



Food allergens: Knowledge and practices of food handlers in restaurants

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ABSTRACT

This survey evaluated the knowledge of managers and food handlers, who work in restaurants functioning in two large supermarket chains in the metropolitan region of the city of São Paulo (Brazil), concerning food allergies. Twelve restaurants were evaluated, representing a total of 74 people (12 managers and 62 food handlers). Results have shown that even though the survey showed that food handlers had some knowledge on food allergies, allergic people must stay on the alert, questioning the place where they are going to have their meals in terms of the ingredients used, verifying whether the food is really free of allergens, and always observing the labels of food products. This is needed since there is no real concern by these establishments in preparing safe meals in terms of food allergies.

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1. Introduction

Food allergies are reactions caused by a food or its ingredients (allergen). The symptoms may be severe and many reactions occur within minutes, although they could take many hours for them to appear (Food Safety Authority of Ireland, 2009). Similarly to food disorders, food allergies are considered a food and public safety problem, once 2% of the world adult population shows food hypersensitivity, and nearly 1% suffers from food allergy *per se*. In general these figures are higher in the case of children, of which 5–8% may show some level of food hypersensitivity and from 1% to 2.5% may suffer from food allergy (International Life Sciences Institute – ILSI, 2003). In the United States, 4% of the American population, i.e. 12 million people, have some sort of food allergy: nearly 6.9 million are allergic to seafood and 3.3 million are allergic to walnuts and peanuts. Unlike the food intolerance that involves digestive enzymes and may result in abdominal pain, gas and swelling, the severe reactions caused by food allergies are responsible for around 30,000 cases of medical emergency and 150–200 deaths per year in the United States (Hunter, 2007; Weiss & Muñoz-Furlong, 2008).

With the increased concern and focus of public health authorities on the issue of food allergies, concern and focus regarding the knowledge and practices of food handlers is likely to increase. It is known that the hygienic and sanitary knowledge of food handlers

is deficient, regardless of the type of establishment where they work (Ansari-Lari, Soodbakhsh, & Lakzadeh, 2010; Jevšnik, Hlebec, & Raspor, 2008; Jevšnik, Hlebec, & Raspor, 2009; Nunes et al., 2010; Omemu & Aderoju, 2008; Tokuç, Ekuklu, Berberoğlu, Bilge, & Dedeler, 2009; Veiros, Proença, Santos, Kent-Smith, & Rocha, 2009; Walker, Pritchard, & Forsythe, 2003). Thus, it is essential to improve the practices involved in the preparation and handling of food in a search to reduce the occurrence of food allergies. This directly involves qualification of the handlers responsible for preparing the meals, but as yet little is known about their knowledge and practices regarding food allergies. Hence, this survey evaluated the knowledge of food handlers working in restaurants functioning in two large hypermarket chains in the metropolitan region of the city of São Paulo, State of São Paulo, Brazil, concerning food allergies.

2. Material and methods

2.1. Restaurants

Twelve restaurants were evaluated, functioning in two hypermarket chains in São Paulo and representing a total of 74 food handlers including managers, cooks, kitchen assistants, and service assistants. Each food and nutrition unit had at least three food handlers and at most seven. Only one unit did not have a fixed manager, since the number of meals was too small as compared to the others. In this case, a manager from another unit was commissioned to oversee the work on a weekly basis. The following services were provided by these establishments: breakfast, lunch,

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Table 1
The perception of managers and food handlers regarding food allergies^A.

Questions	Managers					Food handlers						
	Yes	%	No	%	Not know	Yes	%	No	%	Not know		
(1) Was there any case of food allergy in your unit in the last few months?	–	0	12	100	–	0	–	0	62	100	–	0
(2) Is there any plan to produce safe food in terms of allergens?	–	0	12	100	–	0	1	1.6	61	98.4 [*]	–	0
(3) Is there any training about food allergy?	–	0	12	100	–	0	4	6	58	94 [*]	–	0
(4) Do you think that the meals produced at the restaurant are safe in terms of food allergies?	6	50 ^a	6	50 ^a	–	0	45	73 ^b	17	27 ^b	–	0
(5) Individuals with food allergies can safely consume the foods that cause the allergies if only a small amount is consumed?	–	0	12	100 ^a	–	0	5	8	52	84 ^b	5	8
(6) Can high temperature (deep-frying, cooking) destroy food allergens?	–	0	10	83.3 ^a	2	16.7 ^a	8	13	43	69 ^b	11	18 ^b
(7) If someone has an allergic reaction, is it correct to offer water in order to “dilute” the allergen and stop the reaction?	1	8.3 ^a	7	58.4 ^a	4	33.3 ^a	2	3 ^b	44 ^b	71 [*]	16	26 ^b
(8) If you efficiently clean the kitchen appliances where an allergenic food was prepared, will it be enough to eliminate the allergen?	3	25	9	75 ^a	–	0	24	39	28	45 ^b	10	16 [*]
(9) If you remove allergenic food items (such as walnuts) from a finished dish, will it prevent the client from having an allergic reaction?	1	8 ^a	11	92 ^a	–	0	9	15 ^b	48	77 ^b	5	8
(10) Are you used to checking the label of food products to find out whether it has any ingredient that may cause food allergy?	8	67 ^a	4	33 ^a	–	0	39	63 ^b	23	37 ^b	–	0

^A Note: percentages of ‘yes’, ‘no’ or ‘not know’ within the same job position marked with ‘*’ are significantly different according to the χ^2 test. Percentages that share different letters represent statistically different results ($p < 0.05$) when comparing managers and employees.

dinner and supper. All units produced over 2000 meals per day, including lunch, dinner and supper, as well as more than 700 breakfasts. The public was comprised of the store’s fixed food handlers, plus promoters and eventual visitors, resulting in more than 3000 meals served per day.

2.2. Evaluation of restaurants

The questionnaire was comprised of 11 questions that included allergy crises, training, safety in food preparation and knowledge on food allergies (Table 1). In addition, an extra question was used in order to provide managers and food handlers to select foods that they consider causative agents of food allergies (Table 2). The supervisors of each unit were first contacted, and their authorization requested to conduct the survey. After obtaining the authorization, each unit was contacted by phone and the managers informed about the theme of the survey and how they should proceed when they received the questionnaires: after receiving the questionnaires they should complete one and distribute the others to the food handlers. It was explained that they did not need to

reveal their identity. After completing the questionnaires, the managers were supposed to mail them back to the addressee.

2.3. Statistical analysis

The results were tabulated using the Microsoft Excel 7.0 for Windows, version 2000 computer program in order to calculate the percentage of ‘yes’, ‘no’ and ‘not know’ replies to each question. For the statistical assessment, the respondents were divided in two different groups: the managers and the other food handlers (kitchen assistants, cooks, kitchen assistants and service assistants), the so called “food handlers”. The nonparametric χ^2 (chi-square) test was used to investigate the difference between managers and food handlers’ knowledge on food allergens. A probability level below 5% was considered to be significant.

3. Results and discussion

All of the twelve units took part and all 74 people involved directly ($n = 62$ food handlers) or indirectly ($n = 12$) in food handling completed the questionnaire. The distribution of the participants according to their positions in the units was as follows: 16.21% were managers, of which only two had no university degree and were technicians in nutrition. Cookers represented 16.21%, indicating that each unit only had one person performing this job, which was also the case of the managerial positions. Kitchen assistants represented 24.32% of the total food handlers and service assistants the majority, accounted for 43.24% of the total number of participants. In terms of educational background, most (28.0%) of food handlers had not finished their primary education whereas 23% had. None of the participants were illiterate and only one was semi-illiterate (1.35%).

In Table 1, the perception of managers and food handlers regarding food allergies are shown. It can be seen that among managers most of the answers were “no”, with only in two of the questions (6 and 7) the answer “not know” being provided by the managers. Among food handlers the answers were more diverse, with in five of the 10 questions (5–9) the answer “not know” being reported. This fact shows that the higher the education level the lower the uncertainty on the answers, which reflects higher knowledge of managers on food allergens.

It can be seen in the answers to the question concerning the occurrence of any case of food allergies in the respective units

Table 2
Managers and food handlers’ knowledge on major causative agents of food allergies^A.

Select below the foods that you consider as the major causative agents of food allergies	Managers				Food handlers			
	Yes	%	No	%	Yes	%	No	%
Sea food	12	100 ^a	0	0	61	98.4 ^a	1	1.6
Milk	100	83.3 ^a	2	16.6 ^b	32	51.6 ^b	30	48.3 ^a
Chocolate	8	66.6 ^a	4	33.3 ^b	18	29.0 ^b	44	70.9 ^a
Egg	7	58.3 ^a	5	41.7 ^a	26	42 ^a	36	58 ^a
Peanut	12	100 ^a	0	0	49	79 ^b	13	21
Casein	6	50 ^a	6	50 ^a	29	46.8 ^a	33	53.2 ^a
Strawberry	2	16.6	10	83.3 ^a	0	0	62	100 ^a
Carrot	0	0	12	100 ^a	0	0	62	100 ^a
Tomato	0	0	12	100 ^a	1	1.6	61	98.4 ^a
Orange	0	0	12	100 ^a	0	0	62	100 ^a
Nuts	11	91.6 [*]	1	8.4 ^b	45	72.6 [*]	17	27.4 ^a

^A Note: percentages of ‘yes’ or ‘no’ within the same job position marked with ‘*’ are significantly different according to the χ^2 test. Percentages that share different letters represent statistically different results ($p < 0.05$) when comparing managers and employees.

(question 1) were unanimous, *i.e.*, 100% of the units analyzed had not faced such an occurrence, no matter whether managers or food handlers were interviewed ($p > 0.05$).

It was clear there were no company policies with respect to the adoption of specific practices to prevent food allergies. Managers were unanimous (100%) regarding the availability of a plan to produce foods free of allergens. However, their knowledge on the existence of such a plan, was not significantly different ($p > 0.05$) from food handlers' knowledge since 98.4% of the later claimed there was no plan to produce safe foods regarding allergens. All the managers ($n = 12$) agreed that in their restaurants no training on food allergy was provided to food handlers. On the other hand, 6% of food handlers claimed that some sort of training was provided, which may reflect their remembering on some part of good hygienic practices training. However, it must be clear that specific training on food allergies were not provided by the 12 restaurants sampled.

A significant difference among food handlers and managers' knowledge on food allergies ($p < 0.05$) was observed in the 4th question (Table 1) and most of food handlers (73%) answered that they agree the meals produced in their restaurants are safe in terms of food allergies. Among managers, a value of 50% was found for "yes" and "no" answers. Although no training was provided for food handlers in the restaurants studied, the fact that most of them agreed they produce safe meals regarding food allergens may be explained by the fact that in the present survey, the respondents were food handlers of large hypermarkets, which is a fixed public. In addition, as the menu was contractual and often repeated, there was a certain laxitude on the part of the handlers that resulted in them considering the safety level of the foods they prepared higher than it really was, on account of their limited knowledge on the subject. This in turns leads food handlers to understand that no risks for consumers are derived from consumption of meals in their restaurants. Ahuja and Sicherer (2007) reported similar results, where participants of their study also presented an excessive level of comfort regarding the safety of the meals they prepared in restaurants. In the 5th question, the knowledge of food handlers and managers if the amounts of a food know to contain an allergen may lead or not to food allergies was evaluated. All of the managers acknowledged "no" for this question, while among food handlers the rate of "no" answers was of 84%, with 8% answering that they do not know if someone presenting allergic reactions could or not consume small amounts of foods know to carry allergenic compounds.

The dietary habits of a region and the methods used to prepare the foods play an important role in the predominance of food allergies in many countries around the world. Most reactions are caused by food ingestion, but the steam and smoke originated from the cooking process may contain allergens which can be inhaled (Weiss & Muñoz-Furlong, 2008). The cooking process may reduce the allergenicity of certain proteins in the food, but heating can increase the allergenicity of other proteins by inducing covalent changes that lead to the production of new antigens or improve the stability of existing ones (Mansueto et al., 2006). In the present study, most of food handlers (69%) and managers (83.3%) agreed that high temperatures might not be sufficient to destroy the allergen ($p < 0.05$). In this question, a rate of 18% of food handlers did not know if high temperature could or not destroy food allergens, while among managers this level was of 16.7%.

Of the food handlers and managers interviewed, 71% and 58.4% answered that they did not know if it was the right thing to do to offer water to someone suffering from an allergic reaction with the purpose of "diluting" the allergen and stopping the crisis. Regarding the 8th question, 75% of the managers do not believe that the appropriate hygiene of appliances used in the meals would be an effective measure to eliminate traces of allergenic foods that could interfere in the health of another client in the preparation of a dif-

ferent food. Among food handlers, a rate of 45% do not believe that cleaning would be an effective measure to eliminate allergens from kitchen appliances. Cleaning of equipments and appliances contacting foods is an important route of food contamination with allergens. In the food industry, bad formulation, inappropriate hygiene and cross-contamination with dust or parts of allergens (fragments of peanuts, for example) left in the processing system are potential means for an allergen to contaminate an unrelated product. In this case, in order to guarantee the safety of processes, it is necessary to identify the potential points of contamination and establish a prevention system (Deibel et al., 1997). Thus, the use of equipment to produce food requires well-defined and consistent cleaning techniques, especially if the same equipment is used to prepare several types of product. The Brazilian legislation requires that catering services follow the Manual of Good Manufacturing Practices and the Standard Operating Procedures (SOPs). The SOPs should contain sequential instructions on the operations and frequency of execution, specifying the name, position and/or job of those responsible for the activities. These documents should be available to the food handlers involved and to the sanitary authority when required, and should also be approved, dated and signed by the person responsible for the establishment (Brasil, 2004). Laoprasert et al. (1998) reported the occurrence of an allergic shock effect in a three year-old boy previously affected by the consumption of milk and dairy products, who consumed a lemon popsicle. The allergic reaction, with symptoms of a sore throat, facial edema and vomiting, lasted for about 20 min. The product label cited the following ingredients: filtered water, sugar, lemon juice, corn syrup, pectin, natural aroma and citric acid. However, after analyzing the samples, it was shown that the Popsicle had traces of milk protein. After performing an investigation, researchers concluded that the same equipment had been used to prepare both the Popsicle and milk-based ice creams, explaining the presence of milk protein in the lemon Popsicle. This fact allowed researchers to conclude that the cleaning system was not efficient in guaranteeing the safety of this product, and that labels do not always represent a guarantee of the presence or lack of certain components in the product, be they allergenic or not. This event highlighted the importance of monitoring food processing, both in the industry and in establishments such as restaurants, with regards to the cleaning and hygiene, as well as regarding the use of the same equipment to produce different types of product, in terms of the occurrence of food allergies.

Furthermore, 8% of managers believed that removing food items that cause allergy from a finished dish would prevent the allergic client from having any kind of reaction, while among food handlers this level was of 15% ($p < 0.05$). Measures for removing allergens from foods can be difficult to perform, since traces of the allergen contained in the food could be enough to cause a reaction, and allergic individuals often fail to identify potentially allergenic food in restaurant menus. On the other hand, restaurant food handlers have no training, as well as poor knowledge, on the severity of food allergies, and of the importance of reading the list of ingredients shown on the label and of avoiding cross-contamination during the preparation of meals. In addition many establishments are ill-equipped in cases of emergency (Weiss & Muñoz-Furlong, 2008). Manufacturers are greatly concerned about cross-contamination, which may occur at any stage of the production and storage process (after the products are packed). This usually happens with the transfer of allergenic proteins when the food is processed or handled, especially when multiple ingredients or food items are produced on the same production line as other items that are non-allergenic or that contain another type of allergenic protein (Jackson et al., 2008).

A total of 67% of the manager did have the habit of reading food labels to check whether there was any ingredient that might cause

a food allergy, while among food handlers the rate was of 63%. This is alarming and highlights the need for periodic training practices. Food labeling is an important support for consumers, providing them with the opportunity of knowing the product composition, safely ingesting nutrients and energy, as well as obtaining important information concerning the maintenance of their health. Food legislation should be seen as a strategy to reduce levels of obesity, nutritional deficiencies and non-transmissible chronic diseases associated with the standards of consumption (Ferreira & Lanfer-Marquez, 2007). In the case of allergens, it is essential that labels contain accurate information, even if the presence of traces or the remote risks of traces result in reduced consumption of the products (ILSI, 2003). A study performed with allergic volunteers and parents of allergic children in Greece and the Netherlands in order to verify their behavior towards labeling when shopping for food, concluded that the labeling standards were highly unsatisfying. One of the complaints was related to indications of the minimum and maximum amounts. The participants believed that, in the case of excesses, it would be sufficient to state on the label the amount that exceeds the safe limits, and in the case of trace amounts, only place a warning indicating the presence of the substance. In general, the participants complained about the complexity of the information, its position on the label, its format and packaging changes, amongst others (Voordouw et al., 2009).

In Table 2, it can be seen that of the main food products considered to be allergenic, seafood were virtually unanimous amongst the participants. The ingredients placed in second place as responsible for food allergies were peanuts (100% for managers and 79% for food handlers) and walnuts and hazelnuts (91.6% for managers and 72.6% for food handlers). Food handlers acknowledged lower rates for milk (51.6%), chocolate (29%), egg (42%) and casein (46.8%) as allergenic foods when compared to the answers of managers which yielded 83.3%, 66.6%, 58.3% and 50%, respectively. Significant difference ($p < 0.05$) between managers and food handlers' responses were observed when milk and chocolate were considered. This shows that the handlers had previous knowledge due to experience in their daily routines or acquired from the various means of communication, such as radio and television, since there was no specific training in their work environment regarding food allergies. Similar results were found by Gupta et al. (2009), where most participants identified peanuts as the most common of allergens, both in childhood and in adult life. In this same study, the authors verified that the participants tended to ignore eggs and finfish and crustacean shellfish as major allergens, which did not occur in this present study, since approximately 50% of the participants identified eggs as possible allergens, and virtually 100% identified seafood as possible allergens. Of the food items suggested to the handlers, seafood, peanuts and other nuts were mentioned in most of the answers, which shows that they were well informed in terms of the food items that could damage the health of sensitive individuals.

4. Conclusions

This research reports the food knowledge practices of handlers with respect to food allergens. Despite their excessive trust in the safety of their meals, there was no company policy specifically

addressing to training with respect to food allergies. The lack of training can be seen as the greatest problem. Even though the survey showed that food handlers had some knowledge on the issue, allergic people must stay on the alert, questioning the place where they are going to have their meals in terms of the ingredients used, verifying whether the food is really free of allergens, and always observing the labels of food products. This is needed since there is no real concern by these establishments in preparing safe meals in terms of food allergies. The participation of government agencies is also important for the development of educational campaigns for consumers with respect to this question.

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