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The main problems of food allergic consumers concerning food labeling: an ethnographic study.

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Abstract. It has been estimated that 5–8% of children and 1–2% of the adults in developed countries are affected by food allergy, with symptoms ranging from discomfort to fatality. At present, avoidance of problematic foods is the only effective treatment strategy. As of November 25th, 2005 food manufacturers in the EU are obliged to list 12 potentially allergic ingredients in food. Although the label is still not always fully understood by the consumer, or they get confused by precautionary labelling practices.

This paper aims to gain insights into the information preferences of food allergic consumers regarding existing food labelling and additional information delivery systems. The results of this study will facilitate the development of best practices in information provision regarding food safety in the area of food allergy. In particular the research will elicit preferences for new ICT approaches to information delivery which can be focused on the individual needs of consumers. We argue that improved information supply will contribute to the quality of life of food allergic people.

Keywords: Food allergy, consumers, food labelling, information needs

1. Introduction

1.1 Information needs of allergic consumers

The prevalence of food allergy is between 5-8% in children and 1-2 % in adults^[1,2]. Although self-reported food allergy is much higher 25-30%. Depending on the nature of the allergic reaction, food allergies can result in physiological discomfort or can result in severe or even potentially fatal reactions. At the present time treatments for food allergy are limited to prevention through effective management and emergency treatment if needed^[2].

Several studies show that four important groups can be identified concerning the communication on food allergy: children, parents, and adolescents and young adults^[3,4,5,6,7,8]. The last group is particularly at risk of developing severe food allergy reactions, in part because of lifestyle changes and an increasing tendency to eat away from the home^[6,7]. This may indicate a need for specifically segmented information directed towards the different consumer groups.

On the 25th of November 2005 the new EU-directive (EU directive 2003/89/EC amending 2000/13/EC) was applied which required the industry to list twelve potential allergens on food labels if food products contained them^[9]. The directive underlines the principle that all potentially allergenic ingredients should be labelled, regardless of the quantity contained in the finished product. Despite the new labelling legislation, allergic consumers are still not completely sure about the safety of products^[10]. This uncertainty could be caused by fear of cross- contamination, unlabelled products (for example those which are not packaged), and difficulty in understanding the product labels^[11,12]. To improve the information on products, the labels should be comprehensive regarding consumer information needs, and maximize the food allergic consumer's understanding and interpretation of implications for their own allergy. Labelling of products bought loose, in catering outlets, or in countries other than the allergic consumers' primary country of residence, remains problematic^[13]. A key component of developing an effective communication strategy comprises identification of improperly or incompletely labelled products and subsequently of effective labelling strategies^[14].

Research shows that food allergic consumers perceive a lack of information about the inclusion of potential allergens in the food products they would like to eat [11,12,13,15]. The information on the product labels is reported to be insufficient in terms of the requirements of food allergic consumers. However, the way the information is presented at point of sale is, at the same time, reported to be overwhelming [11,12,13].

Other problems have been reported by food allergic consumers when shopping for food. They report that they spend more time on grocery shopping in order to find safe products [10]. Social activities are problematic for food allergic consumers, because they cannot eat spontaneously anywhere, indicating the need to develop communication about food allergy with the general population, as well as with caterers and other food providers [10]. More specific allergen information is important if food allergic consumers are enabled to engage in normal social activities, and to improve their quality of life. For example, restaurants could place all ingredients used on the menu card, or develop special menus for food allergic consumers. The manufacturers should not only label the 12 most common allergens on food packages, but should also find ways to provide precise information in a clear way [10].

In summary, there is some evidence that food allergic consumers experience stress as result of poor communication and labelling practices. Food manufacturers have a moral and legal responsibility to produce safe products. Despite the new labelling legislation, allergic consumers are still not completely sure about the safety of products, caused by fear of cross-contamination, unlabelled products, precautionary labelling (“may contain” labels), and difficulties in understanding product labels.

The aim of this research is therefore to investigate what the preferences are of food allergic consumers regarding food labelling. The results of this ethnographic study will provide essential knowledge and insights in the problems that food allergic consumers encounter when buying food products. The results will shed a light on the question if the information provided by the manufactures is sufficient for food allergic consumers. Having knowledge about the information preferences will be essential in developing new and better information supply to the food allergic consumer. We argue that improved information supply will improve the quality of life of food allergic people.

2. Method and materials

2.1 Subjects

This cross-cultural study was conducted in the Netherlands and Greece. This paper will only present the result of the Netherlands, as the analysis is not completed yet. In the Netherlands the subjects were recruited through advertisements in several local newspapers and on internet. The three most common allergies were studied in this research: milk, egg and (pea)nuts. The subjects were selected on basis of their allergy and the severity of their allergie(s). Half of the sample consisted of parents of food allergic children, the other half of adults with a food allergy. In total 20 respondents were recruited for the ethnographic study. Table 2.1 shows the demographic characteristics of the study population.

Table 2.1 Demographic characteristics of the study population in the Netherlands.

Characteristics	Category	N	%
Gender	Male	6	30
	Female	14	70
Age	18- 24	3	15
	25- 34	5	25
	35- 44	8	40
	45- 54	2	10
	55- 64	2	10
	>65	0	0
Occupation	Larger employers and higher managerial occupations	1	5
	Higher professional occupations	2	10

	Lower managerial and professional occupations	4	20
	Intermediate occupations	3	15
	Small employers and account workers	2	10
	Lower supervisory and technical occupations	0	0
	(semi) Routine occupations	0	0
	Never worked and long term unemployed	0	0
	Different	3	15
Working status	Full-time	4	20
	Part-time	6	30
	Unemployed	0	0
	Pensioner	1	5
	Student	2	10
	Homemaker	4	20
	On disability allowance	1	5
	Different	1	5
Education level	Low	2	10
	Medium	9	45
	High	9	45
Allergy	Milk	10	50
	(pea)Nuts	13	65
	Egg	9	45
Income	< 750 euro per month	0	0
	750- 1500 euro per month	6	30
	1500- 2250 euro per month	5	25
	2250- 3000 euro per month	4	20
	> 3000	0	0
	undisclose	2	10

2.2 Method

The aim of this study was to investigate the information needs of food allergic consumers. This we have done by observing the shopping behaviour in real-life setting and interviewing food allergic consumers during the course of their shopping.

The study design summarized in figure 2.1 was applied. This was to examine differences in consumer problems according to whether they were in a familiar or unfamiliar shopping environment, and whether the participants were food allergic consumers themselves, or responsible for food allergic children.

Figure 2.1 Study design.

	Parents	Adults	Total
Familiar shop	5	5	10
Unfamiliar shop	5	5	10
Total	10	10	20

Respondents were asked in advance in which supermarket they usually shopped for groceries shopping. During the investigation, half of the sample was sent to a familiar, and half of the sample to an unfamiliar supermarket. Low, middle, and high priced supermarkets were included in the study.

A shopping list containing 15 possibly problematic food products was given to the respondents at the start of the experiment. The respondents were instructed to try purchase all the items mentioned on the shopping list, and do the shopping the way they would normally. During the investigation the interviewers asked respondents the questions shown in Figure 2.2.

Figure 2.2 Interview questions used during the shopping investigation

Did it cost you a lot of effort to find this product?
Why did you choose this specific product?
What kind of information did you look for?
Did you find the information you were looking for? What did you miss?
What do you think of the way the information was presented?
Do you trust the information that was given on the label?
In what way should the information be presented to be useful to you?
If you can't find the product, would you ask the personnel to help you?
Would you trust the information the personnel gives you?
Are you satisfied with the variety of products for this specific product concerning your allergy?

The interviewers did not help the respondents with the shopping, but only observed and interviewed them in the course of their shopping activities. Once all items from the list had been selected, the respondent could go to the cash desk.

Respondents were then required to provide opinions about the potential usefulness of different innovations in information provision. Specifically, they were presented with different information scenarios, and asked their opinion about their potential utility in providing information about food allergy. This was done in the store where the shopping investigation had been conducted, to help the respondents to visualize the scenarios in a real-life setting. The information scenarios consisted of:

- (1) A video clip about a PSA (Personal Shopping Assistant), pictures of the PSA and the PSA dummy. A PSA is a small computer placed on the shopping trolley. Products can be scanned with the PSA and additional information about ingredients and allergens can be obtained.
- (2) In-store information terminals (demonstrated by pictures of information terminals in retail environment)
- (3) A bar code on loose sold products (picture).

It was explained to respondents that the information delivery systems described above can be used in combination with the information terminal to scan the product and provide additional information about the ingredients and allergen information on the computer.

- (4) RFIDs (Radio Frequency Identification) were also described to the respondents using pictures and words. More information can be placed on a RFID tag than on a barcode. The RFID can also be scanned and, when access to an information terminal is provided, give traceability information about ingredients.
- (5) Finally, several slightly different biscuit packages or soup cans were presented to respondents. Half of the respondents were confronted with the biscuit packages and half with the soup cans. The labels differed in the way the information was presented (e.g. font size, contrast, location of ingredient list and allergen information) and the amount of information given (e.g. main ingredients vs. whole ingredient list, written allergen information vs. allergen information in symbols).

Before the actual investigation a pilot study was performed to investigate if the proposed design of the investigation would be appropriate given the aims of the research. The results of the pilot (n=4) showed that the shopping list was sufficient, the whole and the investigation took between 60 -75 minutes for each respondent. The actual investigations were conducted during week days in January and February 2006.

2.3 Materials

The interviews all were audio taped on a MP3 player/voice recorder. Afterwards, the audio tapes were transcribed into English for the analysis. The shopping list handed out to the respondents is shown in Figure 2.3. The information scenarios were demonstrated to respondents using a laptop, and the PSA was demonstrated by using a dummy model. Photos of the PSA and the other new ICT technologies described in section 2.2 were used. Five differently labelled biscuit packages and soup cans were also shown to respondents.

Figure 2.3 Products on the shopping list.

Apple pie (second choice other fruit pie)
Biscuits
Bread rolls
Chicken soup (tinned) (for vegetarians: vegetable soup)
Chocolate bar
Cornflakes
Crisps
Margarine
Mayonnaise
Pasta
Ready meal Asian food
Readily prepared schnitzel coated with breadcrumbs (for vegetarians: corn burger)
Spaghetti sauce (instant)
Sandwich bread

3. Results

The preliminary results of the analysis will be described in this paper.

In general the consumers were not satisfied with the current labelling practices. Some respondents encountered difficulties with the readability of the label. For example, one respondent indicated that the font size of the letters was too small for some products.

P 6: "Only what's written on there is almost not readable, you almost need a magnifying glass for that one."

A lot of respondents mentioned that the colour contrast of the label and font is not great enough to enable them to read the label without extra effort. Furthermore, the material used in the packaging was also problematic, as, some use very shiny materials which makes the information difficult to read.

Most consumers were positive about the allergen information provided, although respondents reported that they sometimes had to search for it on the package. Consumers expressed a preference for providing the information in a standard location on the package, for instance *above* the ingredient list. Consumers reported having to read the whole ingredient list before noticing that there was allergen information written on the package. The allergic consumers indicated that they would prefer the allergen information listed *separately* from the ingredient list.

P 18: "...it is extra information. But it doesn't really stand out from the rest. Now I know where it's written it does, but otherwise I wouldn't have seen it."

P 9: "I have to search the package carefully, to see where my relevant information is located."

Some consumers would prefer to have the ingredients and allergy information to be presented in a bold font. They also mentioned that the use of colours on the label could potentially increase the clearness and readability of the label. A few consumers proposed that the enclosure of the ingredient list and allergen information in a frame could potentially enhance the transparency of the label. The respondents reported that the columns of the ingredients list should not be too wide, so the whole list can be read in one glance without needing to change the position of the package they were examining.

P 3: "I would prefer it if this information was placed on there in bold font, so that you could see and notice it straight away."

The number of languages on the label was a source of irritation to many of the respondents, although it was understood that for foreigners in the Netherlands other languages would be quite useful. A solution suggested by the respondents is the put the Dutch text at the top followed by other languages. To increase clarity and to prevent information overload, some respondents suggested putting a limited number of languages on the label. However, some labels did not even have the information in Dutch. These products tended to be found in lower priced supermarkets. This may be problematic for industry regarding international distributions of a particular product in more than one country.

P 20: "...English or Dutch, but not such a long list of all those languages, so I really have to look for the Dutch one. No I don't like that!"

An important factor in determining food allergic consumer information preferences was the variability in susceptibility to problematic allergen according to allergy type. For some consumers, only a trace of the allergen can potentially cause an allergic reaction, while for others the threshold is higher. Therefore, respondents suggested that it would be useful to mention the percentages or quantities of all the ingredients, particularly the ingredients containing the allergens.

Since the new EU labelling legislation (November 2005), many producers use precautionary warnings, (for example, 'may contain traces of nuts' or 'made in a factory where nuts are processed'). Many of the respondents indicated that these messages limited their food choices. In cases of severe food allergy, the respondents would not take the risk and avoided products labelled with precautionary labels.

P 6: "People walking by will look at you in a funny way and wonder what you're being so fanatical about looking at the product."

The ingredients lists caused a lot of problems to food allergic consumers. The ingredient list is not complete enough for food allergic consumers. Some ingredients are not clearly specified. An example is vegetable oil, which can be derived from various sources. Information about origin is of vital importance to consumers with a peanut (oil) allergy. Another example relates to starch used in products.

P 3: "...I don't know whether it is potato, corn or wheat starch...they don't specify it..."

In line with this, another problem was mentioned. In spite of the new EU rules, producers are not required to specify all the ingredients of end-products used to create new products. For instance, margarine is used in apple pie, but the producers are not obliged to specify the type of margarine, nor how it was produced and from what raw

materials. Food allergic consumers find these 'hidden' ingredients are very difficult to recognize.

P 22: "It is written 'secret of the baker', so I will not trust it!"

E-numbers, additives (e.g. taste/colour enhancers, antioxidant, and preservatives) can cause confusion among food allergic consumers. The meaning of an E-number is not known to many food allergic consumers. The terminology used for additives can be very chemical, these expressions of the ingredients often do not make sense to the average food allergic consumer. The respondents in the study presented here would like simple and clear expressions of the ingredients. The amount of additives and E-numbers in products, together with consumer lack of knowledge regarding the meaning and source of these additives and E-numbers can result in them not buying the product.

P 25: "On both (products available) aromas are listed, so both have a chance of containing something that isn't allowed. Well I think I would want to know what the aroma's are exactly, because that could be so many things."

P 18: "I discovered later that whey powder was a milk product."

Food allergic consumers find the information on the current labels overwhelming. However at the same time, the respondents would like a complete and specific ingredient list. On most fresh products the ingredient list was absent, which is very problematic for food allergic consumers.

Depending on the severity of an individual's food allergy, consumers tend to read the label thoroughly before considering whether to purchase the product. In severe food allergy cases, consumers will not buy a product when they are in unsure whether the product is safe for them. Less severe food allergic consumers are more likely to take risks in eating food even though they are not completely sure it is safe for them. It all depends on the quantity of the allergen in the product, and the severity of the allergy should it occur.

In general, most of the food allergic consumers included in this study prefer separate allergen information on the label next to the ingredient list. There is still a large group of consumers who do not completely rely on the allergen information in isolation. Most respondents tend to use the allergen information as **exclusion** rather than **inclusion** criteria. This means they would first look at the allergy information to determine whether they could purchase the product. If the allergy information indicated the food was problematic, they would replace it on the shelf. However, respondents would read the whole ingredients list to be sure, even in the absence of allergen indicators.

P 3: "for this product it's interesting because you see that normally I would have chosen this product seeing as there is no wheat listed in the ingredient list, but then in the allergen information you see the heading that it contains wheat, lactose. So then what can I trust? Because normally I would have blindly trusted the ingredient list, and I would have bought it."

P 4: "well, if milk was listed in the allergen information, then I wouldn't take it anymore, but if it was listed on the allergen information that is was not there, then I would still check myself just to make sure."

In general most consumers liked the symbols on the package which indicate whether or not an allergen was present in the product. However, consumers wanted the allergen information written out as well. Some symbols were reported to be ambiguous, however. For example, some respondents wondered whether a symbol of an egg was

shown on the label would imply that the product does or does not contain egg. Others suggested that the symbols should be placed on the front of the package to make the searching process easier. In addition, they wanted to see by using a quick single inspection whether the product is safe for them or not while it was still on the shelf. At the present time, the symbols now are placed close to the ingredient list. Most food allergic consumers tend to read the ingredient list even though the allergen information and symbols are on the label.

P 18: "If there is a picture then I will check to see what exactly it contains... it would save a bit time if you knew the pictures and what they meant off by heart."

The personal experiences that food allergic consumers have with products are very important for them. If they have one bad experience with a product, they will not buy it again for a very long time if at all.

P 15: "What I buy is mostly based on experience."

P 23; "Oh, I'll notice that after two bites. If I eat this stuff it's tickling behind the ears and in my throat. Then there is something in it, which is not good for me, so I'll stop eating it. My warning system works very well, my body is responding very quickly."

P 5: "Principally I don't eat anything of Milka either. Even if it is not listed on there I'll have problems with it anyway. I know this from my childhood already that I can never eat Milka chocolate."

Many consumers are getting more assertive nowadays; this certainly is true for the food allergic consumers. When the information on the label is not clear for the food allergic consumer they will contact the information services listed on the products. The information services will look up the ingredients, and when they can not give the answer right away they will call the consumers back 1 or 2 days later. In general these information services react positively on the information requests, although some find the food allergic population too small to invest too much time in delivering the required information. However, consumers have to ask for quite specific information when they call information lines, otherwise they will not get the right information. Most questions concern the additives and hidden ingredients.

P 6: "sometimes I call up the producers and I will ask if it (the allergic ingredient) is in there, they will look at the list and tell you it is not in there, then I will continue asking where they bake it for example, and then sometimes they call back a day later and tell me that the oil (in which it is baked) contains something."

P 8: "When I really want something, and I doubt if it is safe, then I call or email the consumer information."

P 13: "I will sometimes ask to look at the ingredients list myself, or I will call the producer to make sure. Certain producers really take this seriously, and others consider you to be difficult because you are only one of the few with problems, and the mass production has obviously more advantages to them, I do understand that because it gives them more profit, but still..."

In the Netherlands the Public Nutrition Consultancy Centre (Voedingscentrum) provides lists which show brand products that are safe for specific food allergies. Some supermarkets also provide such list to food allergic consumers. A minority of food allergic consumers will use these lists each time they do their grocery shopping. The food allergic consumer can look up the product they want to buy and check if it is suitable for them. This takes the consumer a lot of extra time, but the security they get out of this counterbalances the extra time needed.

P 8: "I always carry this in my shopping bag, it is like 'my' shopping list. This one I got especially from Super de Boer (a Dutch retailer) and this one is from the Public Nutrition Consultancy Centre."

The majority of the food allergic consumers in this study stated that they would not ask the personnel in a supermarket for information. The respondents do not trust retailer to possess adequate knowledge about food allergies. Against this, some food allergic consumers would ask the personnel in a specialized shop, like in a bakery or biological store, whom they tend to trust more than a shop assistant in a supermarket.

P 13: "Employees are often not aware of the seriousness of the situation."

P 15: "Only in special stores, like a nut store. I don't expect the boys and girls working here (the supermarket in which the study was conducted) to know that kind of information."

P 8: "They don't know what you're talking about."

The variety of products food allergic consumers can eat depends on the severity of their allergy and if they have multiple allergies. People with a more severe food allergy have less variation in their diet. This is also true for people with multiple food allergies. Severe food allergic consumers will not eat products about which they are not completely sure, as they are concerned about taking unnecessary risks, in contrast to food allergic consumers with less severe allergies, (for example they are more likely to consume products with precautionary warning labels). Most food allergic consumers do not experience the limitations of variation in their diets as a burden. They claim that they are "used to it" and they have no other choice then to accept reduced dietary variety. Most food allergic consumers make a lot of products themselves, in order to know for sure what is in the dish, and to provide more dietary variety as a consequence.

P 4: "I do make a lot (of food at home), for his birthday I then make cake. And cheese I make myself. With the curd cheese you can make soft curd cheese pie. I'll add some candy and decorations that's what he'll get, because he cannot eat anything else."

P 7: "Mostly I don't want to make the effort to read this all by myself, so I'll just cook it myself."

P 13: "If I make it myself I can vary (the food products) however I like, I can make anything I want!"

Concerning brands, the respondents reacted differently. Some of them reported to trust the well established high quality brands best, partly because of better labelling. Others mentioned that cheaper products in general contain less additives. Additives could be problematic for food allergic consumers and therefore products with less additives are preferred.

Changes in the recipes of products are problematic for food allergic consumers. Many respondents found it annoying that products changed ingredients quite as frequently as seems to happen. Food allergic consumers always pay attention to the package of a food product and, in many cases, if the package is changed, the recipe is changed is well, which results in the consumer feeling insecure and reading the label carefully, although before they claimed to know the product and eat it regularly, which necessitates less scrutiny of the label. This does not apply to consumer with very severe food allergies.

P 6: "See, this one (food product) we usually have, but the package has changed. So, now I'm extra careful about reading the ingredients again to make sure they haven't changed that all again. "

P 8: "The biggest problem is that the packages are constantly changing without knowing whether the content is changed. And then there is the trend to put 'new' or 'renewed' on every package. We cannot be sure anymore what it is made of."

P 13: "Sometimes they put very big on there (the label) that it's new, but sometimes they just change the ingredients without putting it (the information) on there. So even when I'm home I always read the products again before I use them, just to make sure."

Another problem reported by food allergic consumers is the change in the product assortment in the supermarkets. Supermarkets replace products by other brands or by different types of the products (for example tomato soup in stead of vegetable soup), which is complicated for the food allergic consumer.

P 22: "Often, when I have found something okay for me, then it is taken out of production. That is so annoying."

P 16: "Definitely when there is a new product, it costs me approximately 3 times as much time as the other one. I need to look through all ingredients."

Changes in the recipes of products, or changes in the assortment in the supermarket are problematic for food allergic consumers, because they need to find out again whether they can safely eat the product. It takes more of their time to check the labels again and it is annoying if a product they could eat has been replaced by a product they cannot eat safely. In some cases food allergic consumers would buy quite a few safe products which are in stock, because of these assortment changes, so they can eat the safe product for longer period.

P 17: "Now we are eating marzipan balls for example, these are only in the stores once a year, in December around Christmas. When you know that the product is good, my wife will usually buy 10 or 20 of those packages, dependent on the expiration date."

Emotions seem to play an important role for food allergic consumers in the process of buying food. Food allergic consumers feel insecure about most new products they try, especially when they buy those for food allergic children. If they have had bad experiences with specific products, they fear to try it again even under another brand name, or when the recipe is changed. They'd rather eliminate such products from their diet completely. Others will, however, take the risk, especially younger people.

Interviewer: "So you really do take risks?"

P 5: "Yes, why not, you need to live. Otherwise you really can't do anything anymore."

Many food allergic consumers are not completely sure about the information given on the label. However, they tend to trust it, because otherwise it will become very difficult for them to eat anything.

P 18: "I find this very tricky. I can't find concrete evidence of why I should not buy it, but seeing as so much is listed between quotations, I get a little confused."

P 9: "Yes, I do trust it quite a bit, even though it has happened that I have reacted to something in the past."

Consumers expressed irritation about the way information is presented, or about the fact that information is lacking. The respondents did not like having to search the package to find the information they needed, and found it even more annoying if this information was not provided.

P 20: "The information is hidden under the edge of this package... you know what I mean? That makes me angry sometimes."

P 21: "There are things that aren't listed on the label and that does really irritate me."

P 22: "I'm sick of checking it all the time..."

Many food allergic consumers mentioned that people around them do not totally understand the impact of having a food allergy, and, as a consequence, they could be seriously exposed to potentially problematic allergens. The respondents also reported that it is quite difficult to live with a (severe) food allergy.

P 21: "They would say, ah, take a bite, what's the big fuss all about. But she (the food allergic child) almost died doing that."

P 22: "Life would be easier without the allergy. I admit that, but I'm also used to it and prefer to live a bit longer so... That sounds a bit dramatic, but it is true."

Most respondents were afraid of taking risks, but sometimes they still did to have a reasonable life. They also claimed that they were used to living with the food allergy

Some of the respondents thought they spent less money on grocery shopping compared to their non-allergic peers, because they have less choice in their diet and omit a lot of sweets, cookies etc. from their menu. Others mentioned that they made more things at home, which also saves money.

P 3: "I would just skip this one and make tomato soup myself. You also save money doing it this way."

Others said they were willing to pay up to at least twice as much for an allergen-free product. The latter group largely consisted of parents of food-allergic children who didn't want their children to have too restricted a diet.

Interviewer: "Would you be willing to pay more for allergen free products?"

P 18: "Yes I would, just to be able to give my son some more variety."

Some food allergic mentioned that cheaper products are safer than the A-brands, because they contain fewer additives like milk or eggs. For example, it was mentioned that Dutch producers tend to put milk in more products than producers from other countries (where milk is more expensive).

Most of the respondents included in the study indicated that they spend much more time on shopping than people without a food allergy, because they constantly have to check the labels and must put a lot of effort in arranging a varied diet and also being able to try new things. Most food allergic consumers did not like the time they have to spend reading the labels, but felt they this was essential, because they needed to be certain whether or not they could safely eat the specific products and that the ingredients have not changed, although the more the severe the food allergy, the greater the need to check the ingredients became.

Food allergic consumers tend to be quite health orientated. They also consider whether products contain high levels of fat or calories, and prefer products that contain fewer additives. This is because of the potential for additives (like egg or mustard) to cause an allergic reaction. Instead, many of them like to make things by themselves at home.

P 5: "Normally I take this cheapest one and then I would look at the saturated fat contents."

P 14: "Well, it is more because of the fat content that we stick to that brand."

4. Discussion

In this study, the preferences of food allergic consumers regarding information provision about potentially problematic ingredients was investigated. The results show that, in general, food allergic consumers are not very satisfied with the current labelling practices, which they find inadequate, inappropriate or difficult to use. The results of this study provide insight into the information preferences of the food allergic consumers. This is essential if a new and better information supply is to be developed, which would subsequently have a positive effect on their quality of life.

The main results concern the label appearance and the content of the ingredient lists. The readability of the label is problematic. The font size is frequently reported to be too small and the contrast of the label is not good. These findings are consistent with previous research ^[10,11]. This suggests that there needs to be regulations regarding the minimal font size and the minimal percentage of contrast of the label, although, of course, this may not be possible given the amount of information that has to be provided as a statutory requirement, suggesting alternative information delivery systems (for example, novel ICT approaches) would be useful. Another option to enhance the readability could be to clearly enclose the ingredient list and allergen information in a frame and use a white background with black letters.

Another problem is the large number of languages on the label. Some of the food allergic consumers used in this study were overwhelmed by the use of multiple languages, as they could not find the right language right away, (see also ^[10,15]). However, there must be some foreign languages on the label because of the multi-cultural nature of modern societies, and centralised production in the food chain, such that food produced in one country is likely to be exported to several others. Another problem is associated with increased foreign travel in recent times. ICT approaches may deliver useful solutions to these problems.

The location of the allergen information differs between products. To ensure people can find the allergen information fast and easy, a standard location for allergen information on the label is needed, for example in a clearly identifiable place above the ingredient list. At present time, there are no clear rules on 'how' the allergen information should be included on the label. The consumers in this study tended to approve the use of symbols for the allergen information, although they would still like the allergen information to be written out. Because the symbols can be interpreted differently, it was suggested that there is a need for universal or internationally harmonised symbols. Although, the use of symbols was not thought to be trustworthy enough to replace the ingredients lists or allergen information. A good option would be to place symbols on the front of the product and written allergen information on the back of the package above the ingredient list.

Current labels contain a lot of information, but specific information required the food allergic consumer is lacking or difficult to find. This discrepancy could be solved by using modern (ICT) technologies to supply more complete and better understandable product information. New ICT-technologies like Radio Frequency Identification (RFID), bar-coding on foods sold loose and personalised information could be used to provide information which is more complete and easier to understand. In many cases the

terminology used on the label is too difficult for the consumers included in this study to fully understand. Therefore, the ingredient list should be as complete as possible and simply presented. In addition, there is a need for percentages and/or quantities mentioned in the ingredient list to be included, particularly for allergens. These results suggest that the existing 5%- rule is still not adequate in terms of consumer protection.

Precautionary labelling was not viewed positively by consumers in this study as it caused unnecessary restrictions in the diet of food allergic consumers.

Any changes in recipe should be clearly indicated in the ingredients list (for example by using bold fonts for the changed ingredients). Of course, time periods for such changes in labelling to be applied need further consideration. Similarly, use of the terms 'new' or 'renewed' should be monitored.

Some, although not all, of the respondents in this study claimed that they would be willing to pay more for allergen-free products.

In conclusion, the new EU-regulation it is not clear how allergens should be listed on the product labels. Through better and clear labelling the insecurity of food allergic consumer could be decreased. This may have a positive influence on the quality of life of food allergic consumers. Building on our findings we are going to do further research and the next phase is develop new information scenarios (e.g. RFID, PSA, smart cards, information terminals) and investigate the possibilities for implementation together with stakeholders.

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