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Consumption of organic foods and risk of atopic disease during the first 2 years of life in the Netherlands

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We prospectively investigated whether organic food consumption by infants was associated with developing atopic manifestations in the first 2 years of life. The KOALA Birth Cohort Study in the Netherlands (*n* 2764) measured organic food consumption, eczema and wheeze in infants until age 2 years using repeated questionnaires. Diet was defined as conventional (< 50 % organic), moderately organic (50–90 % organic) and strictly organic (> 90 % organic). Venous blood samples taken from 815 infants at 2 years of age were analysed for total and specific IgE. Multivariate logistic regression models were fitted to control for potential confounding factors. Eczema was present in 32 % of infants, recurrent wheeze in 11 % and prolonged wheezing in 5 %. At 2 years of age, 27 % of children were sensitised against at least one allergen. Of all the children, 10 % had consumed a moderately organic diet and 6 % a strictly organic diet. Consumption of organic dairy products was associated with lower eczema risk (OR 0·64 (95 % CI 0·44, 0·93)), but there was no association of organic meat, fruit, vegetables or eggs, or the proportion of organic products within the total diet with the development of eczema, wheeze or atopic sensitisation. Further studies to substantiate these results are warranted.

Organic diet: Eczema: Infants: Birth cohort

The prevalence of atopic manifestations, including atopic eczema, allergic rhinoconjunctivitis and asthma, has increased worldwide, especially in children in Westernised countries[1,2]. Currently one-third of the children in Western societies show symptoms[3].

In 1999 and 2006, studies were published showing that an anthroposophic lifestyle protected against atopic disease in 7–8-year-old children[4,5]. Due to the cross-sectional design of the studies, specific protective factors could not be identified. Among the potentially beneficial factors of an anthroposophic lifestyle in relation to atopic disease is the consumption of organically produced food. A rapidly growing group of consumers in our society prefers to buy organically grown and processed products, which are perceived as healthier and safer[6,7]. However, there are virtually no studies of any size that have evaluated effects of organic *v*. conventionally grown foods on human health[8]. Food or agricultural production certified as 'organic' is a system that excludes the use of synthetic inputs, such as synthetic fertilisers and pesticides, preventive veterinary drugs, genetically modified (GM) seeds and breeds, most preservatives, additives and irradiation (http://www.ifoam.org/sub/faq.html). In the Netherlands 'organic' products include both products from bio-organic as well as from biodynamic production, the latter being a method which strives even more strongly for a healthy ecosystem on the farm[9]. Both types of products carry the registered 'EKO' certification mark for organic products. From comparison studies between biodynamic- and bio-organic-grown products and conventionally grown products we know that these 'organic' products contain on average more antioxidants, especially vitamin C[10], and organic dairy products contain on average a higher amount of conjugated linoleic acid and *n*-3 fatty acids[11,12]. A preventive effect of antioxidants on wheezing complaints has been suggested[13], possibly through protection of the epithelium of the bronchial tubes against oxidative stress. Further, it is hypothesised that *n*-3 fatty acids might have anti-inflammatory properties and can contribute to the skin barrier[14,15], thus potentially decreasing atopic reactions.

Abbreviation: IU, international unit.

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The present paper describes the first prospective study to evaluate the role of organic food consumption on human health. In a large birth cohort study in the Netherlands, we investigated whether early-life organic food consumption was associated with developing atopic manifestations in the first 2 years of life.

Experimental methods

Study subjects

A detailed description of the study design has previously been published[16]. In summary, the KOALA Birth Cohort Study started in October 2000. KOALA is (in Dutch) an acronym for Child, Parent and health: Lifestyle and Genetic constitution. Healthy pregnant women were recruited from an ongoing prospective cohort study on Pregnancy-related Pelvic Girdle Pain[17] at 34 weeks of gestation ('conventional sub-cohort'). Additionally, pregnant women with so-called 'alternative' lifestyles were recruited through several specific recruitment channels, i.e. anthroposophic doctors, midwives, under-five clinics, Steiner schools, posters and flyers in organic food shops ('alternative sub-cohort'). A total of 2834 participants were included in the KOALA study, of whom 2343 were recruited through the Pregnancy-related Pelvic Girdle Pain study and 491 through the specific 'alternative' recruitment channels. The study was approved by the medical ethical committee of the University of Maastricht and Academic Hospital Maastricht. All participants gave signed informed consent and completed the first questionnaire at the third trimester of pregnancy.

Three children were excluded for Down's syndrome and sixty-seven for prematurity (gestational age <37 weeks), resulting in 2764 participants. Loss-to-follow-up rates were low: 93·4 % (n 2598) of all recruited participants were followed up until age 2 years, with information available on at least one of the health outcomes measured in the study (this was 93·5 % (n 2135) of the conventional and 96·3 % (n 463) of the alternative sub-cohort).

All parents were sent detailed questionnaires when the infants were 3, 7, 12 and 24 months of age. Parents in the second half of the cohort (n 1301) were also asked to consent to infant venous blood sampling at age 2 years. Of these, 815 (65 %) gave signed informed consent and were visited at home for blood sampling.

Exposure and follow up

Organic food consumption was measured at age 2 years, by parental reported diet of the infant in the second year of life. Parents were asked whether their infant had consumed meat, eggs, vegetables, fruit, dairy products, bread and/or dry products such as pasta, rice, beans and wheat. If yes, parents were further asked whether these products were conventionally or organically produced. Three diet categories were defined: 'conventional' (organic in <50 % of the occasions that the food is eaten); 'moderately organic' (organic in 50–90 % of the occasions); 'strictly organic' (organic in >90 % of the occasions). Each of the seven food groups was given a score, depending on the percentage organic ('conventional', score = 0; 'moderately organic', score 0·7 (mean of 0·5–0·9); 'strictly organic', score = 1). The scores were added up and divided by the number of food groups that had been eaten. After multiplying by 100 a score between 0 and 100 % was achieved. Organic food consumption is more frequent among individuals with alternative lifestyle practices than in the Dutch general population. Therefore, we calculated cut-off points for three equal groups within our alternative sub-cohort only, which were 21·0 and 71·0. Then, for the whole cohort, we defined a conventional diet as a score below 21·0, a moderately organic food diet as a score between 21·0 and 71·0 and a diet strictly based on organic products as a score above 71·0. The production method of the foods consumed in the second year of life was considered to reflect the production method of foods consumed in the entire first 2 years of life.

Organic food consumption was measured in pregnant mothers at 34 weeks of gestation, by repeating the above-described procedure, using the same food products (ever consumed during pregnancy) and cut-off points to be able to compare the diets of the mothers with those of the infants. The information on the mother's diet was used as a proxy for the infant's at age 2 years when information was missing due to incomplete questionnaires (n 453; 16 %) since organic food consumption by mothers was strongly correlated with organic food consumption by infants (Pearson's R 0·85; $P<0·001$).

Eczema and wheeze occurrence were assessed by questionnaires (from the International Study of Asthma and Allergies in Childhood; ISAAC)[18] adapted to the infant's age and spacing between questionnaires. At age 7, 12 and 24 months, parents were asked whether their child had ever had an itchy rash that was coming and going in the past months. If this question was answered affirmatively at least once, infants were classified as having developed eczema in the first 2 years of life. Infants for whom only diaper rash, rash around the eyes and/or scalp scaling was reported were not regarded as having developed eczema. Wheeze was also covered in the 7, 12 and 24 months postpartum questionnaires. 'Recurrent wheeze' was defined as reported presence of wheezing with at least four attacks ever in the first 2 years. 'Prolonged wheeze' was classified as ever having been awake due to wheezing in both the first and second year.

Assessment of sensitisation

Total IgE antibodies were measured using RIA in serum samples as described elsewhere[19,20]. Results are expressed as international units (IU) IgE/ml; 1 IU is 2·4 ng IgE. For values <150 IU/ml a sandwich RIA was used[20]; for values >150 IU/ml, a competitive RIA[19]. Serum levels of specific IgE against hen's egg, cows' milk, peanut, birch pollen, grass pollen, cat, dog, and house dust mite were determined by the radioallergosorbent test as described previously[20]. Calculation was performed by means of a standard curve that was obtained by a radioallergosorbent test with a dilution series of a chimeric monoclonal IgE antibody against the major house dust mite allergen Der p 2 and sepharose-coupled recombinant Der p 2 (Schuurman *et al.*[21]). The detection limit for total and specific IgE was $<0·50$ IU/ml and $<0·13$ IU/ml, respectively. We defined

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Table 1. Characteristics of infants in the study for the total cohort and stratified by category of organic food use

Characteristic	Total cohort (*n* 2764)	Total cohort (%)*	Conventional (*n* 2306) (%)*	Moderately organic (*n* 283) (%)*	Strictly organic (*n* 175) (%)*
Male	1410	51	51	48	55
Parental history of allergy					
None	1339	48	48	51	53
Father	519	19	19	14	22
Mother	604	22	22	24	15
Both	302	11	11	11	10
Older sibling history of allergy					
No older siblings	1155	44	45	35	33
One older sibling – not atopic	833	31	31	32	36
One older sibling – atopic	261	10	10	11	10
≥ Two older siblings – not atopic	235	9	8	12	15
≥ Two older siblings – one or both atopic	159	6	6	10	6
Unknown	121				
Breast-feeding at age 6 months					
Yes, months 1–4 exclusive breast-feeding	622	25	19	47	62
Yes, months 1–4 non-exclusive breast-feeding	441	17	16	22	22
No, months 1–4 exclusive breast-feeding	62	3	2	5	1
No, months 1–4 non-exclusive breast-feeding	996	39	44	21	15
Never breastfed	410	16	19	5	0
Unknown	233				
Day-care in first 6 months					
Yes	831	32	31	34	20
No	1724	68	69	66	80
Unknown	209				
Pets in first 6 months					
Yes	1168	45	45	47	48
No	1387	55	55	53	52
Unknown	209				
Exposure to environmental tobacco smoke in first 6 months					
Yes	294	12	14	4	1
No	2197	88	86	96	99
Unknown	273				
Vaccinations in first 6 months					
By standard scheme	2242	88	95	67	31
By incomplete scheme†	115	4	3	12	16
None	188	8	2	21	53
Unknown	219				
Antibiotic exposure through breast-feeding in first 6 months					
Yes	262	10	11	8	7
No	2161	90	89	92	93
Unknown	341				
Antibiotic exposure through oral medication in first 6 months					
Yes	489	20	21	16	10
No	1973	80	79	84	90
Unknown	302				
Eczema in first 2 years					
Yes	817	32	32	33	29
No	1766	68	68	67	71
Unknown	181				
Recurrent wheeze in first 2 years					
Yes	265	11	12	7	8
No	2077	89	88	93	92
Unknown	422				
Prolonged wheeze in first 2 years					
Yes	137	5	6	5	5
No	2409	95	94	95	95
Unknown	218				
Atopic sensitisation at Age 2‡					
Yes	223	27	28	23	29
No	592	72	72	77	71

* Percentages add to 100 % in columns, excluding missing values.
† Delayed scheme or alternative composition of vaccine.
‡ Analyses conducted among infants with blood sample (*n* 815). Atopic sensitisation refers to at least one allergen-specific IgE ≥ 0·3 international units (0·72 ng)/ml (against hen's egg, cows' milk, peanut, birch pollen, grass pollen, cat, dog, or house dust mite).

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atopic sensitisation as a radioallergosorbent test value >0·3 IU/ml for one or more allergens.

Statistical analysis

Unadjusted associations between organic food consumption and atopic outcomes were examined using logistic regression. Multivariate logistic regression models were fitted to control for potential confounders (sex, maternal education, BMI in infant at age 1 year, parental history of allergy, sibling history of allergy, number of older siblings, breast-feeding, day-care attendance, pets, exposure to environmental tobacco smoke, vaccinations, antibiotic intake through breast-feeding or through oral medication, vegetarian diet), by simultaneously including them in the regression models. Differences in the geometric mean of total IgE levels were evaluated by linear regression analyses, controlling for the same confounders. In the multivariate analyses, we first tested the possibility of interaction between organic food consumption and parental history of atopy. Since none of these interaction terms were statistically significant at the $\alpha = 0{\cdot}05$ level they were eliminated from the regression models. Separate analyses of the conventional *v.* alternative sub-cohort and boys *v.* girls showed that the key findings were similar within these groups; therefore all infants were combined in the final models. Results are presented as unadjusted and adjusted OR with corresponding 95 % CI.

Results

Study subjects

Table 1 shows participants' characteristics and prevalence of eczema, wheeze outcomes and atopic sensitisation at age 2 years. Eczema lifetime prevalence at age 7, 12 and 24 months of age was 18, 23 and 32 % respectively. Lifetime prevalence of wheeze symptoms at age 7, 12 and 24 months of age was 4, 9 and 11 % respectively. Baseline characteristics and prevalence of eczema and wheeze manifestations did not differ between infants with and without blood samples, but the frequency of organic food consumption was slightly higher among infants with blood samples. In the first 2 years of life, 2306 (84 %) of 2764 infants had consumed a diet based on conventional food products, 283 (10 %) consumed a moderately organic diet, and 175 (6 %) consumed a strictly organic diet (Table 1). During pregnancy, 2369 (86 %) of 2764 mothers consumed a diet based on conventional foods, 255 (9 %) consumed a moderately organic diet, and 150 (5 %) consumed a strictly organic diet. Percentages for specific sensitisation in infants with blood samples were 6 % for hen's egg, 19 % for cows' milk, 5 % for peanut, 1 % for birch, 2 % for grass pollen, 3 % for cat, 2 % for dog and 6 % for mite allergens.

Eczema, wheeze and atopic sensitisation by organic food consumption

Although a trend for an association between organic food consumption and lower eczema risk was observed, this did not reach statistical significance (Table 2). The adjusted OR were 0·95 (95 % CI 0·70, 1·28) and 0·76 (95 % CI 0·50, 1·17) for moderately organic food consumption and strict organic food consumption respectively in comparison with conventional food consumption. No statistically significant associations were observed between organic food consumption and recurrent wheeze (OR 0·51 (95 % CI 0·26, 0·99) and 0·85 (95 % CI 0·35, 2·05) for moderately organic food consumption and strict organic food consumption respectively in comparison with conventional food consumption), prolonged wheeze (OR 0·80 (95 % CI 0·41, 1·55) and 0·97 (95 % CI 0·35, 2·70) for moderately organic food consumption and strict organic food consumption respectively in comparison with conventional food consumption) and atopic sensitisation (OR 0·86 (95 % CI 0·51, 1·45) and 1·45 (0·77, 2·73) for moderately organic food consumption and strict organic food consumption respectively in comparison with conventional food consumption); the latter remained unchanged when using a lower cut-off point for sensitisation (specific IgE < 0·13 IU/ml). The geometric mean of the total serum IgE level at age 2 years was not associated with organic food consumption. We repeated the analyses using information on maternal diet during pregnancy instead of the infants' diet. The adjusted OR changed very little compared with those presented in Table 2; for eczema these were 0·88 (95 % CI 0·58, 1·19) and 0·68 (95 % CI 0·42, 1·12), for recurrent wheeze 0·45 (95 % CI 0·21, 0·89) and 0·79 (95 % CI 0·32, 1·96) and for prolonged wheeze 0·79 (95 % CI 0·33, 1·87) and 0·88 (95 % CI 0·27, 2·83), for moderately and strictly organic diets in comparison with conventional food consumption, respectively.

Finally, we evaluated the isolated effects of each of the following organic foods on atopy outcomes: dairy products, meat, fruit, vegetables and eggs (Table 3). Consuming organic dairy products was associated with a reduced risk of eczema. The OR for strictly organic dairy products hardly changed if we restricted the analysis to (1) infants who had been consuming dairy products, i.e. excluding infants who never consumed dairy products (*n* 226; adjusted OR 0·69 (95 % CI 0·48, 1·01)), or (2) infants who had never consumed raw or farm milk, i.e. excluding infants who ever consumed raw or farm milk in the first year (*n* 52; adjusted OR 0·63 (95 % CI 0·43, 0·93)). Moreover, the OR for strictly organic dairy products remained essentially unchanged, when the analysis was performed using information on the mothers' diet during pregnancy instead of the children's diet (adjusted OR 0·67 (95 % CI 0·46, 0·98), or even when the mothers who avoided dairy products were excluded from the analysis (*n* 40; adjusted OR 0·67 (95 % CI 0·46, 0·99)). No other statistically significant associations were observed.

Discussion

In the present paper we show that the proportion of organic products within the total diet was neither associated with the development of eczema, nor with recurrent or prolonged wheeze during the first 2 years of life, in a statistically significant way. Furthermore, no relation could be found between the proportion of organic products within the total diet and atopic sensitisation at 2 years of age. However, we did find an association between consuming strictly organic dairy products and a reduced risk of eczema.

To date, we know of only one other study on the health effects of consuming organic food products[22]. This cross-sectional study performed in five European countries showed no

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Table 2. Associations between infant organic food consumption and eczema, wheeze and atopic sensitisation (AS) in the first 2 years of life (Odds ratios and 95 % confidence intervals)

Category of organic food use…	Conventional (*n* 2306)	Moderately organic (*n* 283)				Strictly organic (*n* 175)			
Outcome	Reference OR	Unadjusted OR	95 % CI	Adjusted OR*	95 % CI	Unadjusted OR	95 % CI	Adjusted OR*	95 % CI
Eczema (yes)	1·00	1·05	0·80, 1·37	0·95	0·70, 1·28	0·89	0·63, 1·25	0·76	0·50, 1·17
Recurrent wheeze (yes)	1·00	0·52	0·31, 0·86	0·51	0·26, 0·99	0·64	0·36, 1·15	0·85	0·35, 2·05
Prolonged wheeze (yes)	1·00	0·79	0·43, 1·45	0·80	0·41, 1·55	0·74	0·34, 1·62	0·97	0·35, 2·70
AS (yes)†	1·00	0·79	0·49, 1·25	0·86	0·51, 1·45	1·08	0·66, 1·78	1·45	0·77, 2·73
AS against hen's egg (yes)†	1·00	0·51	0·18, 1·46	0·76	0·24, 2·33	0·70	0·24, 2·01	1·64	0·48, 5·71
AS against cows' milk (yes)†	1·00	0·81	0·38, 1·18	0·80	0·42, 1·51	1·21	0·70, 2·09	1·49	0·73, 3·03
AS against groundnut (yes)†	1·00	0·41	0·12, 1·35	0·55	0·15, 1·99	0·37	0·09, 1·57	0·51	0·10, 2·69

* Results from logistic regression analysis, adjusted for sex, maternal education, BMI, parental history of allergy, sibling history of allergy, number of older siblings, breast-feeding, day-care attendance, pets, exposure to environmental tobacco smoke, vaccinations, antibiotic exposure through oral medication and through breast milk, and vegetarian diet.

† Analyses conducted among infants with a blood sample (*n* 815). AS refers to least one allergen-specific IgE ≥ 0·3 international units (0·72 ng)/ml against hen's egg, cows' milk, groundnut, birch pollen, grass pollen, cat, dog, or house dust mite.

difference in atopic outcomes in 5–13-year-old children who had been divided in three groups according to the origin of the corresponding diet: (1) conventional, (2) biodynamic, (3) or a mixture of conventional, biodynamic and organic foods. Since the latter group consumed foods from a mixture of production methods, the isolated effect of organic foods could not be assessed. In contrast, the present study is prospective, and comprises a population that strongly differs in the use of conventional and organic products due to the specific recruitment of participants. Children from conventionally eating mothers might be given organic foods because of the atopy symptoms that they had early in life (reverse causation). Organic food consumption by mothers was strongly correlated with organic food consumption by infants. The availability of information on organic food consumption by pregnant mothers (as proxy for the postnatal infants' diet) therefore gave us the opportunity to investigate an exposure that had preceded the outcome. This enabled us to exclude the possibility of bias in the associations found for infants. With the present data we cannot disentangle the potential influence from the mothers' and the infants' organic diet, because these were highly correlated. Therefore we cannot exclude the possibility that the lower risk of eczema in children who used organic dairy products was actually due to a high consumption of organic dairy products by the mother, conferring protection already starting in the intra-uterine period and during lactation. Interestingly we found that mothers with a high proportion of dairy intake from organic origin had higher levels of rumenic and trans-vaccenic acids in their breast milk[23].

The fact that we extensively adjusted for potential confounders such as vaccinations, use of antibiotics, breast-feeding duration and exclusivity, and BMI makes it highly unlikely that the observed associations are biased by an association between organic dieting and other healthy lifestyle characteristics.

Atopic outcomes such as infant eczema and wheeze may be fairly unspecific for infants aged 2 years[24], and therefore subject to misclassification. Although not likely, we cannot completely disregard the possibility that parents who choose organic foods may report atopic symptoms differently from the other parents as they may be more health conscious. This would, however, tend to lead to over-reporting rather than underreporting in the organic-eating families, and therefore further strengthens the result for organic dairy consumption and eczema; nevertheless we cannot rule out that this differential reporting may have masked true effects of other organic food products on eczema (or organic food use as a whole) and effects on wheeze.

Eczema and wheeze at age 2 years may be weak indicators of an atopic development such as allergic asthma[25,26]. Specific IgE or total serum IgE levels at this age are also only weakly associated with atopic symptoms[27]. Therefore, clinical symptoms and atopic sensitisation were evaluated as separate outcomes. The definitions of eczema and recurrent wheeze were based on questions adapted from The International Study of Asthma and Allergies in Childhood questionnaires[3,18] and included generally accepted characteristics, such as a chronically relapsing course and an itchy rash. Although we found a beneficial effect of the consumption of organic dairy products on the development of eczema, we must be aware that organic dairy products in the present

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Table 3. Associations between infant organic food consumption and eczema in the first 2 years of life (*n* 2583) (Odds ratios and 95 % confidence intervals)

Category of organic food use…	Conventional (reference)		Moderately organic					Strictly organic				
Food	*n*	Unadjusted and adjusted OR	*n*	Unadjusted OR	95 % CI	Adjusted OR*	95 % CI	*n*	Unadjusted OR	95 % CI	Adjusted OR*	95 % CI
Dairy products	1919	1·00	118	1·02	0·68, 1·53	0·90	0·58, 1·39	234	0·77	0·56, 1·04	0·64†	0·44, 0·93
Meat	2116	1·00	153	1·10	0·77, 1·56	0·92	0·63, 1·34	181	0·82	0·58, 1·15	0·71‡	0·48, 1·05
Fruit	2167	1·00	160	0·95	0·67, 1·35	0·89	0·61, 1·29	138	0·91	0·62, 1·33	0·79	0·50, 1·23
Vegetables	2080	1·00	202	1·06	0·78, 1·44	0·99	0·71, 1·38	183	0·91	0·65, 1·27	0·79	0·53, 1·17
Eggs	1836	1·00	168	1·49	1·07, 2·07	1·40§	0·98, 1·99	315	1·07	0·82, 1·93	1·03	0·76, 1·38

* Results from logistic regression analysis, adjusted for sex, maternal education, BMI, parental history of allergy, sibling history of allergy, number of older siblings, breast-feeding, day-care attendance, pets, exposure to environmental tobacco smoke, vaccinations, antibiotic exposure through oral medication and through breast milk, and vegetarian diet.
† $P=0·02$.
‡ $P=0·10$.
§ $P=0·06$.

study were always used in the context of an organic diet and not as an isolated product group within a conventional diet. It is therefore uncertain whether this finding represents a true association, and should be interpreted with some caution until it can be confirmed.

The mechanism by which organic dairy product consumption protects against the development of eczema is unknown. Dietary studies have indicated that raw (unpasteurised) or farm milk was associated with a protective effect against the development of atopic manifestations[28–30]. However, when we repeated our analyses with raw and farm milk consumers excluded, the protective effect of organic dairy product consumption remained unchanged. Similarly to raw milk[31], organic dairy products can also contain more gram-negative bacteria and higher levels of the corresponding lipopolysaccharide than conventional, pasteurised dairy products. Therefore, one could hypothesise that the protective factor associated with the consumption of organic dairy products could be the ingestion of non-infectious microbial components with a possible effect on gut immunity development.

It has been hypothesised that *n*-3 long-chain PUFA have anti-inflammatory properties and can contribute to the maintenance of the skin barrier, due to the observation that *n*-3 fatty acids in maternal milk influence the risk of non-atopic eczema and asthma in infants, but not the risk of atopic sensitisation[14,15]. It has been shown that the levels of *n*-3 PUFA and conjugated linoleic acid are substantially higher in cows' milk from organic producers than from conventional producers[11,12,32]. In the Netherlands, cows' milk from organic and conventional farms differed twofold in *n*-3 level (mean 10·6 *v*. 4·9 mg/g milk fat), whereas conjugated linoleic acid levels differed less (mean 6·3 *v*. 5·1 mg/g)[32]. In Germany, levels of conjugated linoleic acid were found to vary between 0·26 and 1·14 % of total milk fat methyl esters depending on season and production methods (intensive *v*. ecological)[11].

In our most recent studies, we have reported that human breast milk of mothers consuming mainly organic dairy products contains higher levels of conjugated linoleic acid and *trans*-vaccenic acid compared with the milk of mothers who consume conventional dairy products[23]. In the Netherlands, the main sources of conjugated linoleic acid are of dairy origin[33]. Dietary studies have indicated that margarine intake was linked to an increased risk of atopic diseases[34–36], while butter consumption and use of full-cream milk led to a decreased risk of developing these diseases[37–39]. In the present study no discrimination was performed between a dairy diet comprising full-cream milk and one containing semi-skimmed milk, or between a margarine- *v*. a butter-based diet. We speculate that a high intake of *n*-3 fatty acids and/or conjugated linoleic acid from organic dairy products by the child is protective against eczema (independent of atopy), and that also the mother's intake of these fatty acids during pregnancy and lactation contributes to this protection.

In summary, the present prospective birth cohort study suggests that the consumption of organic dairy products, within the context of an organic diet, is associated with the development of eczema. Further studies to substantiate these results using more detailed and quantitative information are warranted. Information on the nutritional and non-nutritional composition of organic dairy products in relation to

the development of eczema, separately from atopic disease, would also be valuable.

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