

Research Note

Presence of Undeclared Peanut Protein in Chocolate Bars Imported from Europe

PETER VADAS* AND BORIS PERELMAN

Division of Allergy and Clinical Immunology, St. Michael's Hospital, Room 8-161, Cardinal Carter Wing, 30 Bond Street, University of Toronto, Toronto, Ontario, Canada M5B 1W8

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ABSTRACT

Peanut allergens are both stable and potent and are capable of inducing anaphylactic reactions at low concentrations. Consequently, the consumption of peanuts remains the most common cause of food-induced anaphylactic death. Since accidental exposure to peanuts is a common cause of potentially fatal anaphylaxis in peanut-allergic individuals, we tested for the presence of peanut protein in chocolate bars produced in Europe and North America that did not list peanuts as an ingredient. Ninety-two chocolate bars, of which 32 were manufactured in North America and 60 were imported from Europe, were tested by the Veratox assay. None of the 32 North American chocolate products, including 19 with precautionary labeling, contained detectable peanut protein. In contrast, 30.8% of products from western Europe without precautionary labeling contained detectable levels of peanut protein. Sixty-two percent of products from eastern Europe without precautionary labeling contained detectable peanut protein at levels of up to 245 ppm. The absence of precautionary labeling and the absence of the declaration of "peanut" as an ingredient in chocolate bars made in eastern and central Europe were not found to guarantee that these products were actually free of contaminating peanut protein. In contrast, North American manufacturers have attained a consistent level of safety and reliability for peanut-allergic consumers.

Sensitization to peanut protein is becoming increasingly prevalent in both North American and European populations. According to current estimates, the rate of sensitization to peanuts among preschool-age children is about 1% in both Europe and North America (2, 7). Rates of sensitization have increased significantly over the past decade. Peanut protein is a very potent allergen, even at low concentrations. Oral challenge studies involving peanut-sensitive subjects have shown thresholds of subjective reactivity at doses of 100 µg, with objective allergic manifestations beginning at doses of 1 mg (3). Moreover, the roasting of peanuts tends to increase the allergenicity of peanut protein compared with that for fried or boiled peanuts (5). Because of the stability and potency of the major peanut allergens, peanuts remain the most common cause of food-induced anaphylactic death (1, 2).

Attempts to desensitize peanut-allergic subjects have met with very limited success. Rates of systemic reaction were high, and thresholds of reactivity did not change dramatically (6). Consequently, the avoidance of exposure to peanuts remains the most important form of treatment for peanut-allergic individuals. In recognition of the central role of avoidance in the protection of peanut-allergic individuals, the ingredient "peanut" is required to be listed on packages for foods manufactured in Canada and the United States that are known to contain peanut protein (4, 8). Many

North American manufacturers have chosen to add precautionary labeling (i.e., "may contain traces of peanut") when products are manufactured in facilities where cross-contamination with peanuts is a possibility.

Accidental exposure to peanuts remains a common cause of potentially fatal reactions in peanut-allergic individuals. To avoid accidental exposures, peanut-allergic consumers rely on the accuracy of labels to guide them in their purchasing decisions. In order to assess the accuracy and reliability of chocolate bar labels, we tested for the presence of peanut protein in chocolate bars produced in Europe and North America that did not list peanut as an ingredient.

MATERIALS AND METHODS

Ninety-two brands of chocolate bars whose packages did not declare peanut as an ingredient were purchased for analysis. Of these 92 chocolate bars, 32 were manufactured in North America, and 60 were imported from eight eastern European countries (Croatia, Czechoslovakia, Hungary, Latvia, Moldova, Poland, Russia, and Ukraine) and six western European countries (Belgium, France, Germany, Holland, Italy, and Switzerland). None of the chocolate bars listed peanuts or tree nuts as ingredients. All bars contained either milk chocolate or dark chocolate; none contained white chocolate.

Quantitative analysis of peanut protein content in chocolate bars. Chocolate was ground with a mortar and pestle, and peanut protein was extracted with a buffered salt solution of 10 mM phosphate buffered saline (pH 7.4) by shaking at 60°C for 15 min followed by centrifugation at 10,000 × g for 15 min.

* Author for correspondence. Tel: 416-864-5777; Fax: 416-864-3033;
E-mail: pv4588@rogers.com.

TABLE 1. *Intra-assay and interassay precision coefficients for the Veratox peanut protein assay*

Amt of peanut protein (ng/ml)	Intra-assay precisions (%) ^a	Interassay precision (%) ^b
100	12.6	14.8
2000	7.8	10.9
400	6.2	8.9
1,000	8.3	16.5

^a Within-run coefficient of variation.^b Run-to-run coefficient of variation.

Following the extraction procedure (performed as recommended by the manufacturer of the assay kit), peanut protein was assayed by a commercial “sandwich” enzyme-linked immunosorbent assay, the Veratox peanut allergen test (Neogen Corporation, Lansing, Mich.). Aliquots of protein extract were added to rabbit anti-peanut IgG antibody-coated wells. Unbound protein was washed away, and horseradish peroxidase-conjugated IgG antibody was added. After a second wash, substrate was added. After 10 min of incubation at 22°C, the reaction was stopped and absorbance was read at 620 nm. Each sample was assayed in triplicate. A calibration curve based on peanut protein standards (provided with the kit) was used to calculate the peanut protein concentrations in the samples. The sensitivity (lower limit of detection) of the assay was 2.5 ppm (100 ng/ml). The assay range was 100 to 1,000 ng/ml, and appropriate dilutions were prepared for samples with higher peanut concentrations. Intra- and interassay precision coefficients were calculated for each peanut protein standard and are shown in Table 1.

Aliquots of authentic peanut protein standards were added to chocolate, extracted, and assayed as described above. The efficiency of the extraction methods on the basis of measured peanut protein concentrations was 92.6%.

RESULTS

Peanut protein was detected in 25 (27.2%) of 92 chocolate bars at concentrations ranging from 4.0 to 245 ppm. In 67 of the chocolate bars, peanut protein was not detectable.

None of the 92 chocolate bars that were analyzed declared peanut protein as an ingredient on the label. Furthermore, the majority of these products (47 of 92; 51.1%) did not contain precautionary warnings (i.e., “may contain traces of peanut”) on their labels. Peanut protein at concentrations ranging from 5.6 to 245 ppm was detected in 17 (36.2%) of 47 products that did not bear precautionary labeling (Table 2). All chocolates containing undeclared peanut protein in the absence of precautionary labeling were manufactured in Germany, Hungary, Latvia, Moldova, Poland, Russia, and Ukraine. The highest levels of undeclared peanut protein were found in products originating from Moldova and Poland.

Forty-five of the 92 chocolate bars tested bore precautionary labeling. Eight of these 45 products contained detectable levels (4.0 to 72.5 ppm) of peanut protein (Table 2). These products were manufactured in eastern and central Europe, namely, in Germany, Poland, and Slovakia.

Thirty-two products made in Canada and the United

TABLE 2. *Products containing detectable peanut protein*

Sample	Country of origin	Amt of peanut protein (ppm)
Products without precautionary labeling		
G-1	Germany	5.0
G-2	Germany	5.6
P-1	Poland	7.0
U-1	Ukraine	7.9
P-2	Poland	9.8
U-2	Ukraine	10.0
R-1	Russia	21.5
U-3	Ukraine	30.5
H-1	Hungary	35.7
H-2	Hungary	35.9
G-3	Germany	37.5
G-4	Germany	39.6
P-3	Poland	40.4
L-1	Latvia	55.0
P-4	Poland	69.6
P-5	Poland	190.0
M-1	Moldova	245.0
Products with precautionary labeling		
P-6	Poland	4.0
G-5	Germany	14.3
P-7	Poland	30.3
G-6	Germany	32.5
G-7	Germany	35.8
G-8	Germany	40.2
G-9	Germany	67.5
S-1	Slovakia	72.5

States were tested. Thirteen (40.6%) of 32 products did not carry precautionary labeling. None of these 32 chocolate bars, including those with precautionary labeling, contained levels of peanut protein detectable by the enzyme-linked immunosorbent assay.

DISCUSSION

Avoidance remains the major means of preventing acute reactions to peanut protein. Consequently, it is important that consumers have access to information on which to base decisions regarding the purchase and ingestion of manufactured products. Accurate labeling is exceedingly important to the peanut-allergic consumer, and the presence of “peanut” among the declared ingredients or the presence of precautionary labeling serves to deter allergic individuals from either purchasing or ingesting potentially dangerous products.

Precautionary labeling serves as an effective deterrent if consumers believe that precautionary labeling reflects a real likelihood of peanut contamination in products bearing this designation. In the random sampling of products in this study, approximately 60% of North American and 60% of western European chocolates carried precautionary labeling, but only 25% of products originating from eastern European countries carried precautionary labeling. Whereas 42.9% of chocolate products from eastern Europe bearing precautionary labeling were found to contain contaminating peanut protein, none of the 19 North American products

bearing precautionary labeling were found to contain detectable peanut protein.

None of the North American products tested, with or without precautionary warnings, contained detectable peanut protein contamination. In contrast, 30.8% of the products from western Europe that did not carry precautionary labeling showed detectable levels of peanut protein. All of the western European products containing contaminating peanut protein in the absence of precautionary labeling originated from Germany. There was even more cause for concern for products from eastern Europe. Only 25% of these products had precautionary warnings on their labels; 75% did not. Peanut protein contamination was present in 13 (61.9%) of 21 of products from eastern Europe that did not carry precautionary labeling.

In this study, we found that the absence of precautionary labeling and the absence of the declaration of peanut as an ingredient in chocolate bars produced in eastern and central Europe did not guarantee that these products were actually free of contaminating peanut protein. A very high proportion of the chocolate bars without peanuts listed as an ingredient and without precautionary labeling, mainly products manufactured in eastern and central Europe, contained significant levels of peanut protein. The levels reported in this study are similar to those that have provoked reactions in peanut-allergic subjects (3). The reuse or reworking of chocolate containing peanuts, a standard manufacturing practice in much of Europe, leads to the presence of contaminating peanut protein in finished products. The obvious danger arising from this practice is compounded

by the absence of adequate warnings on labels to guide the peanut-allergic consumer. In contrast, North American manufacturing practices have achieved a consistent level of safety and reliability for peanut-allergic consumers, although the widespread use of precautionary labeling for North American chocolates may unduly restrict the choices available to these consumers.

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