

Effective System for Information Supplements for Food Products - Consideration from the Perspective of Consumer Needs -

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Abstract. This paper presents the analysis results of consumer needs concerning food information supplements. Consumer awareness of food safety is recently heightening, and food allergy issues seem to be becoming a greater concern these days; therefore, effective solutions are required. Improving the quality of food might be an important solution, but supplementation with information that consumers really need might also be considered important. In order to contribute to resolving this issue, surveys to general consumers and parents of allergy patients were conducted, and from their results, a system was designed and developed its prototype proposed in this paper.

Keywords: *food purchasing process, food ingredient information, food allergy, food safety, effective navigation*

1. Introduction

Consumer awareness of food safety is seems to be growing frequent, after recent food fraud incidents. For example, peoples' voices emphasizing "awareness of the region of production" or "trying to avoid too many food additives" have often been heard. Food allergy issues seem to be increasingly covered by the media. According to a survey conducted by Tokyo Metropolitan Government, children who have symptoms of any allergy before the age of three comprise 51.5% of respondents, and percentage of food allergy symptoms has increased from 9.4% to 15.6% in the ten years before the time of the survey[1]. According to 16th Joint Meeting on Food Labeling (conducted by the Ministry of Agriculture, Forestry and Fisheries of Japan), only 1.6% answered "yes" to the following question: "Are opportunities of getting information about food allergy enough for you?" And people answering "rather no" or "no" reached more than 70%[2]. As for practical problems of dealing with allergy, about 70% of respondents answered that there is a "lack of information about allergy" and about 40% of respondents answered that it is "time-consuming to shop or cook" [3]. Thus, this situation where there is a lack of information inconveniences people with dietary limitations or their families who have to

purchase or cook food for them. There are various countermeasures for dealing with these issues of food safety or food allergy, but decreasing or controlling food additives or allergenic substances is not the only solution. Enabling the effective and applicable information supplements for food products would contribute to solving the problem of food allergy or food safety described above. Needs of consumers to be considered are not only quality (“quality” here means the required quality for each consumer) of food itself, but also information about food products. And the scope of information supplements should not be limited to information provided on the package. The information must be considered from the perspective of the purchasing process for food products. The same can be said of people who do not have allergy but are conscious about food safety and seek safe food (*e.g.*, food not containing recombinants, artificial coloring, synthetic preservatives, etc.) for their families. As well as the matter of whether products meeting consumer requirements exist or not, information on this fact and where consumers can purchase such products might remedy inconvenience of purchasing for consumers who are conscious about safe food.

In this paper, some results of activities for solving these problems from various angles are described. These activities were conducted in cooperation with the Iizuka class of “Seminar in Information Strategy” (Joho Senryaku Enshu in Japanese) (2006) and Iizuka Project 2007 at Senshu University. A survey was conducted focusing on consumers’ awareness about food safety (including the families of food allergy patients) and the information acquisition process. Based on results of these surveys and interviews, the information system proposed in this paper was designed and a prototype system was developed.

2. Works related to Food Safety

Works related food safety can be roughly classified into certain groups: clarification of information on food ingredient labeling, improvement of food allergy sufferers’ food lifestyle, risk communication regarding transmission of information including that on food additives, supplements of information on food ingredients, etc.

As research clarifying information on food ingredient labeling, research has been conducted to elucidate the effectiveness and safety of health foods [4] as has research on creating an information database of recombinant crops in order to develop a safety assessment technique. There are task analyses for research into improvement of food allergy patients’ food life style, such as works on nutritional guidance for food allergy patients [5] or studies on elimination diets for food allergy patients [6]. Regarding scientific analysis of food safety, there are works analyzing residual agricultural chemicals, and some of these works propose analysis using databases. As for risk communication regarding transmission of information including food additive research, works such as analysis of the relationship between factors (of the accuracy of transmitted information about food additives, degree of disclosure, tendency to cover up) and citizens’ trust in risk managers (message senders) have been undertaken. For example, there is research dealing with food additives and nuclear plants as cases, and the citizens’ trust formation process was the focus of the research [7]. As for research on information supplements of food ingredients, there are works about producers’ information supplements for food products using a radio-frequency identification (RFID) integrated circuit (IC) tag and focusing on

technological edge or quality management [8]. It is necessary to understand a consumer's needs for effective information supplements for food products considered to be required from a social perspective. In order to solve this problem, the authors and collaborative members conducted surveys and developed a prototype system. The surveys were conducted focusing on the consumers' information-seeking process, and from the results of the surveys, a prototype system was developed in order to shape effective navigation to where food meeting their requirements can be bought, using mobile devices, home PCs, and in-store devices. The results are summarized in the following chapters.

3. Consumers' Perception about Information on Food Products

3.1. Overview of surveys

Three surveys were conducted in order to understand how consumers try to acquire information on food products that meet their requirements, from the point of view of the purchasing process. These surveys were conducted from 2006 to 2008.

(1) Survey on awareness of food product information

- Respondents: Ordinary consumers (survey sheets handed out by the assistance of citizens' groups in Kawasaki City)
- Survey period: October – December 2006
- Survey method: Sending and receiving the questionnaire sheet by postal mail
- Number of valid responses: 270

(2) Survey on food allergy

- Respondents: Parents who have young children
- Survey period: February 2008
- Survey method: Hands-on survey sheet to respondents at pediatric services in Kawasaki City
- Number of valid responses: 97

(3) Interview on food allergy

- Interview period: August 2007 –March 2008
- Interview method: Face-to-face interview (interview conducted with parents of food allergy patients through referral from the Parents' Association for Food Allergy Patients)

In addition to the interviews described above, the authors conducted some other interviews to find additional details missing from the results of the survey.

3.2 Survey on awareness of food product information

In this section, extracts from the results of the survey on food product information awareness (number of valid responses: 270) are presented. The respondents were consumers who were given survey sheets through the assistance of citizens' groups in Kawasaki City.

3.2.1 Awareness of safety and price

The answers to questions about “matters of concern in everyday food life (first priority to third priority),” “safety” holds the foremost place (cumulative total for the second and third priority) (Figure 1). This is followed by “nutritional balance,” and “price” was a lower priority than expected. However, there might be a difference according to age, so in order to see whether there is a difference, data were accumulated and are presented as Figure 2. The under-30s seem to be less conscious about safety, which was their third priority, compared to the over-40s, as safety was their first priority. As for gender, males seem to be less conscious about safety compared to females in a similar way (Figure 3). Looking at the respondents who answered “price” as a “matter of concern in everyday food life,” the under-30s seem to be more conscious about safety (first priority) compared to the over-40s (third priority) (cumulative total for the second and third priority) (Figure 4). As for gender, females seem to be less conscious about price compared to males in a similar way (Figure 5). Although the under-30s seem less conscious about safety compared to the over-40s, this finding is relative. From interviews with parents who have young children, “finding reasonably priced food is difficult and trying.” It would bring about a considerable degree of convenience if these constraints could be overcome to some degree by information supplements.

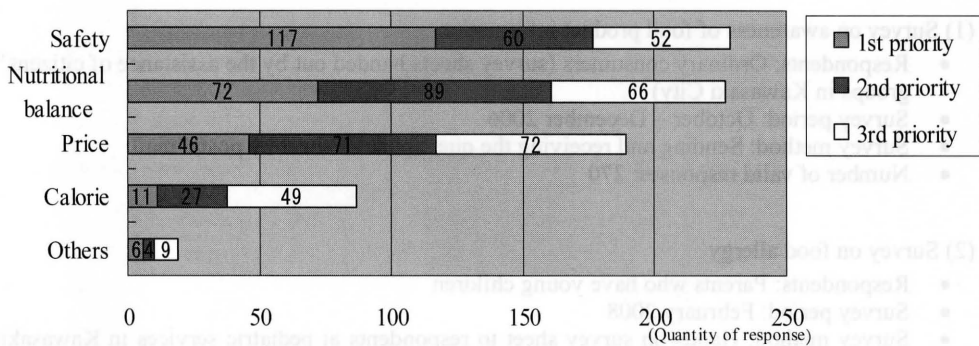


Figure 1: Matters of concerned for everyday food life

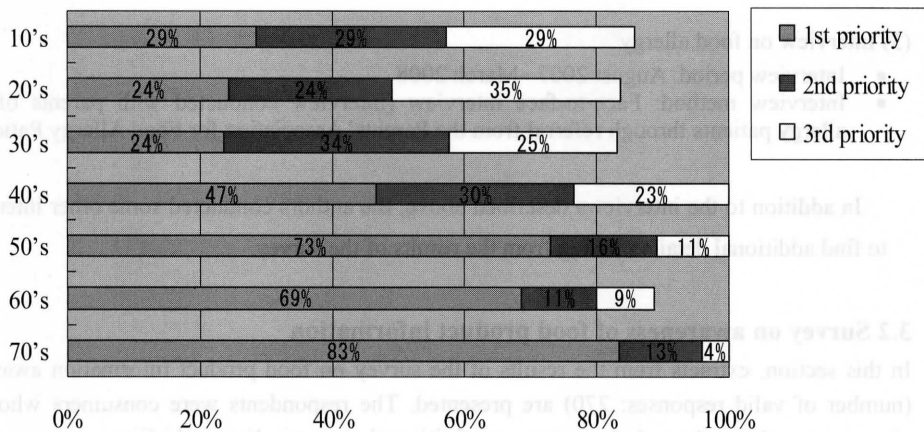


Figure 2: Matters of concerned for everyday food life (count "safety" by age)

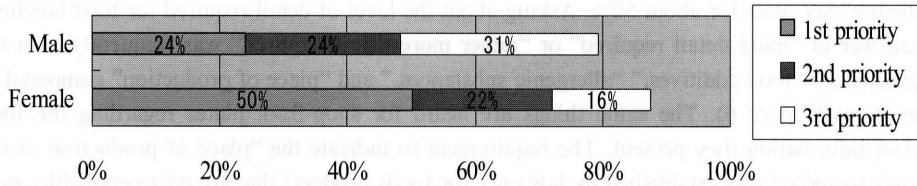


Figure 3: Matters of concerned for everyday food life (count "safety" by gender)

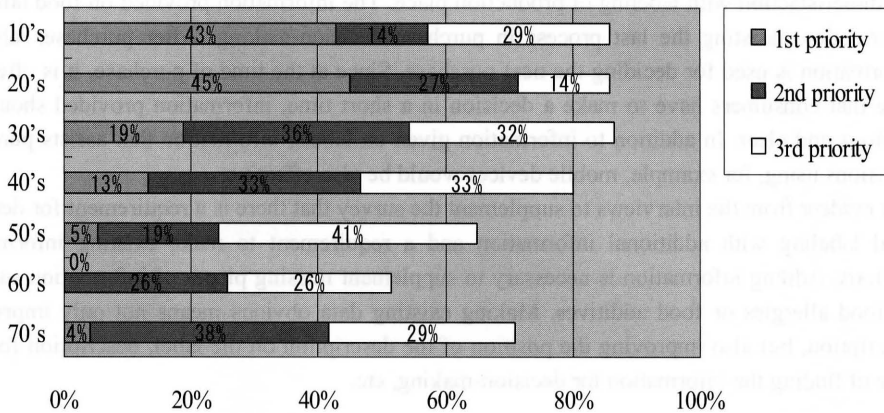


Figure 4: Matters of concerned for everyday food life (count "price" by age)

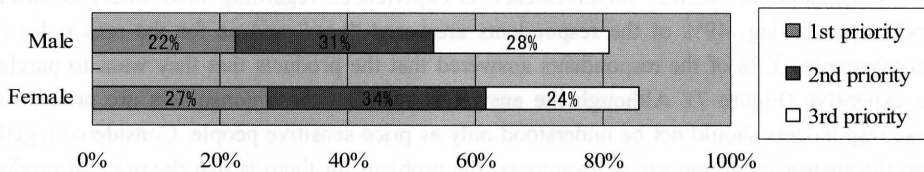


Figure 5: Matters of concerned for everyday food life (count "price" by gender)

3.2.2 Awareness of food labeling

In answer to the question, "How often do you read food labels when you purchase a food product?," 48% of the respondents answered "every time," and 41% the respondents answered "sometimes." About 90% read food labels when purchasing food products. Asking about the degree of satisfaction with labeling detail, about 20% of the respondents who read labels "every time" answered that they were "satisfied" or "rather satisfied," and about half of them answered that they were "rather dissatisfied" or "dissatisfied" ("rather dissatisfied": 41%; "dissatisfied": 8%). Only 14% of the respondents who read labels "sometimes" answered that they were "satisfied" or "rather satisfied," and about 40% of them answered that they were "rather dissatisfied" or "dissatisfied" ("rather dissatisfied": 36%; "dissatisfied": 6%). From this result, it is hard to say that existing food labeling meets consumers' requirements at present. Asking the reason for the dissatisfaction of the respondents who answered that they were "rather dissatisfied" or "dissatisfied," the fact that "the description is not obvious" or "the description is

confusing” accounts for about 50%. Asking about the level of detail required for food labeling, the answer of “more detail required” or “rather more detail required” was frequently seen for “ingredients,” “food additives,” “allergenic substances,” and “place of production” compared to other items (Figure 6). The same things are heard for shop-front plates regarding the food product information they present. The requirement to indicate the “place of production of the primary material” was established by law only for foods products that are near-perishable, such as dry foods, pickled plums, cured meats, and so on [9]. This fact might be one of the reasons for dissatisfaction with labeling of production place. The information provided on food labels is information assisting the last process in purchase decision-making. After purchase, labeling information is used for deciding the next purchase. Since at the time of purchase, it is often the case that consumers have to make a decision in a short time, information provided should be obvious and clear. In addition to information given on labels, information that assists purchase decisions using, for example, mobile devices would be also effective.

It is evident from the interviews to supplement the survey that there is a requirement for detailed food labeling with additional information and a requirement to make existing information obvious. Adding information is necessary to supplement missing pieces of information such as on food allergies or food additives. Making existing data obvious means not only improving description, but also improving the position of the description on the label, description format, ease of finding the information for decision-making, etc.

3.2.3 Awareness when food product shopping

For the question of whether inconvenience is experienced regarding food safety or healthy product purchasing, 49% of the respondents answered “yes,” and as for the reason for this inconvenience, 32% of the respondents answered that the products that they want to purchase are expensive (Figure 7). Although the answer shows that these consumers are price-aware, these respondents should not be understood only as price-sensitive people. Considered together with the answer regarding safety awareness, the problem for them is that the price of products that meet their requirement level is high. If they can select products that meet their requirements effectively (not being of excessive quality) from among various options, it seems possible to solve this problem.

3.3 Survey on awareness of food product information (including the families of food allergy patients)

In the survey for citizens’ groups described in a prior section, the awareness of most of the respondents was rather high, and from the supplementary interviews, quite a few mothers who have young children tend to be conscious about safe food product purchasing, including awareness of food allergy. In order to comprehend the actual state of consumers who have young children including food allergy patients, a survey was conducted. For the survey sheets handed to respondents at the pediatric service in a hospital in Kawasaki City, and the number of responses was 97 in total (parents of allergy patients: 52; other parents of young children: 45).

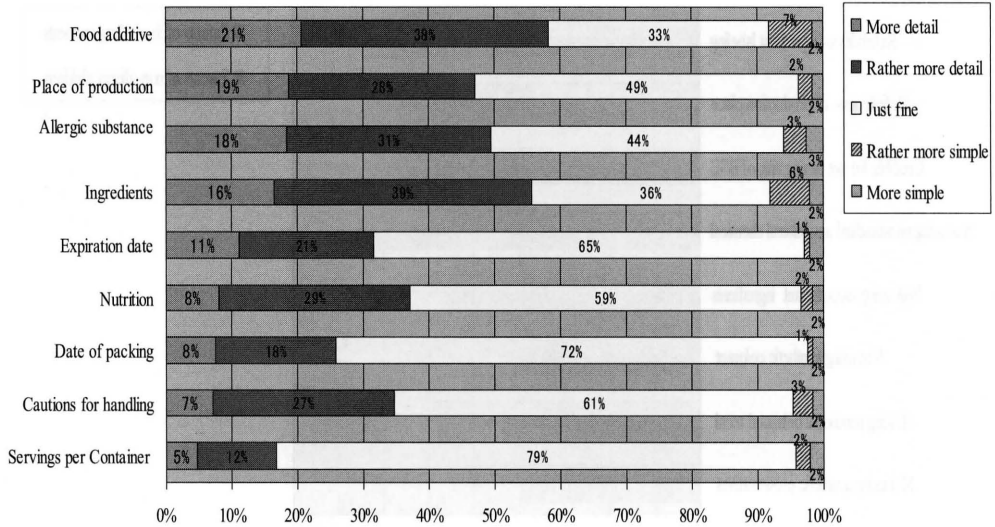


Figure 6: Requirement for detail level for food labeling

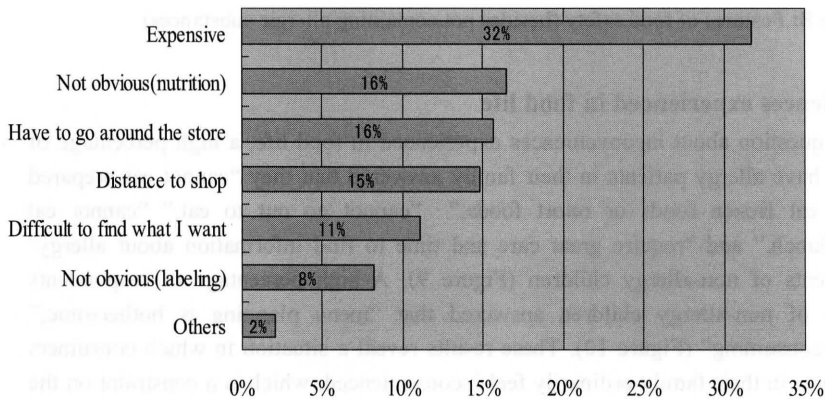


Figure 7: Reasons for feel inexperience for food product purchasing

3.3.1 Awareness about safety

Asking about features of safe food (besides not containing allergenic substances) understood by the respondents, a high percentage of parents of allergy patients answered “yes” for the items “reliability of ingredient labeling,” “not using recombinant ingredients,” “not using synthetic preservatives,” and “not using synthetic colorants.” For items “production place defined,” “not using nonstandard agricultural chemicals,” “believed to carry no risk of BSE,” the percentage of respondents answering “yes” showed no difference between parents of food allergy patients and respondents whose family members are food allergy patients, or percentage of the latter is even a little higher (Figure 8). The latter are more conscious about aspects focused on by the mass media (e.g., food fraud, BSE), while the former are more conscious about food ingredients.

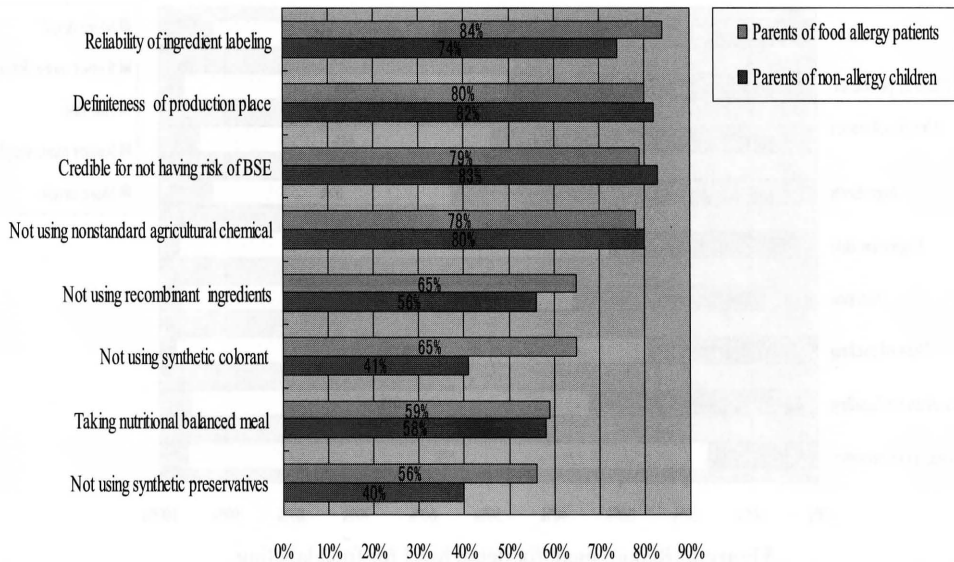


Figure 8: Features of food safety (besides not containing allergic substances)

3.3.2 Inconveniences experienced in food life

In answer to the question about inconveniences experienced in food life, a high percentage of respondents who have allergy patients in their family answered that they “cannot eat prepared meals,” “cannot eat frozen foods or retort foods,” “cannot go out to eat,” “cannot eat school-provided lunch,” and “require great care and time to find information about allergy” compared to parents of non-allergy children (Figure 9). A high percentage of respondents who are parents of non-allergy children answered that “menu planning is bothersome,” “cooking is time-consuming” (Figure 10). These results reveal a situation in which consumers with allergy patients in their family ordinarily feel inconvenienced, which is a constraint on the families of allergy patients.

3.3.3 Sufficiency of information on food allergy

The result of asking about sufficiency of information on food allergies of respondents with patients in their family, for the overall answer items, more than half of the respondents answered that it was “insufficient” or “rather insufficient.” Regarding the reason for the information being insufficient, “information is not obvious” and “it is difficult to find information” both account for about one third (Table 1). For basic information such as that on food allergy or influence, lack of content seems to be the reason for dissatisfaction, as well as daily nutrition aspects such as “menus not using forbidden foods,” “information about the allergy risk of individual food products,” and “information to assist in searching for food products not using forbidden ingredients.” There seems to be dissatisfaction in finding out the information wanted.

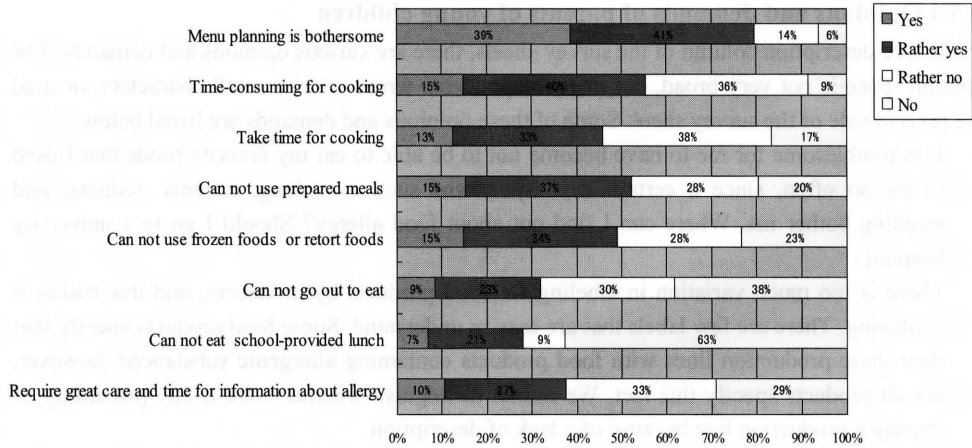


Figure 9: Reasons for feel inexpediency food life (Parents of food allergy patient)

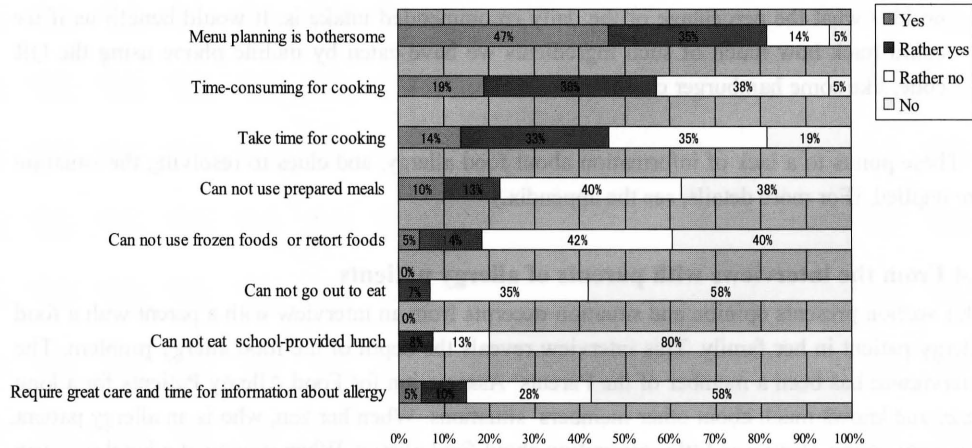


Figure 10: Reasons for feel inexpediency food life (Parents of non-allergy children)

Table 1: Sufficiency of information about food allergy

	Sufficiency of information (%)				The reason for insufficiency (%)				
	Insufficient	Rather insufficient	Rather sufficient	Sufficient	Information do not needed	Information is not obvious	Difficult to find information	Required information not exist	Others
(1) Basic information about allergic substance	19	36	41	0	4	60	28	8	4
(2) Effect on a body about allergic substance	32	21	38	2	7	60	20	12	8
(3) Method for symptomatic improvement of allergy	40	38	15	0	7	36	43	14	7
(4) Menu of not using recusing food	28	26	36	2	8	30	37	18	15
(5) Ingredients information of each food products	27	22	42	2	7	36	24	28	12
(6) Information about risk of allergy sideratioof each food products	35	31	28	2	4	14	47	32	7
(7) Information to assist searching food product not using recusing indegrants	28	26	33	4	9	36	32	28	4

3.3.4 Opinions and demands of parents of young children

In the free description column of the survey sheets, there are various opinions and demands. The column space is not very broad, but many respondents wrote a lot in small characters, or used the reverse side of the survey sheet. Some of these opinions and demands are listed below.

- It is troublesome for me to have become not to be able to eat my favorite foods that I used to eat so often, since a certain day. Symptoms such as itching, eczema, redness, and swelling bother me. Where can I find out about food allergy? Should I go to a university hospital?
- There is too much variation in labeling for food products by producers, and this makes it confusing. There are few labels that are easy to understand. Some food products specify that they share production lines with food products containing allergenic substances; however, not all products specify this fact. We cannot distinguish whether there is any possibility of sharing a production line because of a lack of description.
- We cannot distinguish whether food, either prepared food or food eaten out, contains food additives or not. Salt and sugar contents are not labeled for most food products, and we have no idea what the percentage of the daily recommended intake is. It would benefit us if we could track how much of such ingredients we have eaten by mobile phone using the QR code, like some hamburger chain stores.

These points to a lack of information about food allergy, and clues to resolving the situation are implied. (For more details, see the appendix.)

3.4 From the interviews with parents of allergy patients

This section presents opinion and situation excerpts from an interview with a parent with a food allergy patient in her family. This interview reveals the depth of the food allergy problem. The interviewee has been a member of the Parents' Association for Food Allergy Patients for a long time, and knows much about other members' situations. When her son, who is an allergy patient, was very young, there was little recognition about food allergy. When staying at a hotel on a trip, she had to prepare and bring foodstuffs and cooking equipment such as a rice steamer for meals for the whole day (breakfast, lunch, and dinner) to the hotel. There were very few books about food allergy written in Japanese at that time, so she had to read imported books. Studying hard, she was able to find detailed facts about food allergy such as the fact that different foods contain the same allergens and that these foods are therefore forbidden to allergy patients. For example, apples and peaches both belong to the rose family, so patients who are allergic to apples will also be allergic to peaches. She said that the most risky situation is a sudden change in the ingredients of a food product without any announcement. In this situation, a patient who used to eat a product because it used to be safe for him or her now accidentally ingests it. The interviewee already has experience and knowledge about food allergy, but she said that a system of navigating towards and assistance in buying safer food is required for young parents who have children who are food allergy patients.

From this interview, the interviewers strongly reaffirm the need for information about food allergy such as basic information on food, detailed and exact information on food products (including ingredient changes), and assistance when eating out.

3.5 Consumer needs for information supplements for food products and the requirement for a system

The needs of consumers understood from the two surveys and several interviews with consumers are listed below.

Shopping

- In acquiring information, both the time before buying and at the time of buying are important. Consumers want to know how to reach products that meet their requirements (information before buying), and want to remove the burden of searching around for products that meet their requirements in the store (information at the time of purchasing)
- As for the level of detail of the information, existing food labeling information is not enough (e.g., the ingredients of individual foods in a packaged set are provided together) especially for consumers who have allergy patients in their family.

Eating out at restaurants, etc.

- In acquiring information, both the time before and at the time of eating out are important. Consumers want to know how to find restaurants that meet their requirements (information before eating out), and want to remove the burden of asking which menu items are edible for them. Especially for food allergy patients, this is a critical matter because they have to avoid eating foods forbidden them at all times.
- Though some restaurants have different versions of the menu for allergy patients, there very few and inconvenient to use. allergenic foodstuffs on the menus at restaurant is favorable to become more obvious and easy to grasp for each consumers who need them.

In addition to these requirements, considering the budgets of families with small children, offering price information for decision-making (on food products that meet consumers' requirements extracted from the survey) is a requirement.

4. Approach toward creating an information supplement system for food products

As seen in prior chapters, consumers conscious about food safety want their inconveniences to be remedied. In this chapter, the concept and developed prototype of a system for assisting effective information supplements for food products are described. The prototype system was developed as a work of the Iizuka Project 2007 at Senshu University. The first version of this system was named "Shoku ("食" in Japanese characters) ping." [10] *Shoku* means "food" in Japanese, and *ping* means active SONAR (sound navigation and ranging), which navigates submarines by sound waves, and using this equipment, submarines can acquire necessary information (whether they can go forward safely or not) according to whether reflections (echoes) of the pulses come back or not. The system also aims to respond and give information on food regarding whether one can or wants to eat it or not. And shoku-ping (食 ping) is a pun on a word "shopping," and enhancement of this system is ongoing by voluntary members.

Table 2: Situation of food searching and requirements of the system

Situation		Required feature
Shopping (Stores)	At home	Searching products that meet requirement, and get information about where to buy (including inventory situation)
	Entrance and inside the store	Searching products that meet requirement, and get information about inventory situation
	Inside the store (display shelf)	Search food integrant at the shelf.
Eating out (Restaurants, cafeterias, etc.)	At home	Searching menu that meet requirement, and get information about where to eat. Store searching, Menu searching
	At the restaurant	Probing food integrants in the menu.

4.1 Situation and requirements of the system

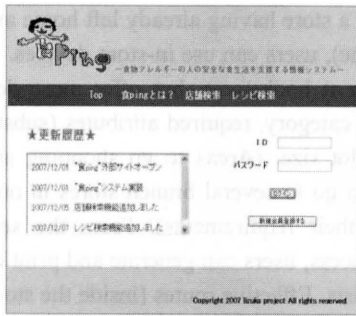
The situation when the information of food are needed, and requirement for system are described in Table2. Situations are categorized according to the target scene (shopping or eating out) and use scene (at home or outside home).

4.2 Major features of the proposed system

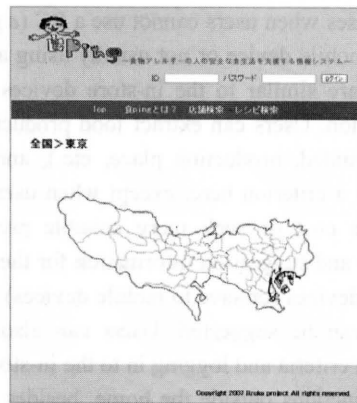
The major features of the system that the authors are proposing are described in this section. The major function of this system is categorized according to the target scene (shopping or eating out) and use scene (at home or outside home). Up-to-date information about food safety standards or food product information is shown on the screen as “What’s New” for any scene (Figure11). Functions according to individual scenes are described below.

Functions for shopping

Functions for shopping used at home aim to avoid the situation of going to the store but being unable to find a wanted product by searching for products before going shopping, and aim to navigate one to stores where one can buy the products one wants in the comfort of one’s own home. By entry items such as category, required attributes (substances to be avoided, production place, etc.), required lot size, and areas where one can shop, extracted data are displayed as a list. From the list, users can select food products from alternatives that satisfy their safety requirements. Users can select products by price, store (in case the same or similar products are sold by several stores), or specification details. The selection condition can be set up by user preferences such as “minimizing the number of stores to visit” or “minimizing the amount of money spent on total products bought within a selected area.” Such flexibility will contribute to solving the problem of people who want to buy safe foods but are concerned about the price of products. Effective routes (inside the store or store to store) for buying can be suggested. This information obviates the need to go around several stores. From the selected products and suggested information for the buying process, users can generate and print out (or save to a mobile device) shopping lists. This shortcut route may be seen as depriving stores of the opportunity of their customers finding new products haphazardly, so in order to compensate for this lost opportunity, users can look around the recommended product selection on the web. Products are extracted using the personal information registered by users. Users can reduce the selection process by registering their selection criteria and logging in.



1. Login and What's new
(possible to skip login here)



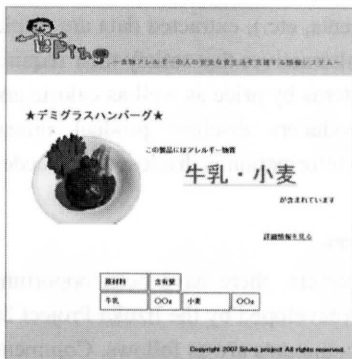
2. Select area



3. Select menu



4. Selected menu (for information that meets personal choice criterion, login is required here)



5. Ingredients information



6. Detailed ingredients information

Figure 11: Shoku(食)-ping screen (Original version)

In the cases when users cannot use a PC (*e.g.*, entering a store having already left home and not having mobile device or not usually using a PC at home), users can use in-store devices. These devices are similar to the in-store devices often seen at bookstores, but offer more detailed information. Users can extract food products by entry category, required attributes (substances to be avoided, production place, etc.), and required lot size. (Areas to go shopping are not basically a criterion here, except when users choose to go to several branch stores in order to minimize cost or seek more suitable products for their requirements). From the selected products and suggestion information for the buying process, users can generate and print out by in-store devices (or save to mobile devices) shopping lists. Effective routes (inside the store) for buying can be suggested. Users can also reduce the selection process by registering their selection criteria and logging in to the in-store devices.

For functions outside the home, besides in-store devices, mobile devices (phones and PCs) are to be used. Mobile devices, besides having the functions described above, have the function to show detailed information on individual food products (each component of packaged food products). However, since not all producers disclose product information, marking the shelves where such detailed information is disclosed is needed.

Functions for eating out

Functions for eating out used at home aim to avoid the situation of going to a restaurant and being unable to find suitable menu items by looking for products before going to the restaurant, and aim to navigate one to restaurants or cafeterias where suitable foods can be eaten. By entry items such as category (Japanese, Chinese, Italian, etc.), required attributes (substances to be avoided, number of seats, etc.), and areas to eat out, extracted data are displayed as a list. These functions are considered to be useful not only for daily life but also for looking for restaurants at travel destinations visited for the first time.

For functions outside the home, mobile devices (phones and PCs) are to be used. Using mobile devices, besides the functions described above, there is the function to show detailed information about each food listed on a menu, and the function to assist in choosing menu items. By entry items such as menu category (starter, main dish, dessert, etc.) and required attributes (substances to be avoided, production place of ingredients, etc.), extracted data are displayed as a list. From the list, users can select menu items from alternatives that satisfy their requirements. From the list of search results, users can select menu items by price as well as calorie and other nutrition information. However, since not all producers disclose product information, considerations such as marking shelves where detailed information is disclosed are needed.

4.3 Comments on the system from potential users

Though enhancement of this system is ongoing at present, there have been opportunities to receive reviews and comments on the original version (developed by the Iizuka Project 2007) of this system from potential users. Excerpts from these comments are as follows. Comments from food allergy patients or their family are, for example, as follows: "It is helpful to us in easing the burden of looking around for the products we want," "I think the function of navigating to stores or restaurants is good; I wish stores or restaurants bringing in this system would spread," and "I wish this system would be put into practice because I am willing to use it." (This comment is

from an allergy patient who is the son of an interviewee who is a member of the Parents' Association for Food Allergy Patients described in a former chapter). These comments seem to show the need for an effective information system. On the other hand, there are comments about requests for new functions: "Since there are so many things that I do not yet understand about food allergy, it would be helpful to show how to acquire important information." Comments from attendees of the project exhibition were as follows: "I think the way of showing information is good, but how to cooperate with stores is challenging," "It is nice to use both at home and outside home," and "It will become more useful if personal profile data can be managed." In the enhanced system, the profile data control function and operation support function will be updated; however, some considerations need to be taken in account such as the fact that entry items are not strictly confinable and have flexibility.

The business planning section staff of food retail stores also commented on this system, which comments are summarized as follows: Retail stores are trying to give consumers useful and required information, and since food safety is an important issue to them, using this kind of system in the future is reasonable for them. However, even if retail stores are willing to use a system such as that proposed in this paper, it will not work if producers do not disclose detailed information. So starting from private brands in the food chain stores might be reasonable.

5. Conclusion

In this paper, the analysis results of consumer needs for food information supplements considering food safety and food allergy have been described in order to respond to heightened awareness of these issues from the point of view of information supplements. The concept and prototype of the system are accepted by many consumers including allergy patients and their families.

The significance of the activities described in this paper are follows: Firstly, trying to clarify the needs of consumers regarding food safety and food allergy from the point of view of the buying process started from seeking products, and a system has been designed and a prototype of it developed. In addition, this activity has been undertaken in cooperation with several class works, and it has therefore contributed to project-based learning (PBL). Comments of the students who participated in these activities are as follows: "I realized that it was interesting and meaningful to find problems to be solved from the analysis of the survey that we conducted," and "Thinking about to how to solve this problem was challenging and valuable" [11].

As future work, besides transmitting information on analysis results and the proposed system in this paper to organizations involved in food safety or food allergy, we plan to enhance the system. And from PBL aspects, continuing to implement practical activities are considered be important, in the sense of putting into practice what students has learned, and making social contributions.

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Appendix

(From the free description in the survey on the survey on food allergy)

- It is troublesome for me to have become not to be able to eat my favorite foods that I used to eat so often, since a certain day. Symptoms such as itching, eczema, redness, and swelling bother me. Where can I find out about food allergy? Should I go to a university hospital?
- I would like to get information on what kind of food is good for me to eat.
- I feel it is very inconvenient to read labels when I am going to buy food products at stores. The characters are too small and are not easy to read. Description of assorted food products sold in one package such as oden is written altogether (*e.g.*, ingredients, etc.). I have to call food producers regarding which products (tsumire, hanpen, chikuwa, etc.) contain eggs by phone each time. I hope indication of allergenic foodstuffs on the menus at restaurant will become more obvious and easy to grasp (though some restaurants have different versions of the menu for allergy patients). Since I am now breast-feeding, I have to be careful about my own food, but I am surprised that there are so many foods that contain allergenic substances. And I hope that easy-to-cook snacks or sweets (*e.g.*, pancake mix not using eggs) will be more readily accessible. In order to get the food I want, I have to search around for food ingredients and recipes, and it is difficult for me because I am not a full-time housewife and do not have enough time. Additives sometimes used in the production process are not written on food labels, so it is difficult to take control through information on labels.
- Information about emergency treatment when someone in the family suddenly has severe allergic symptoms is required, if possible.
- I hope there are menu items for food allergy patients in school-provided lunches. I think that drinks for school lunches should not be limited to milk. Carry-in Japanese tea in a water flask should be permitted.
- There is too much variation in labeling for food products by producers, and this makes it confusing. There are few labels that are easy to understand. Some food products specify that they share production lines with food products containing allergenic substances; however, not all products specify this fact. We cannot distinguish whether there is any possibility of sharing a production line because of a lack of description.
- We cannot distinguish whether a food, either prepared food or food eaten out, contains food additives or not. Salt and sugar contents are not labeled for most food products, and we have no idea what the percentage of the daily recommended intake is. It would benefit us if we could track how much of such ingredients we have eaten by mobile phone using the QR code, like some hamburger chain stores.
- I wish there were some website pages that contain easily understandable information about food allergy.
- Though I order foods with allergenic substances removed from catalogs of such food items, there are only few items available, and they are too expensive to use every day. I wish I could get this kind of food more easily and at a reasonable price.

- Since I have to be careful about allergenic substances all the time, it would be beneficial to me if there were shops or corners where I could buy food products without worrying too much about allergenic substances.
- I think the safety of most food products has deteriorated recently. I wonder how we can enjoy our meals without anxiety about food safety.
- I would like food label descriptions and displays at stores to be more detailed and with consideration given to allergy sufferers.
- There are few people in our generation. I guess satiation or other environmental issues are causing the recent food allergy situation.
- There is no one who is a food allergy patient in my family, but I think information about dealing with allergy is insufficient.