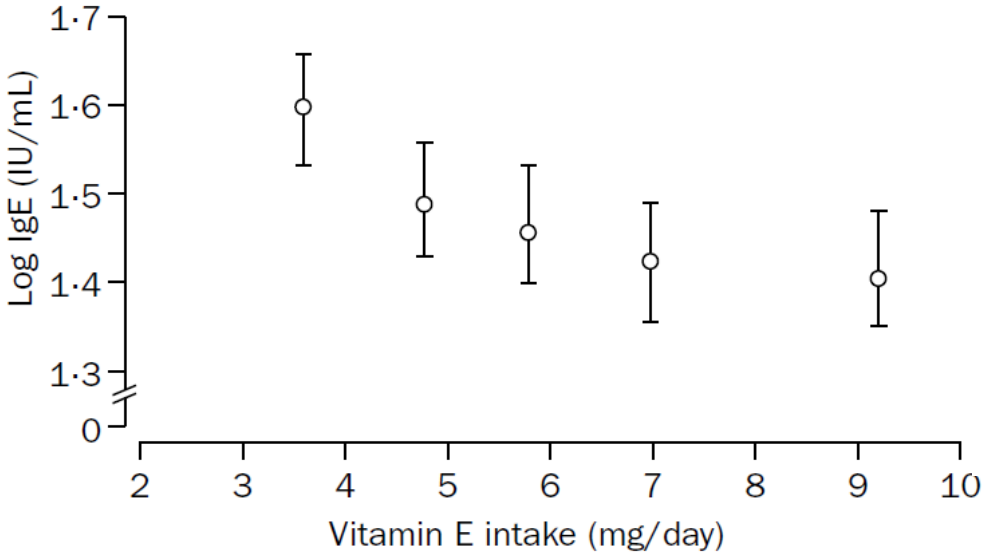
Am J Respir Crit Care Med Vol 163. pp 1246–1255, 2001

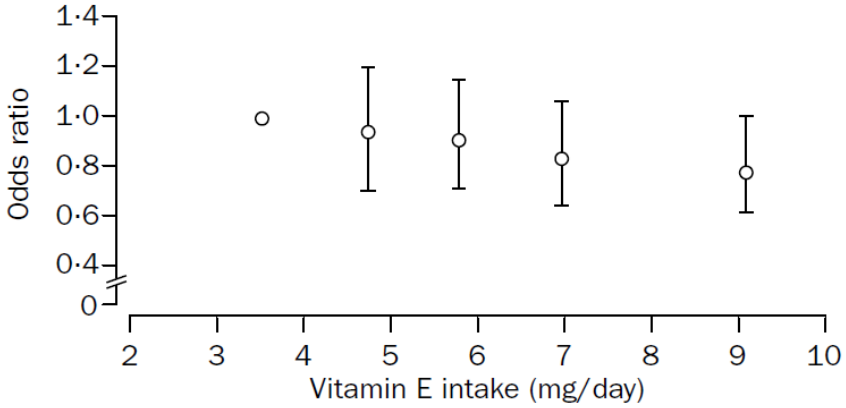
Why don't we give chest patients dietary advice?

Dietary vitamin E, IgE concentrations, and atopy

A Fogarty, S Lewis, S Weiss, J Britton

*Vitamin E inhibits IgE responses to allergic stimuli in animals. We investigated the relation between dietary vitamin E intake and serum IgE concentrations and atopy, measured as allergen skin sensitisation, in a random sample of 2633 adults. Higher concentrations of vitamin E intake were associated with lower IgE concentrations and a lower frequency of allergen sensitisation. These findings may explain the beneficial effect of dietary vitamin E on the incidence of asthma. (**Lancet** 2000;356:1573–4)*





Thorax 2001;56(SuppI II)

Potential effects of vitamins on asthma

Vitamin E

Downregulation of oxidative stress,
Airway inflammation, and Th2 immune response

>20 studies of postnatal dietary intake suggest an **inverse association** between vitamin E intake and physician-diagnosed asthma in children and adult, with **inconsistent** results for wheeze, self-reported asthma, and airway responsiveness.
When studies of prenatal dietary intake are reviewed along with those of postnasal intake, **weak evidence** exists of an inverse association between vitamin E intake and asthma or atopy in children.

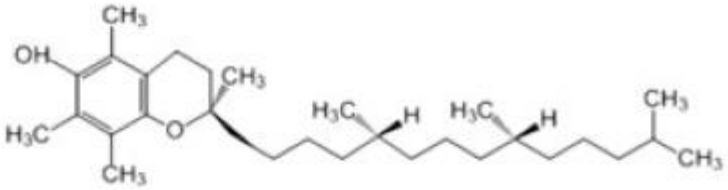
No Primary RCT of vitamin E supplementation during preg.
2 RCT showed **no significant effect** of vit.E supplementation on airway responsiveness or inflammatory and immune markers in adults with asthma
Support a protective effect of vitamin E supplementation against ozone-induced bronchoconstriction

Table 1: Collective findings of studies and trials of potential effects of vitamins on asthma

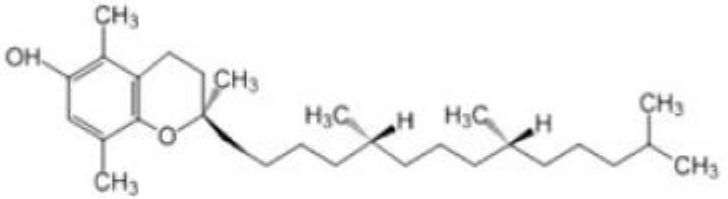
Lancet Respiratory Medicine 2013;1:813-22

Vitamin E isoformer

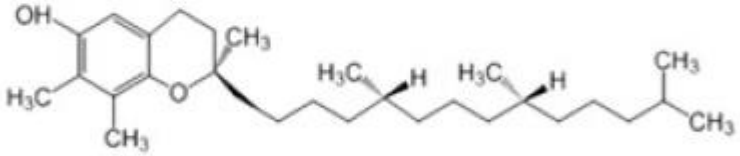
α-T



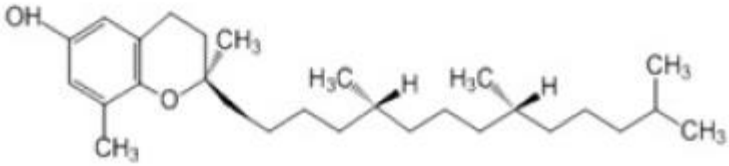
β-T



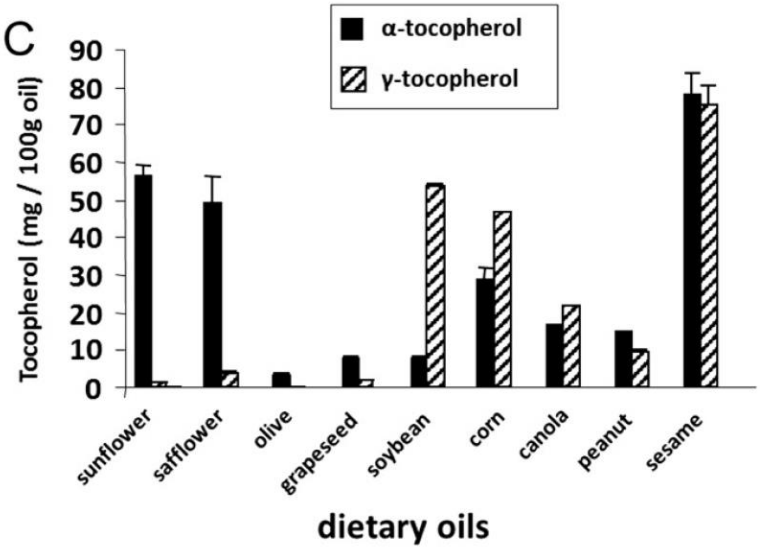
γ-T



δ-T



country	average plasma tocopherol γ-T (μM)	α-T (μM)	year	asthma prevalence (2004)	(2012)
USA	5 or 7	22 or 27	2001	10.9%	N.D.
Scotland	1.9 or 2.0	24 or 27	2000,2011,1995	18.4%	≥10%
Netherlands	2.3	25	2007	N.D.	15.2%
Australia	1.6	19 or 34	2003, 2009	14.7%	21.5%
Ireland	1.8	26	2001	≥10%	9.2%
Japan	1.7 or 2	23	2006, 2008	5.1-7.5%	N.D.
Sweden	1.6	19.6	1999	5.1-7.5%	≥10%
Finland	0.5 or 1.8	24 or 41	2012, 2010	8.0%	10.2%
France	1.2	26	2001	6.8%	10.6%
Italy	1.2	24	2003	4.5%	6.3%
Lithuania	0.9	19	1999	N.D.	6.4%
Russia	N.D.	23	2008)	2.2%	2.5%
China	1.4	19 or 22	1998, 2003	2.1%	1.4%



Dietary n-3 long chain polyunsaturated fatty acids in allergy prevention and asthma treatment

Linette E.M. Willemsen

Division of Pharmacology, Utrecht Institute for Pharmaceutical Sciences, Faculty of Science, Utrecht University, Universiteitsweg 99, 3584 CG Utrecht, The Netherlands

A B S T R A C T

The rise in non-communicable diseases, such as allergies, in westernized countries links to changes in lifestyle and diet. N-3 long chain polyunsaturated fatty acids (LCPUFA) present in marine oils facilitate a favorable milieu for immune maturation and may contribute to allergy prevention. N-3 LCPUFA can suppress innate and adaptive immune activation and induce epigenetic changes. Murine studies convincingly show protective effects of fish oil, a source of n-3 LCPUFA, in food allergy and asthma models. Observational studies in human indicate that high dietary intake of n-3 LCPUFA and low intake of n-6 PUFA may protect against the development of allergic disease early in life. High n-6 PUFA intake is also associated with an increased asthma risk while n-3 LCPUFA may be protective and reduce symptoms. The quality of the marine oil used has impact on efficacy of allergy prevention and several observations link in particular n-3 LCPUFA DHA to allergy suppression. Randomized controlled trials indicate that optimal timing, duration and dosage of n-3 LC-PUFA is required to exert an allergy protective effect. Supplementation during early pregnancy and lactation has shown promising results regarding allergy prevention. However these findings should be confirmed in a larger cohort. Although clinical trials in asthma patients reveal no consistent clinical benefits of n-3 LCPUFA supplementation on lung function, it can suppress airway inflammation. Future food-pharma approaches may reveal whether adjunct therapy with dietary n-3 LCPUFA can improve allergy prevention or immunotherapy via support of allergen specific oral tolerance induction or contribute to the efficacy of drug therapy for asthma patients.

European Journal of Pharmacology 675(2016) 174-186

Fatty acids, inflammation, and asthma

Stacy Gelhaus Wendell, PhD, Cindy Baffi, MD, and Fernando Holguin, MD, MPH *Pittsburgh, Pa*

Fatty acids and consequently diet play an essential role in the formation of inflammatory mediators involved in the pathogenesis of asthma. Because intake variations of omega-6 (n-6) and omega-3 (n-3) fatty acids ultimately determine cell membrane incorporation, changes in diet have the potential to modify downstream production of inflammatory mediators derived from

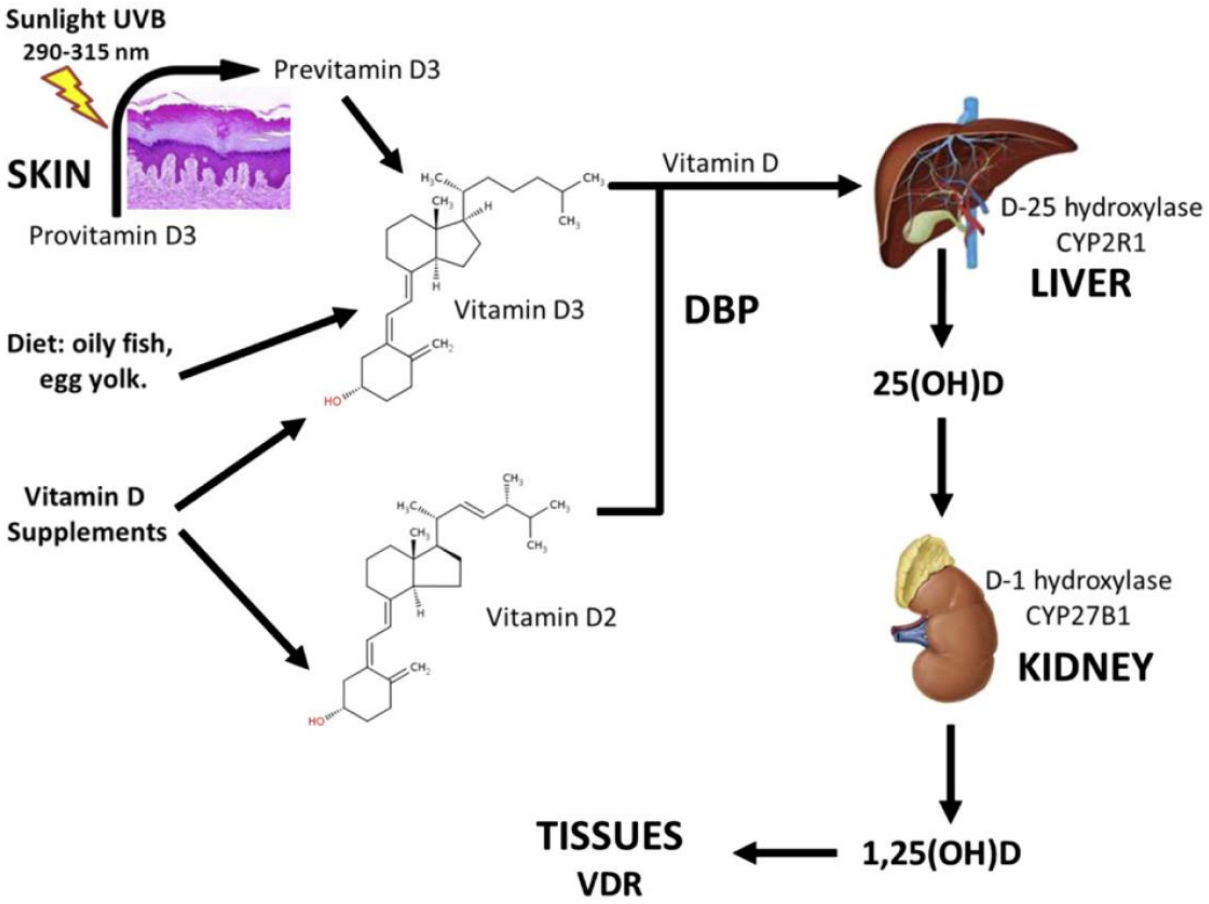
that decreasi
more proinfl
formation of
resolve inflar
improved ast
incidence. Th
inflammatory
clinical and
fatty acid pr
Immunol 201

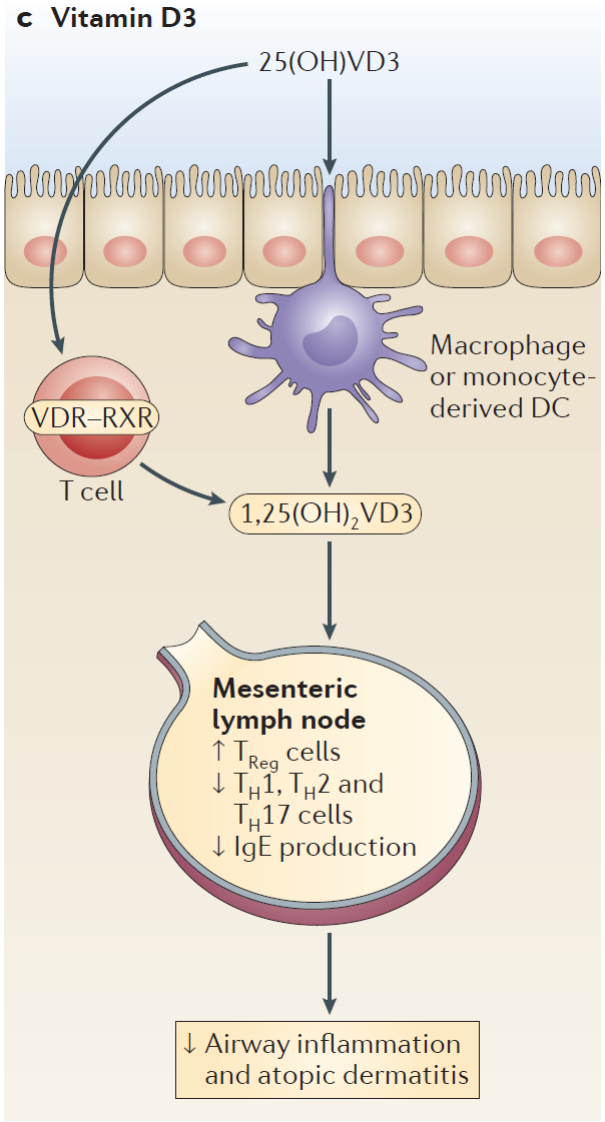
CONCLUSIONS

Fatty acids play an essential role in the development and resolution of inflammatory pathways relevant to the pathophysiology of asthma. Although dietary interventions have been largely disappointing, there is ongoing interest to determine whether specific endogenous fatty acids can be used as therapeutic agents to resolve airway inflammation in asthmatic patients and, perhaps more importantly, to determine which type of asthmatic phenotype would gain the greatest benefit.

J Allergy Clin Immunol 2014:133:1255-64

Vitamin D & immune modulator





Potential beneficial effect of vitamin D on asthma

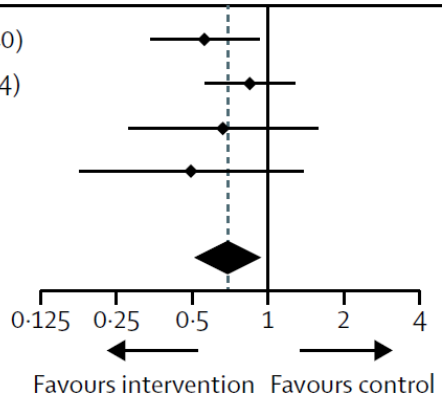
Vitamin D effects on the innate immune system:
– Enhances epithelial barrier function and chemokine secretion. – Increases the production of antimicrobial peptides in macrophages and monocytes. – Enhances the generation of reactive oxygen and nitrogen species in leukocytes.
Vitamin D effects on the adaptive immune system:
– Promotes tolerogenic T regulatory cells (Tregs). – Inhibits the development of pathogenic effector Th1 and Th17 cells. – Inhibits B cells, plasma cell differentiation, and Ig production.
Unproven potential clinical benefits:
– Protection against asthma development in early life. – Protection against respiratory infections, a risk factor for asthma onset and exacerbations. – Enhances anti-inflammatory response to corticosteroids.

Vitamin D supplementation to prevent asthma exacerbations: a systematic review and meta-analysis of individual participant data

David A Jolliffe, Lauren Greenberg, Richard L Hooper, Christopher J Griffiths, Carlos A Camargo Jr, Conor P Kerley, Megan E Jensen, David Mauger, Iwona Stelmach, Mitsuyoshi Urashima, Adrian R Martineau

Two-step individual participant data meta-analysis, event rate for asthma exacerbation requiring treatment with systemic corticosteroids

	Vitamin D (N)	Vitamin D (events/participant-years [event rate])	Placebo (N)	Placebo (events/participant-years [event rate])	Adjusted incidence rate ratio (95% CI)	Weight (%)
Castro et al[11]	201	24/105·4 (0·23)	207	44/109·0 (0·40)	0·56 (0·34–0·92)	32·89
Martineau et al[12]	125	42/117·4 (0·36)	125	51/116·7 (0·44)	0·85 (0·56–1·28)	48·39
Jensen et al[15]	11	9/4·9 (1·84)	11	13/5·3 (2·47)	0·66 (0·28–1·58)	10·89
Kerley et al[16]	17	9/5·2 (1·72)	22	13/7·0 (1·86)	0·49 (0·18–1·38)	7·82
Tachimoto et al[14]	54	1/26·5 (0·04)	35	0/16·8 (0·0)	(Excluded)	0·00
Overall (I^2=0·0%, p=0·560)					**0·69 (0·52–0·92)**	**100·00**

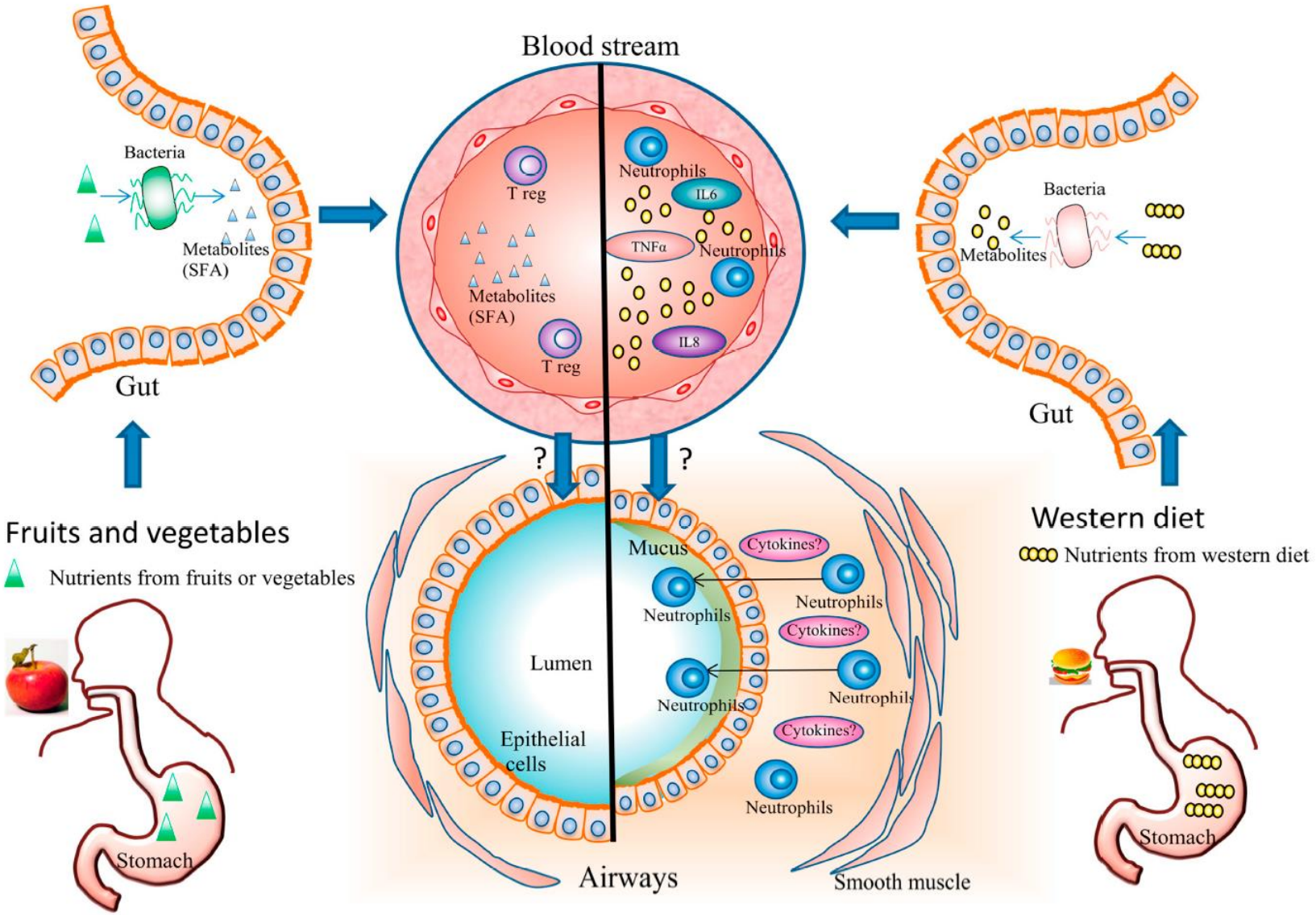


- Which is normal range of vitamin D ?
  - Not in Skeletal and calcium metabolism
- How to supply ?

CONTENTS

- Dietary pattern
- Primary prevention
  - Maternal food, infant food (Breastfeeding)
- Nutrient ; vitamin A,B,C,D,E & FishOil
- Gut-lung axis (microbiome) and obesity

Systemic and airway effects of dietary patterns on asthma



Nutrients 2017, 9 1227

The microbiome in asthma

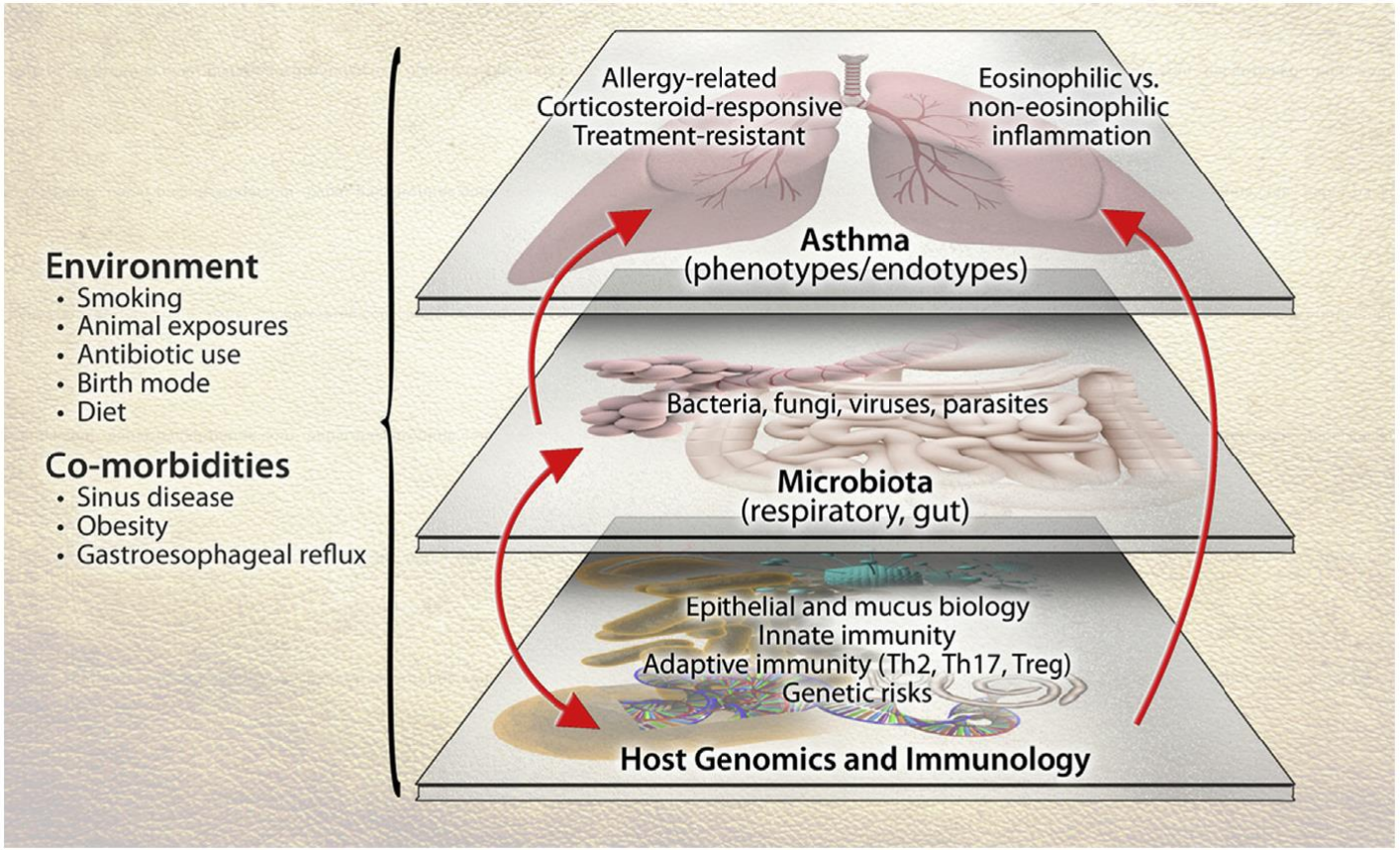
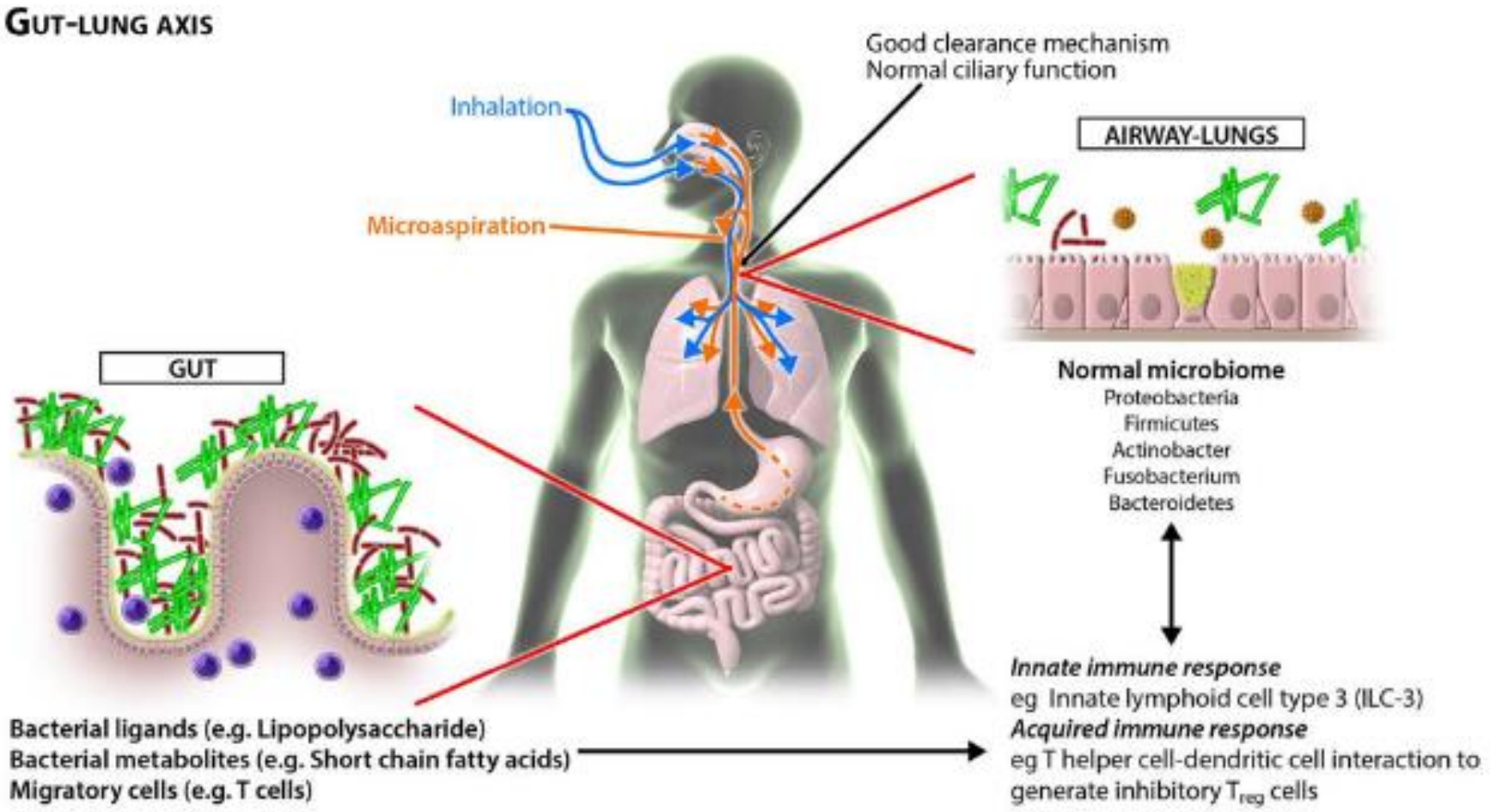


FIG 1. Interface of microbiota interactions with other factors that collectively influence susceptibility to asthma or its manifestations. Components of the depicted system (ie, host genetics and immunology, microbiota, environmental exposures, and asthma) are themselves heterogeneous entities, presenting challenges to more precisely dissect the role or roles of the microbiome in asthma.

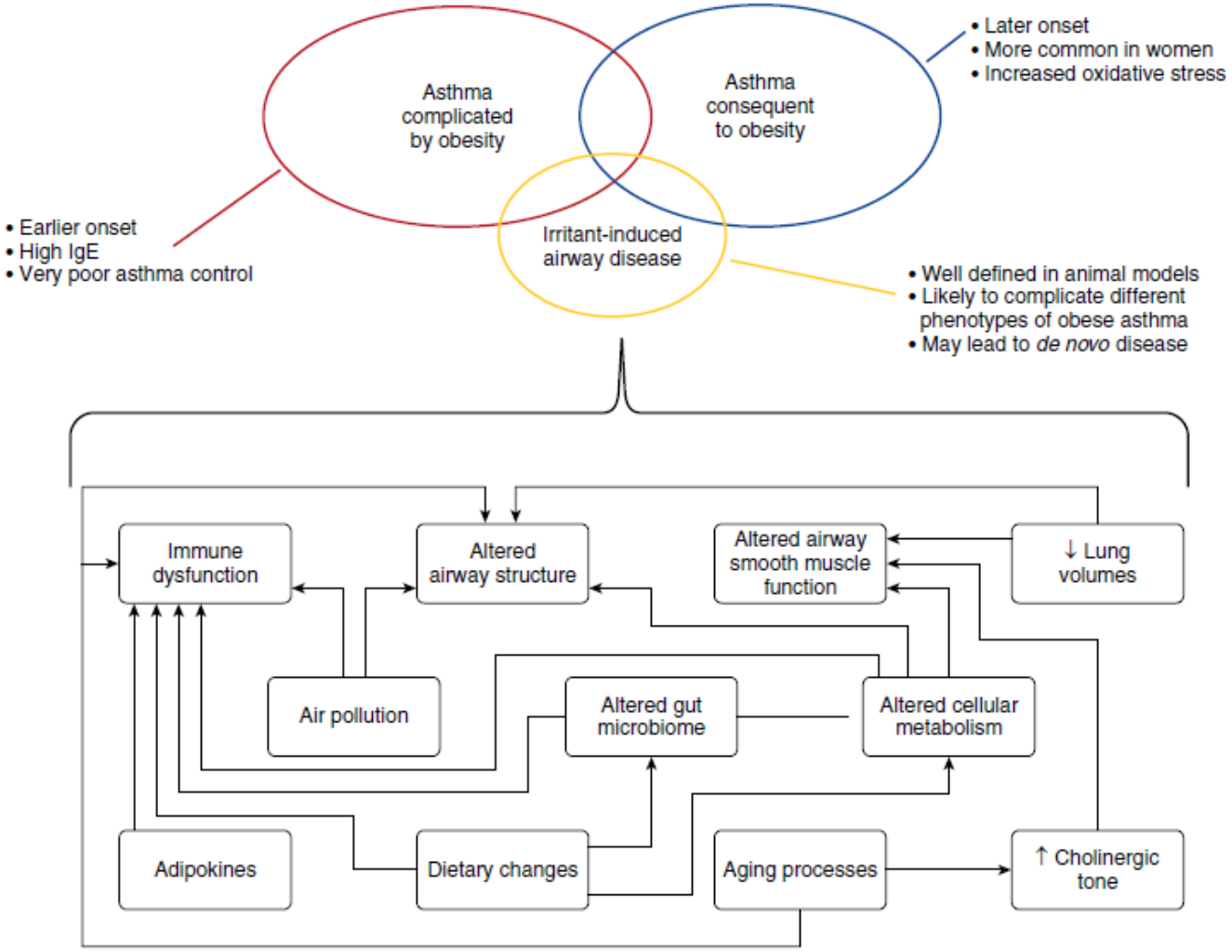
Asthma and Obesity: The Chicken, the Egg, or More Than One Beast?



J Allergy Clin Immunol 139(4):1071

Am J Respir Crit Care Med 195(9):1181-1188

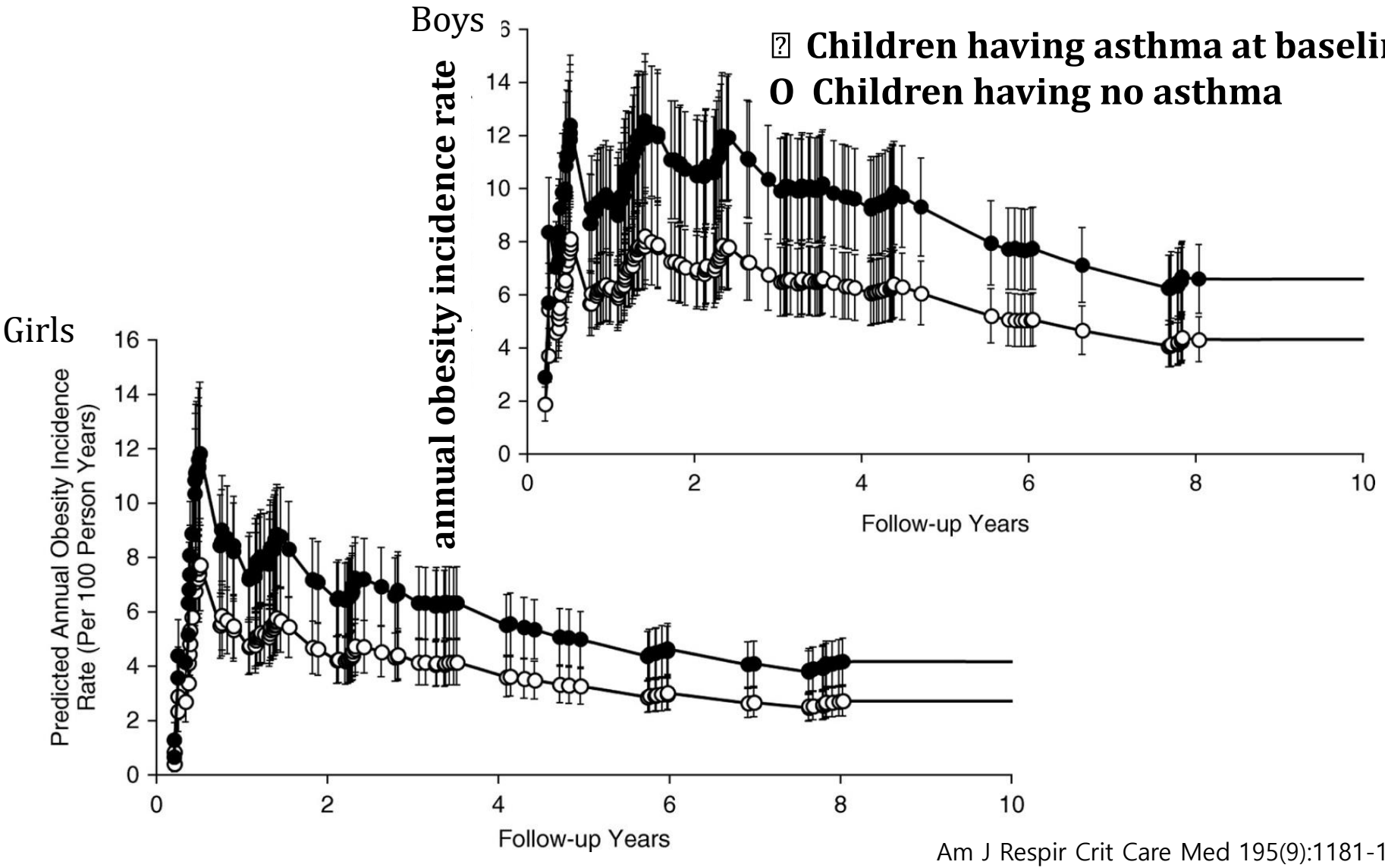
Asthma and Obesity: The Chicken, the Egg, or More Than One Beast?



Am J Respir Crit Care Med 195(9):1181-1188

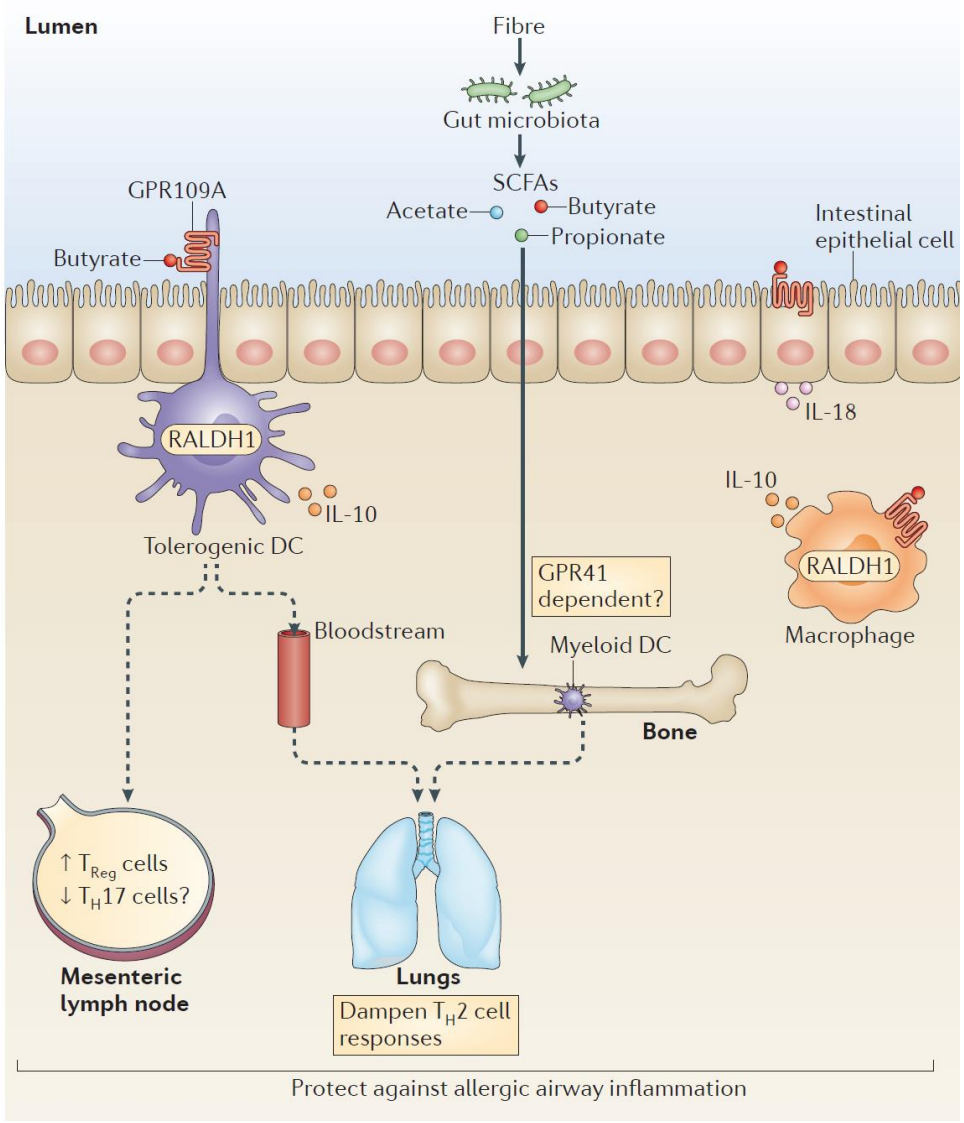
Am J Respir Cell Mol Biol 54(5);601-608

Effects of childhood asthma on the development of obesity among school-aged children

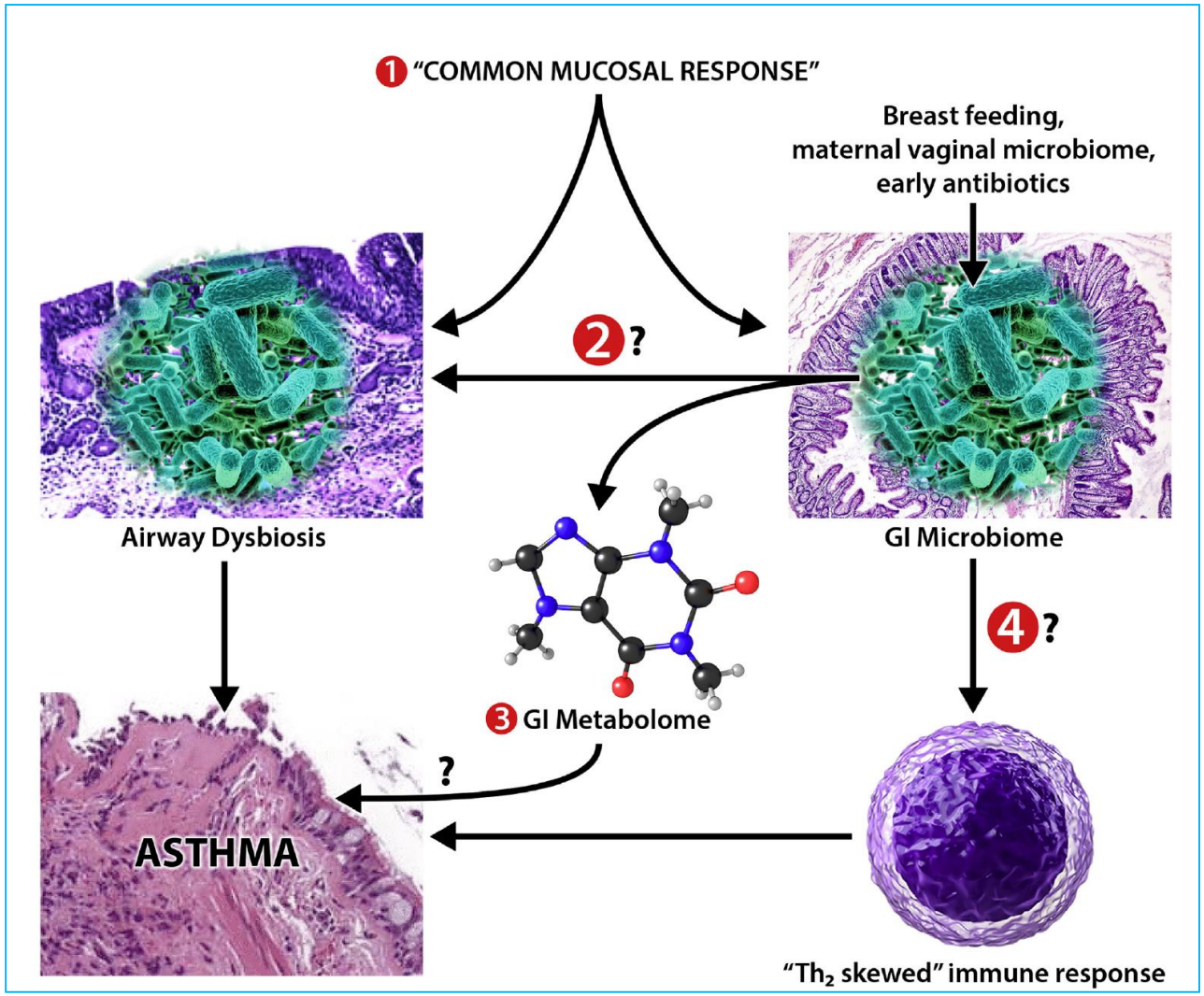


Am J Respir Crit Care Med 195(9):1181-1188

Immune modulation by fiber and short-fatty acid



Asthma causation and the gastrointestinal microbiome and metabolome: Might there be a signal, or is it just noise?



J Allergy Clin Immunol 2019

Summary

- **FOOD**; a key factor influencing immune homeostasis and the development of allergic diseases through a ***complex interplay*** between nutrients, their metabolites and immune cell populations.

- **ASTHMA**; An umbrella term including various phenotype and endotype
  Not only atopy and obesity related.

- **Controversy** ; Definition of asthma (self-report, wheezing, diagnosis), Timing of exposure, Susceptibility, Study design, Dose of the nutrients…

- Further investigations ; still required to understand complex relationships

- Rich in antitoxins (Vegetable & Fruit) diet
  Vitamin D supplementation & maintain proper weight

“Let FOOD be thy medicine Let MEDICINE by the food”

Hippocrates

Thank you for your attention