

Latex type I sensitization and allergy in children with atopic dermatitis. Evaluation of cross-reactivity to some foods

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Recent studies have demonstrated that allergy to natural rubber latex (NRL) is associated with cross-reactivity to certain foods. The aim of this study was to investigate the prevalence of NRL sensitization and allergy in children with atopic dermatitis ($n=74$). We also examined cross-reactions between latex and foods, and compared the frequency of suspected latex cross-reacting fruits in children with and without NRL-specific immunoglobulin E (IgE). Twelve of the 74 atopic children studied (16.2%; 95% confidence interval (CI), 8.7–26.6%) had circulating IgE antibodies to latex. These NRL-sensitized children were older and they showed significantly higher total IgE values ($p<0.003$) when compared with the group of children without NRL sensitization. Of the specific food IgE evaluations, 18.4% (93 out of 505) were positive, and 69.9% were observed in the group of children with latex-specific IgE, most frequently to potato, tomato, sweet pepper, and avocado. An isolated latex-specific IgE response without food-specific IgE was never observed. Exclusively in the latex-positive group, conformity with the report of allergic symptoms after ingestion of food and increased food-specific IgE was found. Twenty children without proven latex sensitization showed increased food-specific IgE, most frequently to potato, banana, and chestnut. Avocado-specific IgE was never determined in this patient group. No significant differences were detected concerning the sensitization to potato, banana, and kiwi between NRL-sensitized children and the group of 20 children without latex-specific IgE. The competitive CAP inhibition using sera from children with specific IgE to both latex and food showed different cross-reactivities between latex and the specific food. A close relationship existed between latex and avocado (median inhibition: 100%), whereas sensitization to latex and kiwi seemed to be independent in our study group (inhibition: $<25\%$). In particular, for potato, cross-reactivity and co-sensitization existed. Our study demonstrated that children with atopic dermatitis are a high-risk group for latex sensitization. Increasing age, additional sensitization to ubiquitous inhaled allergens, and enhanced total serum IgE values seemed to be important variables for latex sensitization and further sensitization to the latex-associated foods. Cross-reactivity and, in some cases, co-sensitization to specific fruits and vegetables, were observed.

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Risk groups for the development of natural rubber latex (NRL) allergy are patients with spina bifida and/or multiple operations and

health care workers. Further groups known to be at risk of latex sensitization include atopic patients (1,2). It is evident that the prevalence of

latex allergies in children is increasing (3). Multiple protein allergens are involved in NRL allergy (e.g. Hev b 1 to Hev b 8) (4). The clinical manifestations in individual patients are dependent on the route of exposure (airways or skin) (5) and can occur as contact urticaria, allergic rhinoconjunctivitis, asthma, and even as life-threatening anaphylactic shock (6).

NRL allergy has been reported to be associated with certain fruits and vegetables (7–11). Beezhold et al. (12) observed cross-reactivity between latex and several potato proteins, whilst Delbourg et al. (13) and Alenius et al. (14) demonstrated cross-reactivity to banana by immunoblot inhibition analysis. In addition, cross-reactivity among latex, avocado, and chestnut was demonstrated by radioallergo-sorbent test (RAST) inhibition (8). In adults, Brehler et al. (15) observed, in addition to the aforementioned foods, immunoglobulin E (IgE) antibodies to tomato, papaya, pineapple, mango, melon, peach, and kiwi. Moreover, an association between latex and sweet pepper was found (9). All these fruits and vegetables are not taxonomically related to latex (*Hevea brasiliensis*). Knowledge on cross-reactivities is important for the clinician because the majority of food allergies are caused by cross-reactive IgE antibodies.

The aim of this study was to investigate the prevalence of NRL sensitization and allergy in children with atopic dermatitis. Moreover, we examined the frequency and importance of suspected latex cross-reacting fruits in children with and without NRL-specific IgE antibodies. To differentiate between cross-reactivity and co-sensitization, we used inhibition tests. In addition, we evaluated the detailed clinical history by a questionnaire, and performed double-blind placebo-controlled food challenges (DBPCFC) in some patients.

Subjects and methods

Patients and study design

This study was authorized by the local ethics committee, and all parents gave their informed consent for participation. From June 1996 to December 1997, 74 children took part non-selectively in the study (50 boys, 24 girls). All had atopic dermatitis and suspected or proven food allergy. The age of study group members ranged from 3 months to 14.5 yr (median age: 2 yr 5 months).

The patients' familial atopic risk, their history of clinical symptoms after food ingestion, and contact with latex devices were documented and their condition explored by the score for the

determination/classification of atopic dermatitis (SCORAD) index. In addition to personal data, the questionnaire contained items such as time of disease manifestation, development of symptoms, factors of provocation (e.g. allergen exposure, emotion, infection, seasonal fluctuation), cutaneous superinfection, diet, therapy, and other atopic diseases.

The standardized questionnaire requested information on clinical symptoms that occurred after contact with NRL devices, especially baby bottle nipples, pacifiers, latex-containing toys, and balloons, and any symptoms after visits to the dentist or after previous surgery. In addition, symptoms of food intolerance (cutaneous, oral, gastrointestinal, and pulmonary reactions) were documented.

Six patients participated in DBPCFC (16,17) with 10 food products plus one placebo provocation for each volunteer.

Total and specific IgE determination

Children's sera were taken and investigated for total and specific IgE to latex, tomato, potato, kiwi, banana, avocado, sweet pepper, and chestnut. Total serum IgE was determined in all serum samples by the CAP-fluorescence enzyme immunoassay (FEIA) system (Pharmacia, Uppsala, Sweden). Specific IgE to latex and the aforementioned fruits and vegetables were analyzed by RAST-CAP and expressed as RAST-CAP units, according to the manufacturer's recommendation (class 0, <0.35 kU/l; class 1, 0.35–0.7 kU/l; class 2, 0.7–3.5 kU/l; class 3, 3.5–17.5 kU/l; class 4, 17.5–50.0 kU/l; class 5, 50.0–100.0 kU/l; and class 6, >100.0 kU/l).

In addition to the serological determination of specific IgE, we performed skin prick tests (SPT) for latex-associated foods in a few older children only.

Inhibition test

Sera with high levels of food-specific IgE (according to CAP results) were diluted with phosphate-buffered saline (PBS) to fit the linear range of the CAP-reference curve. Sera with CAP values below 0.7 kU/l were not suitable for reproducible inhibition experiments. The inhibition test was carried out by preincubating 50 µl of serum (diluted or undiluted) overnight at 4°C with 10 µl of latex-C-serum proteins or PBS as a control. The solutions used for inhibition had a protein concentration of 1 mg/ml. The inhibition percentage was calculated by the following formula:

Table 1. Characteristics of the patient group with natural rubber latex (NRL)-specific antibodies (group I, n=12) and the group of patients without NRL-specific antibodies but with food-specific antibodies (group II, n=20)

Patient group	Age	Gender	Total IgE*	SCORAD index†	NRL-specific IgE*	Reaction to latex (no. of children)	Positive skin test results to inhalative allergen
I (n=12) (P1–P12)	Median: 6 yr 3 months Range: 1 yr 9 months to 14 yr 5 months	7 males 5 females	965 (238–3460)	27 (19–62)	3.25 (0.38–17.1)	4 skin 2 oral 7 none 1 nd	3 trees (hazel, birch, alder) 3 animal dander 1 bakery dust 2 herb pollen 1 grass 5 none 1 nd
II (n=20) (P20–P39)	Median: 11 months Range: 3 months to 7 yr 10 months	14 males 6 females	162 (5.52–967)	21 (0–53)	<0.35 No one with NRL-specific IgE	20 none	20 none

nd=not done.

*Values expressed as median (range) in kU/l.

†Values expressed as median (range).

% inhibition =

$$\frac{(\text{CAP value of PBS control}) - (\text{CAP value in the presence of inhibitor solution})}{(\text{CAP value of PBS control} - 0.35)} \times 100$$

When the CAP value of the inhibition experiment was as high or higher than the control value, the inhibition percentage was defined as zero. When the CAP value was below 0.35 kU/l (i.e. the detection limit of defined IgE antibody levels), the inhibition was defined as being 100%. Inhibition values higher than 25% were regarded as positive.

Statistical analysis

Wherever relevant, statistical differences of variables were analyzed and compared by the Fisher's exact test (two-tailed) or Mann–Whitney *U*-test. The tests were carried out with the statxact program (version 2.11; Cytel Software, Cambridge, MA). Probabilities less than 5% were considered statistically significant.

Results

Patients

Seventy-four children suffering from atopic dermatitis were included in our study. Evaluation of the questionnaires revealed that 69 children who recorded a complete case history had repeated contact with rubber products such as baby bottle nipples and pacifiers (in five patients, questions regarding latex contact were not answered). Twelve of 74 children (16.2%) (P1–P12) had circulating IgE antibodies to latex, ranging from 0.38 to 17.1 kU/l (median 3.25 kU/l) (Table 1).

The children with latex-specific IgE antibodies showed significantly higher ($p < 0.003$) total IgE values ($n = 12$; median 965 kU/l) than atopic children without sensitization to latex ($n = 49$; median 159 kU/l). Six of the 12 children (50%) had additional positive SPT results to ubiquitous inhaled allergens (Table 1). In the NRL-negative group, 12 patients (12/64; 18.75%) had a positive SPT to domestic animal dander; no positive SPTs to grass, herb and/or tree pollen were documented in the non-NRL-group. The NRL-sensitized children were older than the atopic children without NRL-sensitization (average age: 6 yr 10 months vs. 1 yr 8 months).

According to the questionnaire, seven children were identified as having perioral and enoral and/or cutaneous symptoms after contact with NRL-containing products (Table 1). Four (P1, P3, P5, and P8) showed increased latex-specific antibodies. Pulmonary symptoms were not found. In addition, three patients without NRL-specific IgE reported skin (one) or oral (two) reactions after latex contact.

According to case histories, only one patient (P7; from the NRL-sensitized group) had had previous surgery.

Food-specific IgE

Serum samples of all children were tested for IgE antibodies to banana ($n = 72$), tomato ($n = 72$), potato ($n = 74$), avocado ($n = 73$), sweet pepper ($n = 72$), chestnut ($n = 71$), and kiwi ($n = 71$). In total, 93 (18.4%) increased specific IgE values were detected. Most frequently, IgE antibodies to potato (31.9%), banana (20.8%), sweet pepper (18%), tomato (16.6%), chestnut (14.1%), and avocado (13.7%) were observed. For kiwi, a

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Table 2. Distribution of immunoglobulin E (IgE) antibodies to the investigated food in the group of patients with (group I, n=12) and without non-rubber latex (NRL)-specific antibodies (group II, n=20)

Patient group	Tomato-specific IgE*	Potato-specific IgE*	Avocado-specific IgE*	Sweet pepper-specific IgE*	Banana-specific IgE*	Chestnut-specific IgE*	Kiwi-specific IgE*	No. of patients with symptoms to the indicated food according to the questionnaire	No. of patients with symptoms during and after DBPCFC (positive test) to the indicated food
I (n=12) (P1–P12)	3.84 (< 0.35–0.38)	5.29 (< 0.35–36.8)	2.14 (< 0.35–4.66)	2.28 (< 0.35–49.8)	0.95 (< 0.35–6.46)	1.49 (< 0.35–10.0)	< 0.35 (< 0.35–75.5)	3 tomato 3 potato 0 avocado 3 sweet pepper 2 banana 0 chestnut 0 kiwi	2 tomato 3 potato 14 nd
II (n=20) (P20–P39)	< 0.35 (< 0.35–0.38)	1.15 (< 0.35–77.5)	< 0.35 (< 0.35)	< 0.35 (< 0.35–0.71)	< 0.35 (< 0.35–3.09)	0.35 (< 0.35–17.8)	< 0.35 (< 0.35–1.97)	2 tomato 0 potato 0 avocado 0 sweet pepper 1 banana 0 chestnut 0 kiwi	1 banana 1 potato 19 nd

nd=not done.

DBPCFC, double-blind placebo-controlled food challenge.

*Values expressed as median (range) in kU/l.

prevalence of only 7% was found in the total study group.

Sixty-five of these 93 positive results (69.9%) were observed in the group of children with latex-specific IgE antibodies. All patients with latex-specific IgE antibodies (P1–P12) additionally had increased IgE antibody levels to at least two, and nine patients to at least five or more, out of the seven investigated food products. An isolated latex-specific IgE response without IgE antibodies to fruits was never observed. Eleven of 12 (91.7%) NRL-sensitized children had specific IgE antibodies to tomato, potato, and sweet pepper, whereas only four subjects showed increased IgE-specific antibodies to kiwi. According to the questionnaire, none of the patients with increased IgE antibodies to

avocado, chestnut, and kiwi had ever eaten these fruits.

Only 29 of 421 evaluations (6.9%) were positive in the group of children without proven latex sensitization (n=62). Twenty (32%; P20–P39) showed an increased number of food-specific antibodies (Table 2), most frequently to potato (65%), banana (35%), chestnut (25%), and less commonly to tomato and kiwi (5%). Sensitization to avocado was not detected in the group without latex-specific IgE antibodies. No positive SPT results to ubiquitous inhaled allergens were documented in this patient group (Table 1).

In the group of NRL-sensitized children, a significantly higher number of positive specific IgE antibodies were found to tomato, avocado,

Table 3. Frequency of food-specific immunoglobulin E (IgE) in the groups with (n=12) and without (n=20) latex-specific IgE

Food	Children with latex-specific IgE (n=12)	Children without latex-specific IgE (n=20)	Comparison between the two groups* (p-value)
Potato	11/12 (91.7%)	13/20 (65%)	ns
Tomato	11/12 (91.7%)	1/20 (5%)	<0.001
Sweet pepper	11/12 (91.7%)	2/20 (10%)	<0.001
Avocado	10/12 (83.3%)	0/20 (0%)	<0.001
Banana	9/12 (75%)	7/20 (35%)	ns
Chestnut	9/12 (75%)	5/20 (25%)	<0.01
Kiwi	4/12 (33.3%)	1/20 (5%)	ns
Total	65/84 (77.5%)	29/140 (21%)	<0.001

*Statistical differences between both groups (Fisher's exact test).

ns, not significant.

Table 4. Summarized results of inhibition of food-specific immunoglobulin E (IgE) binding by latex extract

No. of sera tested	Solid-phase allergen	Inhibitor	Degree of inhibition in sera (%)					Median value of inhibition (%)	Range values of inhibition (%)
			100	75–95	50–75	25–50	0–25		
8	Avocado	Latex	5	1	0	1	1	100	100–18
9	Tomato	Latex	4	1	1	1	2	76	100–0
9	Potato	Latex	4	0	1	1	3	58	100–2
9	Sweet pepper	Latex	2	0	1	0	6	12	100–0
6	Chestnut	Latex	1	0	1	2	2	35.5	100–0
3	Kiwi	Latex	0	0	0	0	3	13	21–0

and sweet pepper ($p < 0.001$) in comparison to the latex-negative group ($n = 20$) (Table 3). Significant, but less distinct, was the difference in the sensitization to chestnut ($p < 0.01$). No significant differences were detected in the sensitization to potato, banana, and kiwi between the groups. A significant difference ($p < 0.001$) was found in the total number of positive specific food-IgE between children with and without latex-specific IgE (77.5% vs. 21%) (Table 3).

The comparison of both groups (Table 1) indicated that children with NRL-specific IgE were older than the children without NRL-specific, but with food-specific IgE ($p < 0.001$). In addition, the total IgE levels in the NRL-sensitized group were significantly enhanced compared to the group of children with food-specific IgE only ($p < 0.002$). In contrast, the mean SCORAD index in both groups (Table 1) was not significantly different ($p > 0.05$).

Thirteen of 74 patients (17.6%) reported allergic reactions after ingestion of the fruits and vegetables investigated, especially tomato, banana, and kiwi; five of these patients belonged to the group of NRL-sensitized children. Exclusively in the group with latex-specific IgE antibodies, conformity with the report of allergic symptoms (documented in the questionnaire) after ingestion of the investigated foods, and increased food-specific antibodies (eight of nine children) was found (Table 2). These children reported reactions ranging from cutaneous symptoms to anaphylaxis, but in the DBPCFC they only showed cutaneous symptoms, such as erythema, urticaria, and an aggravation of atopic dermatitis.

In contrast, only three of 20 children without latex-specific IgE (15%) reported comparable allergic reactions after ingestion of the investigated fruits and vegetables, but none of these children had increased food-specific IgE to the foods. Five additional patients reported allergic reactions after ingestion of the fruits; they

belonged to the group without latex- and food-specific IgE ($n = 42$). DBPCFC results (documented as relevant symptoms during and after DBPCFC) are included in Table 2.

Inhibition of allergen-specific antibodies to fruits by latex extract

In the CAP-inhibition test, the binding of IgE antibodies to solid-phase fruits (avocado, tomato, potato, sweet pepper, chestnut, and kiwi) was tested by preincubating the sera with soluble latex-extract proteins. The sera from 15 patients, 12 with latex-specific IgE antibodies (P1–P12) and three without latex-specific IgE but with potato-specific IgE (P20, P22, and P23), were used.

The results demonstrate that in four sera (P3, P6, P10, and P12) 100% inhibition of food-specific IgE by latex extract was obtained (exception: in serum P6, the inhibition of sweet pepper-specific IgE was only 63%). In three sera (P1, P2, and P9), inhibition of fruit-specific IgE ranged from 0 to 52%, 0 to 18%, and 0 to 21%. No inhibition of potato-specific IgE was obtained by preincubating the three sera (P20, P22, and P23) with latex extract.

In five out of eight sera (62.5%), preincubation with latex extracts completely inhibited avocado-specific IgE (Table 4). Only in one case was the inhibition not regarded as being positive (range 0–25%). Tomato- and potato-specific IgE was completely inhibited by latex extracts in four out of nine sera (44%). The inhibition of sweet pepper-specific IgE by latex extracts was 100% in two out of nine samples (22%), whereas in six samples the inhibition values were below 25%. Chestnut-specific IgE was completely inhibited by latex extracts in one of six patients (16.7%), whereas no inhibition was found in two. Inhibition of kiwi-specific IgE was performed in three patients only. In all these patients, inhibition was below 25%.

Discussion

Our results demonstrate that 16.2% (95% confidence interval (CI), 8.7–26.6%) of children with atopic dermatitis (12 of 74) had NRL-specific IgE serum antibodies, and underline the increased risk of atopic children for developing latex sensitization and allergy. The prevalence of latex sensitization and/or allergy apparently varies widely, depending on the population examined. In atopic children, Liebke et al. (2) reported that 20.8% (60 of 306) had increased latex-specific IgE antibodies, whereas Cremer et al. (18) found a prevalence rate of 13.6% (six of 44) for atopic children. Only 0.3% of non-atopic children had latex-specific IgE in their sera (2).

In addition, these NRL-sensitized children were older, had significantly higher total IgE values, and most had supplementary sensitization to ubiquitous inhaled allergens of plant origin compared to the children without NRL sensitization.

Probable sources of latex sensitization in our group were baby bottle nipples and pacifiers (summarized according to the questionnaire response about contact to latex products). Only child P7 had had previous surgery, and this child had the highest latex-specific IgE value in the study group. In addition, sensitization to NRL could be enhanced in eczematous skin by damage of the skin barrier function. Nevertheless, almost all atopic children in our study had contact with the aforementioned latex products and no significant difference existed between the SCORAD index in NRL-sensitized and non-NRL-sensitized children. Increasing age and atopy seemed to be risk factors for latex sensitization in children with atopic dermatitis. Increasing age was also a significant variable for latex allergy and sensitization in children with meningomyelocele (19). In addition to our study, Niggemann et al. (20) concluded, in their retrospective analysis of risk factors, that besides the number of operations, only an atopic predisposition was a definite risk factor for developing sensitization or allergy to latex in children up to 5 yr of age.

Further studies (21, 22) demonstrated that the degree of atopy also seemed to correlate with latex allergy; children with high total IgE serum levels (greater than 1000 kU/l) more frequently had higher latex-specific IgE levels than children whose total IgE levels were less than 1000 kU/l. In our study, six of the NRL-positive children had total IgE greater than 1000 kU/L; only two reported reactions to latex products. One of the 12 NRL-sensitized patients (P9) had a latex-

specific IgE value of <0.7 kU/l. Because of the lack of latex provocation tests, it remains unclear whether this low value is of clinical relevance (food-specific IgE in this child were higher).

Associated food-specific IgEs were found in all NRL-sensitized children. Potato, tomato, and sweet pepper were the most common IgE-positive foods, followed by avocado. Only in four children could kiwi-specific IgE antibodies be detected.

In the group of children without latex-specific IgE, but with food-specific IgE, the highest frequency of food-specific IgE was measured for potato and banana. Avocado-specific IgE antibodies were not detected in this group. Significant differences concerning fruit-specific IgE between the two groups existed for tomato, avocado, sweet pepper, and chestnut. In 15 of 93 food-specific IgE determinations, the specific IgE values were below 0.7 kU/L; no reactions after ingestion of the specific food were reported and the clinical relevance is not yet clear. Taking into consideration that the specificity of food-specific IgE determination was lower than that to inhalant allergens (23), a positive IgE without symptoms must be carefully interpreted, as it can be caused by a degree of sensitization that is too low to cause clinical symptoms.

Blanco et al. (8) diagnosed latex and food allergies on the basis of clinical history and a positive SPT to the corresponding allergen and pointed out that 52% of their latex-allergic patients had allergies to certain fruits. They postulated the existence of a 'latex fruit syndrome'. Brehler et al. (15) even detected, in 69% of subjects with well-documented hypersensitivity to latex proteins, fruit-specific IgE antibodies.

Of the allergens causing high sensitization rates, we investigated the cross-reactivity between latex and various foods (avocado, potato, tomato, sweet pepper, chestnut, and in two cases kiwi) by CAP-inhibition tests. Our data show that IgE binding to avocado could be completely inhibited in 62.5% of sera, to potato in 55.5% of sera, to tomato and chestnut in 40% of sera, and to sweet pepper in 25% of the tested sera, by preincubation with latex extract. In the subjects with kiwi-specific IgE, the inhibition with latex extract was below 25%. In addition to the fact that avocado-specific IgE was only detected in the sera of latex IgE-positive children, the high degree of cross-inhibition supports the assumption that, in particular, a number of avocado proteins and some latex proteins share IgE-binding epitopes. A current study of our group by Posch et al. (24) confirmed the close relationship between latex and avocado sensitization by identification of a class I endochitinase (a

31 000 MW protein), which contains a hevein domain as the causative allergen in latex-associated avocado allergy. In the case of the other foods, the diversity of IgE epitopes seems to be greater when compared with latex. Our data indicate that only few similarities of IgE epitopes exist between latex and kiwi; sensitization to latex and kiwi seems to be independent. In addition, we found individual differences between the degrees of cross-inhibition. Especially with regard to patients P2 and P7, we found a different pattern of cross-reactivity between potato and latex. Both patients P2 and P7 had positive DBPCFC results with potato (Table 3) and high potato-specific IgE serum levels (P2: 36.8 kU/l and P7: 16.7 kU/l). The latex-specific IgE levels were rather different (P2: 0.82 kU/l and P7: 17.1 kU/l) as was the percentage of inhibition of potato-specific IgE with latex (P2: 2% and P7: 100%). In patient P2, the potato allergy was dominant and the origin of sensitization seemed to be independent of latex (co-sensitization). This was in contrast to patient P7 whose potato-specific IgE was completely inhibited by latex, i.e. the potato allergy and the latex sensitization were closely related (cross-reactivity). Preliminary immunoblotting experiments with potato protein extract and serum from patient P2 showed a major IgE-reacting protein band of $\approx 46\ 000$ MW, which was completely inhibited by serum preincubation with isolated and purified patatin. In contrast, Hev b 7, the 46 000 MW-protein homolog of patatin in latex (4, 7, 10), could not be detected by immunoblotting with latex protein and serum from patient P2. Therefore, patatin was probably the main causative allergen of sensitization to potato in patient P2, but its structural homolog, Hev b 7, had no relevance as a latex allergen on this occasion.

Our data indicate that, in contrast to the questionnaire concerning food-associated symptoms, the one regarding latex-associated symptoms was reliable. With respect to food-associated reactions documented in the questionnaire, we only found increased food-specific antibodies in a small patient group, and conformity was only observed in the group of children with detectable latex-specific antibodies. We detected food-specific IgE in 38.5% (five of 13) of the sera from children with symptoms reported after ingestion. Brehler et al. (15) detected, in 32% of the sera from patients (children and adults) reporting intolerance reactions to fruits, the corresponding fruit-specific IgE antibodies.

We propose that NRL sensitivity or allergy sometimes precedes, or is at least associated

with, a clinically relevant food hypersensitivity. However, it has to be borne in mind that sensitization with clinical relevance, particularly to potato and kiwi, may not involve latex cross-reacting proteins.

Conclusions

We demonstrated that children with atopic dermatitis are a high-risk group in this context (16.2% had circulating latex-specific IgE). Increasing age, additional sensitization to ubiquitous inhalative allergens, and enhanced total serum IgE values seemed to be important variables of latex sensitization and further sensitization to the latex-associated foods. Our investigation supports the demand for evaluating the association between latex, fruits and vegetables, and for elucidating the risk of clinically relevant food hypersensitivity.

We point out that patients with latex sensitization (increased latex-specific IgE antibodies) or allergy (additional clinical symptoms after latex contact) frequently suffer from food sensitization and, in some cases, from food allergy, as shown by DBPCFC and clinical history.

Furthermore, we found that all patients with latex IgE antibodies had additional IgE antibodies to at least two of the foods tested. The association and/or the cross-reactivity between latex and potato, avocado, tomato, banana, red pepper, chestnut, and kiwi showed individual differences; a close relationship existed between latex and avocado, whereas sensitization to latex and kiwi seemed to be independent in our study group.

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