

Watermelon and ragweed share allergens

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A biotin-avidin amplified ELISA was used to measure antigen-specific IgE for ragweed, representative members of the gourd family (watermelon, cantaloupe, honeydew melon, zucchini, and cucumber), and banana in the sera of 192 allergic patients, each with an IgE ≥ 180 $\mu\text{m}/\text{ml}$. Sixty-three percent (120/192) of the sera contained antiragweed IgE, and of these patients, 28% to 50% contained IgE specific for any single gourd family member. In contrast, no $>11\%$ of the sera positive for a given gourd or banana were negative for ragweed. Correlations between ragweed and gourd-specific IgE levels were significant ($p < 0.001$), and correlation coefficients between any two gourds exceeded 0.79. In an ELISA system, the extracts of watermelon and ragweed inhibited each other in a dose-dependent manner; the resulting nonparallel inhibition curves indicate that some, but not all, of the allergens in the two extracts are cross-reactive. Isoelectric focusing of watermelon and ragweed extracts in narrow range gel (pH 4 to 6) followed by immunoblotting demonstrated six watermelon allergen bands with isoelectric points identical to those of ragweed allergens. Several remaining bands in the two extracts had differing isoelectric points, however. Six of 26 patients interviewed with watermelon-specific IgE reported developing oropharyngeal symptoms (itching and/or swelling of the lips, tongue, or throat) after ingesting at least one of the study foods, whereas only one of 25 patients interviewed without detectable watermelon-specific IgE reported similar symptoms ($p = 0.05$). We conclude that most oropharyngeal symptoms associated with the study foods are mediated in part by an IgE mechanism and that ragweed shares allergens with watermelon and probably the entire gourd family as well as banana. (J ALLERGY CLIN IMMUNOL 1987;79:867-75.)

Watermelon may provoke oropharyngeal symptoms in ragweed-sensitive persons as can other members of the gourd family, such as cantaloupe and honeydew melon.¹ The extent and immunochemical basis of cross-reactivity between ragweed and gourds is, however, unknown. We wished to clarify the relationship between ragweed allergens and allergens found in representative members of the gourd family: watermelon, cantaloupe, honeydew melon, zucchini, and cucumber. Because of the reported association between banana and ragweed sensitivity,¹ banana, a nongourd, was also studied. Specifically, we wished to determine whether sera containing ragweed-specific IgE also contain IgE specific for watermelon or other gourd extracts, whether extracts of ragweed and watermelon contain similar or immunologically identical aller-

Abbreviations used

pI: Isoelectric point: that pH at which the net charge of a given molecule is zero

BSA: Bovine serum albumin

gens, and whether persons with watermelon- and ragweed-specific IgE are more likely to have oropharyngeal symptoms than ragweed-sensitive individuals not having watermelon-specific IgE. We concluded from the present studies that most oropharyngeal symptoms associated with the study foods are mediated in part by an IgE mechanism and that ragweed shares allergens with watermelon and probably the entire gourd family as well as banana.

PATIENTS, MATERIAL, AND METHODS

Patients

Sera from 192 patients observed in the Henry Ford Hospital Allergy Clinic during 1984 were chosen for study. Each serum sample studied contained at least 180 $\mu\text{m}/\text{ml}$ of IgE as determined by ELISA.² Fifty-one of the 192 patients were

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TABLE I. Number of sera containing food-specific IgE

	No. food positive* (%)	No. food and ragweed positive† (%)	% Food positive of all ragweed positives‡
Watermelon	63 (33)	60 (95)	50
Cantaloupe	48 (25)	46 (96)	38
Honeydew melon	34 (18)	34 (100)	28
Cucumber	43 (22)	42 (98)	35
Zucchini	62 (32)	55 (89)	46
Banana	24 (13)	21 (88)	18

*n = 192.

†One hundred twenty sera of 192 are ragweed positive.

‡Number of sera both food and ragweed positive divided by the total number of ragweed positive sera times 100.

the subjects of telephone interviews. Group 1 patients consisted of 26 subjects considered strongly positive for watermelon-specific IgE with ELISA binding activity to watermelon ≥ 3 times that of normal control subjects; group 2 consisted of 25 subjects negative for watermelon-specific IgE with ELISA binding activity ≤ 1.5 times that of normal control subjects. All group 2 patients had ragweed-specific IgE with binding activity ≥ 3 times that of normal control subjects. All but two group 1 subjects had ragweed-specific IgE with binding activity ≥ 3 times that of normal control subjects. All the 34 potential group 1 subjects (subjects with watermelon ≥ 3 times that of normal control subjects) and all the 38 potential group 2 subjects (subjects with watermelon ≤ 1.5 and ragweed ≥ 3 times that of normal control subjects) who could be reached by telephone were interviewed and admitted to their respective groups. Each of the 51 persons contacted (26 in group 1 and 25 in group 2) was cooperative during the interview. Each subject was asked whether he/she had food allergies and was then asked about reactions to specific foods. Each was asked about oropharyngeal symptoms in relation to specific foods. The inquiry concerned the study foods as well as "control" foods, i.e., orange, pear, pineapple, and apple. Food histories were considered positive only if the patient had experienced the same symptoms on at least two occasions and if the symptoms began less than 2 hours after food ingestion. The 51 subjects were interviewed in random order by a single investigator who used a standard questionnaire and who was blinded as to the subject's group placement and laboratory values.

Extracts

Extracts were made from fresh, locally obtained watermelon, cantaloupe, honeydew melon, cucumber, zucchini, and banana. In the cases of cucumber and zucchini, extracts were made from both the peel and the remaining peeled vegetable (pulp). All foods were diced and then liquified in a blender. Volumes of cucumber peel, zucchini peel, and banana were increased approximately 50% by the addition of phosphate-buffered saline, pH 7.4, whereas no additional fluid was added to the other liquified foods. The foods were then centrifuged at $25,000 \times g$ for 20 minutes, and the

supernatants were removed. Azide to a concentration of 0.01% was subsequently added. Pilot studies demonstrated no differences in IgE binding activity between extracts of zucchini or cucumber peels and pulps. For this reason, the peel and pulp extracts of cucumber and zucchini were combined in a ratio of one part peel to four parts pulp. These preparations were considered full strength extracts of the study foods. Commercially available short ragweed extract (Hollister-Stier, Spokane, Wash., 1:20, 50% glycerine, lot no. D51565M) was also used. Extracts were assayed for total protein content with the method of Lowry with BSA as a standard.³ Expressed as milligrams of protein per milliliter of extract, the following results were obtained: ragweed, 8.4; watermelon, 1.4; cantaloupe, 3.0; honeydew melon, 3.0; zucchini, 2.3; cucumber, 1.0; banana, 2.1.

ELISA

Antigen-specific IgE for ragweed, watermelon, cantaloupe, honeydew melon, zucchini, cucumber, and banana was determined by a biotin-avidin amplified enzyme-linked immunoabsorbent assay as previously described.² Briefly, each extract was diluted 1:100 (except banana and ragweed, which were diluted 1:10 and 1:250, respectively) in a 60 mmol/L carbonate/bicarbonate, pH 7 buffer, and adsorbed to plastic microwells (Removawell, type B, Dynatech, Alexandria, Va.) overnight. Sequentially, with interspersed washes, a study serum, biotin-antihuman IgE, avidin-alkaline phosphatase, diethanolamine buffer, and 4-methylumbelliferyl phosphate were added. Fluorescence proportional to IgE bound was determined by a microfluorimeter (Dynatech MR 580). Values reported are the ratio of the mean of duplicate determinations for a study serum compared to the mean of duplicate determinations for two negative control sera.

Isoelectric focusing and transfer to nitrocellulose

The multiple proteins in the ragweed and watermelon extracts were separated by isoelectric focusing in 2% polyacrylamide gel in the presence of Ampholine (LKB, Gaithersburg, Md.), pH range 3.5 to 10, or 4 to 6 as previously described.⁴ Electrofocusing was performed at 4°C, and

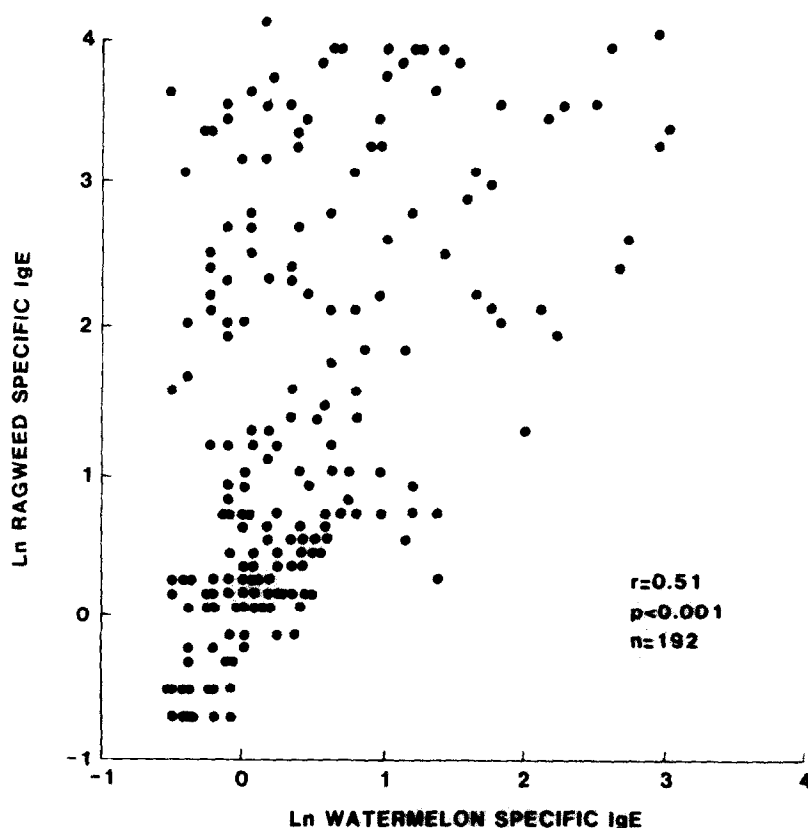


FIG. 1. A comparison of watermelon- and ragweed-specific IgE.

4 W constant power for 2 hours with the broad range gel and 3 hours with the narrow range gel. After electrofocusing, the separated proteins were electrophoretically transferred to nitrocellulose membranes (Bio-Rad, Richmond, Calif.).⁵ The electrophoretic conditions were 0.7% acetic acid buffer, pH 2.5, at 70 V for 5 hours by use of a Trans-Blot cell (Bio-Rad).

Detection of proteins

The isoelectrically separated proteins, which had been transferred to the nitrocellulose membrane, were localized with a sensitive, enzyme-linked stain (Biotin-Blot protein detection kit, Bio-Rad). The basis of this stain is the coupling of biotin to the nitrocellulose-bound proteins followed by incubation of the nitrocellulose sheets in a solution of avidin-horseradish peroxidase conjugate. The bound horseradish peroxidase is then localized by interaction with a color development reagent. This method has proven more uniform and sensitive in our laboratory than other protein stains such as amido black.

Detection of protein binding IgE

The binding of IgE to a protein establishes that the protein is an allergen. To determine IgE binding, nitrocellulose membranes, to which the separated proteins had been transferred, were initially blocked with 10% BSA and then incubated 16 hours with pools of sera containing IgE to both

ragweed and watermelon.⁶ After washing, the nitrocellulose membranes were incubated from 4 to 16 hours at room temperature with rabbit antihuman IgE (Calbiochem-Behring, La Jolla, Calif.), diluted 1:300 in 1% BSA, 0.05 mol/L of phosphate, and 0.1 mol/L NaCl, pH 7.5, and the mixture was gently agitated. IgE bound to proteins was identified with the Immuno-Blot assay (Bio-Rad) in which the membranes were incubated 1 hour with a goat antirabbit horseradish peroxidase conjugate, washed, and covered with a color development reagent.⁷

ELISA inhibition

ELISA-inhibition studies, patterned after RAST inhibition,⁸ included both ragweed inhibition of a watermelon system and watermelon inhibition of a ragweed system. The watermelon system used five pooled watermelon positive, ragweed positive sera (both ≥ 5 times negative control) and a solid phase prepared from the same watermelon extract described above. The ragweed system used 24 pooled ragweed positive, watermelon negative sera (ragweed ≥ 5 and watermelon ≤ 1.8 times negative control) and a solid phase prepared from the same ragweed extract described above. In order to obtain inhibition within the ragweed system, it was necessary to concentrate the watermelon extract tenfold by use of a stirred ultrafiltration cell with a YM5 Diaflo filter, (Amicon Corp., Danvers, Mass.). Pooled sera and inhibiting antigen were incubated overnight at room tem-

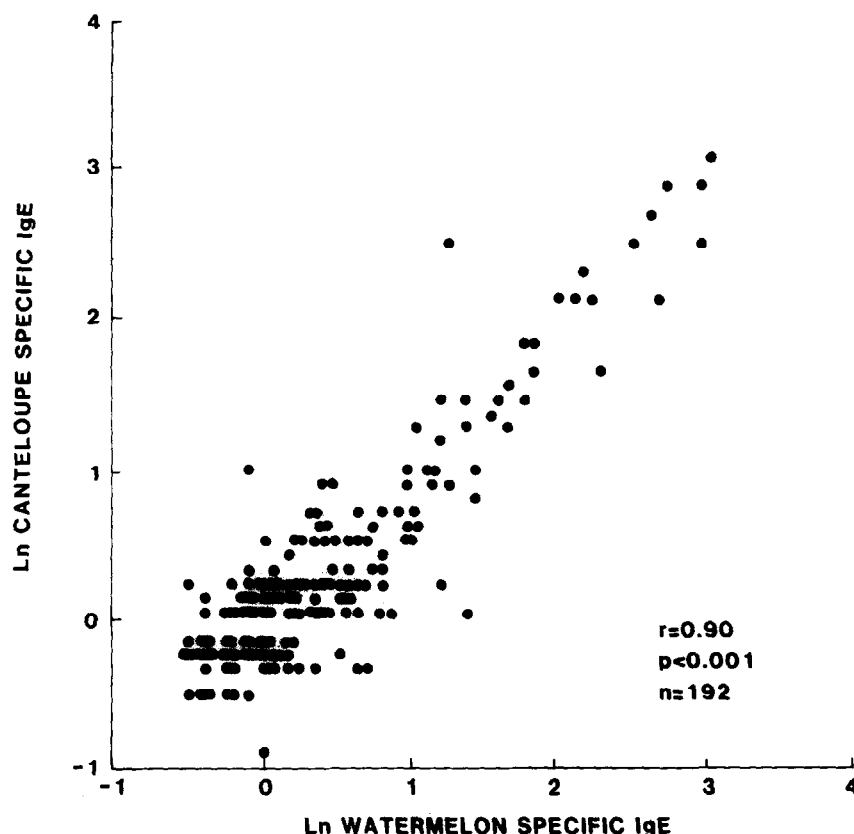


FIG. 2. A comparison of watermelon- and cantaloupe-specific IgE.

TABLE II. Correlation coefficients between quantities of antigen-specific IgE in sera of 192 allergic subjects

RS	1.000							
Wm	0.509	1.000						
Can	0.498	0.896	1.000					
Hd	0.432	0.820	0.849	1.000				
Zu	0.495	0.873	0.897	0.835	1.000			
Cuc	0.418	0.794	0.807	0.900	0.871	1.000		
Ban	0.252	0.632	0.664	0.666	0.582	0.586	1.000	
	RW	Wm	Can	Hd	Zu	Cuc	Ban	

RW = ragweed; Wm = watermelon; Can = cantaloupe; Hd = honeydew melon; Zu = zucchini; Cuc = cucumber; Ban = banana. Before correlation coefficients were calculated, antigen-specific IgE values were converted to their natural logarithmic equivalents; $p < 0.001$ for all correlation coefficients.

perature; the mixture was then incubated for 5 hours at room temperature in the microwells to which solid phase antigen had previously been absorbed. The subsequent ELISA procedure was identical to that described above.

Statistics

The data were analyzed by the Michigan Interactive Data Analysis System.⁹ Because of the strongly positive skew of the allergen-specific IgE data, these were converted to natural logarithmic equivalents before calculation of correlation coefficients. The latter were then calculated by linear regres-

sion. The significance of correlation coefficients differing from zero was calculated by t test; the significance of values in contingency tables was calculated by the chi-square statistic. Analysis of covariance was used to compare slopes of inhibition for parallelism.

RESULTS ELISA

ELISA values are expressed as ratios between study and control sera, and 1.8 times negative control or

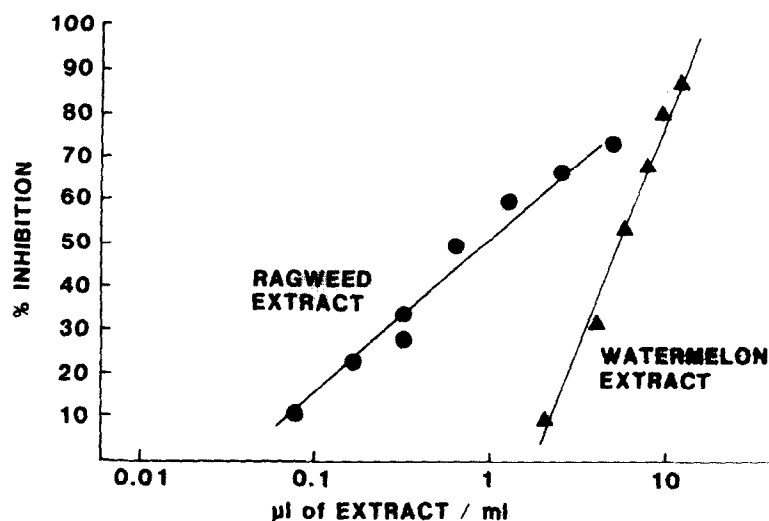


FIG. 3. Inhibition of watermelon positive serum pool to watermelon solid phase.

greater is considered positive. Based on 54 determinations of negative control sera, the value of 1.8 represents the mean plus 3.75 standard deviations. One hundred twenty (63%) of the 192 sera were positive for ragweed, and 63 sera (33%) were positive for watermelon. ELISA results for each of the study foods are presented in Table I. Nearly all sera positive for any food were also ragweed positive. Fig. 1 graphically depicts the quantities of watermelon- and ragweed-specific IgE in the 192 sera studied. The overall correlation between watermelon- and ragweed-specific IgE is significant ($r = 0.51$; $p < .001$). Sera grouped in the upper left corner of Fig. 1 have varying degrees of reactivity to ragweed but little reactivity to watermelon; the remaining sera demonstrate a strong correlation between ragweed- and watermelon-specific IgE. Only two of the sera strongly reactive with watermelon failed to react positively with ragweed.

Fig. 2 illustrates the strong correlation between the quantities of watermelon- and cantaloupe-specific IgE ($r = 0.90$; $p < 0.001$). Further relationships between the study foods are demonstrated as correlations in a matrix (Table II). Correlations are significant between all combinations of antigens tested and particularly strong among gourd family members. All correlations among the gourds are >0.79 . The correlations between gourd and banana are also relatively strong ($r = 0.58$ to 0.67).

ELISA inhibition

Both the ragweed and watermelon extracts readily inhibited the binding of watermelon positive sera to solid-phase watermelon in a dose-dependent manner ($r = 0.98$ and 0.96 , respectively) as illustrated in Fig. 3. The slopes of the inhibition curves are sig-

TABLE III. Characteristics of interviewed patients

	Group 1 Watermelon positive	Group 2 Watermelon negative
No.	26	25
Mean age in yr (range)	34.1 (10-71)	31.5 (12-71)
M:F	20:6	9:16
Watermelon-specific IgE (mean $\pm$ SD)	6.9 ± 4.2	1.02 ± 0.25
Ragweed-specific IgE (mean $\pm$ SD)	20.2 ± 16.5	19.7 ± 12.2
Serum IgE* (geometric mean)	601	380

* $p < 0.01$.

nificantly different ($p < .02$), indicating that the allergenic composition of the ragweed and watermelon extracts is one of partial identity. The results of the converse experiment, i.e., inhibition of binding to a ragweed solid phase, are similar (data not presented). In a dose-dependent manner, watermelon as well as ragweed extract inhibited ragweed positive sera from binding to ragweed. Again, the slopes were not parallel.

Isoelectric focusing

The results of isoelectric focusing (gel, pH range 3.5 to 10) with subsequent protein staining are presented in Fig. 1, A. At least 12 protein bands can be observed in the ragweed preparation. Immunoblots from similarly prepared gels can be observed in Fig. 4, B. Almost all of both the ragweed and watermelon bands observed with the protein stain can

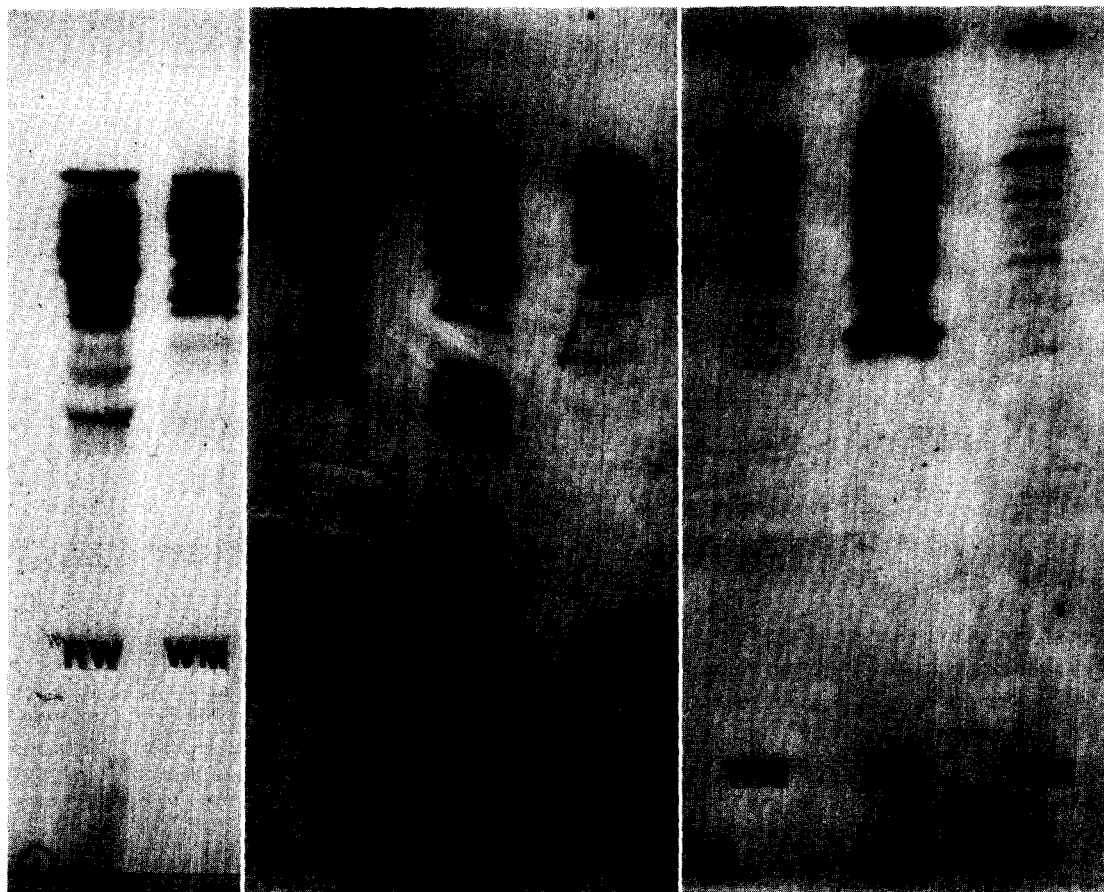


FIG. 4. Isoelectric focusing of ragweed and watermelon extracts: A, pH 3.5 to 10 gel, protein stain. B, pH 3.5 to 10 gel, stained for bands binding IgE. C, pH 4 to 6 gel, stained for bands binding IgE. RW, ragweed; WM, watermelon.

again be observed, indicating that most of the detected proteins are allergens. Fig. 4, C, illustrates immunoblots of extracts separated in gel with pH ranging from 4 to 6. The narrower pH range of this gel has the effect of increasing the distance between the allergen bands. At the top of the immunoblot (anode or area of lowest pH), the dominant allergen in watermelon extract can be observed to have a pI identical to that of a ragweed allergen. Present are five other watermelon allergen bands, each of which have pIs identical to pIs of ragweed allergens. At least two well-stained ragweed allergens have no watermelon counterparts. There are also weakly staining watermelon allergens with no ragweed counterparts. These data suggest that ragweed and watermelon share some, but not all, of their allergens.

Patients

Characterized in Table III are the two patient groups. The mean total serum IgE of watermelon positive group 1 is significantly higher than that of wa-

termelon negative group 2 ($p < 0.01$), suggesting that members of the former are potentially more sensitive. Relationships between quantities of food-specific IgE and patient reports of oropharyngeal symptoms are presented in Table IV. Six of 26 subjects in group 1 reported developing oropharyngeal pruritus after ingesting at least one of the study foods. These persons described itching of the lips, tongue, or throat and, in some cases, swelling of the lips. Symptoms, which in all cases began within 5 minutes after food ingestion, lasted from 15 to 120 minutes. Only one of 25 group 2 subjects developed similar symptoms. The difference between the proportions of symptomatic patients in the two groups is significant ($p = 0.05$). Three of the six symptomatic subjects reacted to watermelon, whereas five subjects reacted to cantaloupe and four subjects reacted to banana. Food-specific IgE levels are not significantly higher in symptomatic than in asymptomatic group 1 individuals. The single symptomatic individual in group 2 reported developing pharyngeal pruritus after can-

TABLE IV. Quantities of food-specific IgE in the sera of 51 patients interviewed

	IgE	Wm	Can	Hd	Zu	Cuc	Ban
Group 1 (watermelon positive)							
Symptomatic patients							
1	260	12.5*	12.1*	3.8*	10.2*	3.4*	2.0*
2	394	3.9	3.4*	1.5*	3.5	2.3	1.4
3	291	5.2*	4.8*	2.7*	3.1	2.7	1.8*
4	978	4.8	3.9	1.2	3.6	1.1	1.3*
5	2490	3.5*	11.6*	9.6	7.3	3.8	1.9*
6	393	4.3	2.3*	1.9	4.9	2.9	1.5
Mean $\pm$ SD of foods causing symptoms (n = 6)	801 $\pm$ 868	7.1 $\pm$ 4.8 (n = 3)	6.8 $\pm$ 4.7 (n = 5)	2.7 $\pm$ 1.2 (n = 3)	10.2 (n = 1)	3.4 (n = 1)	1.8 $\pm$ 0.3 (n = 4)
Nonsymptomatic patients							
Mean $\pm$ SD (n = 20)	719 $\pm$ 390	2.2 $\pm$ 4.5	6.0 $\pm$ 4.2	5.5 $\pm$ 4.7	6.2 $\pm$ 4.7	6.0 $\pm$ 5.9	2.0 $\pm$ 1.1
Group 2 (watermelon negative)							
Symptomatic patient	733	1.5	1.8*	1.8*	3.7	2.4	0.7
Nonsymptomatic patients							
Mean $\pm$ SD (n = 24)	412 $\pm$ 226	1.0 $\pm$ 0.2	1.1 $\pm$ 0.4	0.9 $\pm$ 0.3	1.2 $\pm$ 0.4	1.1 $\pm$ 0.3	1.0 $\pm$ 0.6

Wm = watermelon; Can = cantaloupe; HD = honeydew melon; Zu = zucchini; Cuc = cucumber; Ban = banana; total IgE expressed as micrometers per milliliter.

*Foods causing oropharyngeal symptoms.

taloupe and honeydew melon ingestion. Although we had considered the ELISA of the patient for watermelon as negative (1.5), ELISAs of the patient for cantaloupe (1.8) and honeydew melon (1.8) were borderline positives. Three of the interviewed subjects reported developing oropharyngeal symptoms after ingestion of control foods. Two symptomatic group 1 patients developed symptoms after ingestion of apple, whereas one (otherwise) asymptomatic group 1 patient developed symptoms after ingesting apple or pear. No group 2 patient reacted to any of the control foods. Interestingly, three of the six symptomatic group 1 subjects voluntarily stated they had less intense oropharyngeal symptoms after a period of ragweed immunotherapy.

DISCUSSION

In 1970, Anderson et al.¹ documented the association between food-induced oropharyngeal symptoms and ragweed pollinosis. Subsequently, little concerning this phenomenon has been published. The present study is the first to demonstrate IgE-mediated food sensitivity in ragweed-sensitive individuals, to report IgE-mediated sensitivity to cucumber and zucchini, to correlate amounts of food-specific IgE with ragweed-specific IgE, and to suggest the immunochemical basis by which this cross-reactivity occurs.

Because it is generally believed that botanically

similar foods contain cross-reacting allergens,¹⁰ we quantitated antigen-specific IgE directed against representative members of the gourd family: watermelon, cantaloupe, honeydew melon, zucchini, and cucumber. Antibanana IgE was also measured because of previously described association of banana with oropharyngeal symptoms.¹ The IgE assays were performed on the sera of 192 allergic patients, each of whom had IgE ≥ 180 μ m/ml, a concentration arbitrarily chosen to select individuals with a high probability of atopy. Sixty-three percent was ragweed positive, and of these 63%, 28% to 50% was positive for any particular gourd family member. In contrast, no more than 11% of the sera positive for a given gourd was negative for ragweed.

Correlation coefficients calculated between quantities of IgE directed against any two of the study antigens were highly significant; those calculated between gourd family members were particularly strong. Banana-gourd correlations were also highly significant. These data support the hypothesis that allergens within the study foods cross-react with each other and with those of ragweed. The data are consistent with the view that cross-reacting allergens may be found among botanically similar foods.

The high degree of correlation found between IgE responses to the five gourd family members is not surprising, given their close botanical relationship.

TABLE V. A botanical classification

	Short ragweed	Watermelon	Banana
Phylum	Magnoliophyta	Magnoliophyta	Magnoliophyta
Class	Magnoliopsida	Magnoliopsida	Liliopsida
Subclass	Asteridae	Dilleniidae	Zingiberidae
Order	Asterales	Violales	Zingiberales
Family	Asteraceae	Cucurbitaceae	Musaceae
Genus	<i>Ambrosia</i>	<i>Citrullus</i>	<i>Musa x paradisiaca</i>
Species	<i>Elatios</i>	<i>Vulgaris</i>	

The correlation of IgE responses between the gourd and ragweed or banana is not explained by close botanical relationships. As presented in Table V, gourds and banana are only distantly related, since bananas are monocotyledon (Magnoliopsida), whereas gourds are dicotyledons (Liliopsida).¹¹ Although gourds and ragweed are both dicotyledons, their classifications diverge at the subclass level, and they are only distantly related.¹¹

ELISA inhibition and isoelectric focusing studies were performed in an attempt to establish an immunochemical basis for the cross-reactions observed among the study antigens. In our ELISA system, the extracts of watermelon and ragweed inhibit the binding of each other in a dose-dependent manner. The resulting nonparallel lines indicate that some, but not all, of the allergens in the two extracts are cross-reactive. This is confirmed by the isoelectric focusing studies demonstrating that the extracts of both ragweed and watermelon contain allergens with identical pIs. At least six watermelon allergens, separated in narrow pH range gel, have pIs identical to pIs of ragweed allergens. The combination of equal pIs and shared antigens suggests that the proteins are identical. Further studies will be needed in order to identify which, if there are any, of the known ragweed allergenic components (AgE, K, Ra3, etc.)¹² are present in watermelon.

Patient interviews were conducted by a single investigator who telephoned the subjects in a random order, who used a standard set of questions, and who was blinded as to group placement and ELISA results at the time of the interview. He was able to interview 26 of 34 (76%) potential group 1 and 25 of 38 (66%) potential group 2 subjects. Although we believe that this was an unbiased sample, histories of clinical food sensitivity can only be confirmed with double-blind food challenges.

Approximately one fourth of individuals with watermelon positive ELISA results reported oropharyngeal symptoms in response to one or more of the study

foods. This is consistent with the findings of Sampson¹³ or May and Bock¹⁴ who, in other settings, found double-blind food challenges to be positive in 23% and 32% of instances in which skin prick tests were positive. Our findings are also consistent with those of Anderson et al.¹ who reported that 5.9% of 1446 patients with pollinosis had oral pruritus from eating watermelon, cantaloupe, honeydew melon, or banana and that all of these symptomatic individuals were ragweed sensitive. The single symptomatic patient in the watermelon negative group was ELISA positive for the two foods associated with her symptoms. Thus, in all but two instances (symptomatic patients 2 and 5, Table IV), symptomatic patients had measurable quantities of IgE specific for the food or foods producing their symptoms. In contrast, ragweed positive, gourd family negative individuals failed to develop symptoms in response to study foods. Although Anderson et al.¹ did not assess food-specific IgE, they were unable to find oropharyngeal symptoms in their 620 patients without pollinosis, suggesting that individuals who presumably lack ragweed and gourd sensitivity fail to develop oropharyngeal symptoms. Failure to find a directed relationship between patient symptomatology and food-specific IgE concentration, however, is not unexpected; no such relationship is found, for example, between symptoms and venom-specific IgE concentrations.¹⁵ Three group 1 individuals developed symptoms in response to apple ingestion. Birch is a common aeroallergen in our area, and apple and birch are reported to cross-react.¹⁶

Our observations suggest that most oropharyngeal symptoms induced by the study foods are mediated by specific IgE. Nonetheless, other mechanisms must be important because many individuals with food-specific IgE do not report symptoms with food ingestion. Oropharyngeal symptoms after ingestion of gourd family members of banana occur because of previous allergic sensitization. Although this sensitization could result from ingestion of the food or a

cross-reacting food, it could be the result of ragweed inhalation. Therefore, one could be symptomatic after gourd ingestion even in the absence of previous gourd exposure.

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