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## CONSUMERS' UNDERSTANDING AND AWARENESS OF FOOD IRRADIATION IN UITM PENANG

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### Abstract

It has been remarked that food irradiation is an emerging technology with many advantages to consumers. Among the benefits of food irradiation include the destruction of insects, fungi and bacteria that cause food to spoil and causes food borne illnesses in humans. However, there appears to be a lacking in widespread public awareness and understanding of food radiation for human consumption. Therefore, this study is attempting to investigate consumer awareness, attitude, trust and understanding toward food irradiation. A total of 237 respondents participated in the study via self-administered questionnaires. Findings revealed that consumers' level of awareness towards food irradiation was surprisingly high. On the other hand, level of positive attitude and trust towards irradiated food were accepted. The findings of this study could contribute to the body of knowledge regarding the awareness, knowledge, attitude and trust towards food irradiation among consumers. In addition, it provides information and suggestions for the authorities in governing and imposing rules and regulations on food and beverage operators and handlers in Malaysia.

**Keywords:** *food irradiation, awareness, understanding, consumers.*

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### Introduction

Food irradiation is legalized in over 60 countries, with about 500,000 metric tons of foodstuff annually processed globally. This technology is no longer new and has been used widely, but had not receive greater awareness among foodservice operators, consumers and suppliers. This technology has been employed in the medical industry for years, and beginning to gain traction in the food industry. The irradiation process has been practiced widely globally, especially in culinary and gastronomy field because food and health organizations found this method to be a foolproof and harmless way to rid food source of disease-causing bacteria, parasites and fungi, thus can prolonging the shelf-life of some perishable food product such as strawberries and potatoes (Buzby et. al, 1997). EFSA (2011) has listed a few food and products to contain food irradiation components such as shellfish, particularly oysters, raspberries and strawberries, red meat, poultry, ham, herbs, spices and vegetables. Meanwhile, examples of food and products in Malaysia which contain food irradiation components include herbs, spices, tea, grains and frozen food as cited by Datuk Dr Muhammad Lebai Juri (2014).

Food irradiation is the procedure of exposing food to ionizing radiation in order to destroy microorganisms, bacteria, viruses or insects that might be present in the food (Bradish. 2008). Buzby (1999) stated, in the United States, food irradiation has been approved as a method to

control and avoid insects in food, enabling the shelf-life of the fresh fruit and vegetables to be extended. Moreover, food irradiation also minimizes food borne pathogen in poultry. In relation to the above, the procedure begins with exposing foodstuff to a source of energy capable of stripping electrons from individual atoms. This treatment is applied to preserve food, decrease the risk of food borne illness, inhibit the spread of invasive pest and delay or eliminate sprouting or ripening. The irradiation can be transmitted from a radioactive substance or generated electrically. However, irradiated food does not become radioactive and can be used to decrease the pathogens in foods.

Food irradiation has been permitted by the FDA for over 50 years, but the only major development area for the commercial sale of irradiated foods for human consumption allowed are vegetables and fruit that are irradiated to kill insects for the idea of quarantine. In the early of 2000s in the US, irradiated meat was ordinary at some grocery stores, but because of lack of consumer demand, it is no longer common. There is only limited amounts of irradiated food that have been sold in the United States (Brackett, 2009). Some regular concerns about food irradiation include the effect of food irradiation on food chemistry, as well as the indirect effects of irradiation becoming a general food handling procedure. In addition, consumers were apprehensive about the safety and the nutritional value of the food that has been irradiated because there was confusion in that food irradiation could become radioactive. Other than that, it was said food irradiation may cause vitamin losses.

Even though researches were done to prove that food that has been irradiated is safe to consume, there were still some criticism due to the misperception. Chen and Chern (2002) stated consumers acceptance of food irradiation are still influenced by attitudinal factors, such as risk perception and opinion on food irradiation labelling, the difference between non-irradiated and irradiated food, and the potential advantages of irradiated food. Although the technology has been thoroughly studied and well documented, its implementation is slow in Malaysia and minimized. Furthermore, minimal research had been done in Malaysia, in the discussion of responsible parties in the food manufacturing that perform such procedures and the issue of labelling regulations being imposed on the food packaging in the market. Thus, it raises the question whether consumers are actually aware of the food processes and the benefits or the risk it possess. At the same time, it is also beneficial to know the consumers personal perceptions and sentiments in relation to this issue.

## **Literature Review**

### **Food Irradiation**

Food irradiation is a technique under which foods; either packaged or in bulk, are exposed to ionize radiation from high energy gamma rays emitted from radioactive materials (Marcotte. M, 1989). Basically, Ronald and Bruhn (2012) emphasized that food irradiation is the treatment of foods by exposing them to a controlled amount of ionizing energy for a amount of time to reach certain technical objectives. Food is irradiated in a special processing facility where it is exposed to x-rays, gamma rays or electron beams. The food is closely examined to ensure that the exact dosage or treatment level is reached. The objective of each process is to kill or reduce the breeding capacity of an undesirable living organism or to affect the product morphology in a useful way that will prolong shelf life. Datuk Dr Muhamad Lebai Juri (2014), the Malaysian Nuclear Agency (MNA) said that the best alternative method to increase food quality and safety is by using food irradiation process which apply nuclear technology. Besides, the process that implicated the process of exposing finished food products to a specific amount of gamma radiation could kill harmful bacteria and keep food especially fruits and raw product from spoiling.

### Awareness and Knowledge

Objective knowledge is recognized as real knowledge that consumers are concerned with food irradiation as different to subjective knowledge, which is defined as what the consumer think they experience about food irradiation (Costa-Font 2008). A clear understanding of the outcome of irradiation on food quality and safety, as well as on the environment and on people will increase consumer insight and acceptance. Making consumer aware that scientists and health groups endorse the safety of irradiated products further enhances trust. Some of the consumers have little knowledge or no knowledge about food irradiation, they may be misled by inaccurate or incomplete information received from a special interest organization. Some studies find that information provision about food irradiation will have an impact on consumer insight (Gunes and Tekin, 2006). However, just as positive information may increase insight among consumers, negative information may decrease insight by the consumers (Lyndhurst, 2009).

### Attitude and Trust

The lower level of knowledge has been insisted as reason of negative attitudes towards food irradiation. A study was conducted in the surrounding suburban and rural area of Kansas City, Missouri to survey consumers' acceptance of irradiated food. The study indicated that consumers accepted the concept of irradiation after they were provided with additional information about the irradiation process. Malone. Jr, (1990) also said that the attitude in consumer was changed after they were afforded the chance to read about and discuss food irradiation. In addition, he also stated that half of the consumer had heard of irradiation, but few were aware that the process was FDA approved. Moreover, Malone. Jr, (1990) noted that the success of irradiated food product in the marketplace depends upon the acceptability of consumers and marketing firms. The consumer will purchase such products if they are convinced and trust their safety and wholesomeness, have a pleasing appearance, and are competitively priced. Food firms will market irradiated food products when they are convinced that the image of their existing product line will not be compromised by the introduction of products that may be unacceptable to many consumers.

### Methodology

A descriptive research design using a quantitative approach was applied to a self-administered questionnaire where the empirical investigation was employed to investigate consumer's perception and their awareness as well as their trust regarding food irradiation. The survey was distributed at UiTM Penang campus among the students and staff as the respondents. The survey was conducted at the main university's hall, "Laman Perdana", a food court at one of the colleges, "Kolej Baiduri", UiTM Penang Library and at "Jamal", a cafeteria. It was approximated that only 15-20 questionnaires could possibly be gathered in a day. With that, the convenience sampling technique is carried out in the data collection process.

The survey instrument comprised of three major parts. Part A contained four questions using nominal scales and focused on respondent's demographic profiles. Items in Part B were used in measuring respondent's awareness and understanding towards food irradiation. Dichotomous scales were employed in this part to derive yes or no response. Nine items were used in Part C in measuring consumer's attitude and trust towards food irradiation. In this segment, the respondents are needed to indicate their level of agreement of Five-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). Despite most questions being adapted from previous literature and self-construct to suit the study objectives, a pilot study was also initially conducted in a sample of 50 respondents from UiTM Penang to verify

and confirm the reliability and validity of the items used. All comments and suggestions were noted and given deliberation in the final draft of the survey instrument. From a total of 338 questionnaires collected in a period of two weeks, only 276 were able to be composed and found beneficial for data analyses. The reliability test was undertaken for Part B and Part C separately. The result indicated that the instrument and items used were reliable with a coefficient alpha value at 0.888 for Part B and 0.885 for Part C.

### Analysis and Results

#### Respondent's Profile

From 276 of the total respondents, 67.8% (n=187) were female against 32.2% (n=89) male. It can be highlighted that female respondent percentage is higher compared to male respondents due to their willingness to give cooperation. 70.7% (n=195) were in the range 19-29 years old, 19.9% (n=55) from 30-40 years old while 7.6% (n=21) ranging from 41-50 years old and 1.8% (n=5) were above 51-60 years old. Regarding marital status, majority of respondents were single 55.8% (n=154) and 44.2% (n=122) were married. In term of education background, almost 54.7% (n=151) of the respondents were Bachelor Degree students followed by 23.2% (n=64) Diploma students, 8.3% (n=23) Master's Degree holder, 6.9% (n=19) SPM holder, 4.7% (n=13) Certificate holder and 2.2% (n=6) were Phd holder.

#### Awareness and Knowledge of Food Irradiation

Eight close ended questions were explored to prompt respondents' awareness and knowledge of food irradiation. The magnitude of the percentage of all items were demonstrated in Table 1. Referring to question one, the majority of respondents, 36.2% (n=100) answering "yes" as they aware about food irradiation in the market compared to 31.9% (n=88) who said "no" and have mixed feeling. Counting at the responses, respondents believed food irradiation helps in preserving foods 37.3%. Likewise, only 13.8% (n=38) claimed they often buy irradiated food at the hypermarket while 58.3% of respondents were having mixed feeling. The majority of respondents believed they have not heard of food irradiation, amounting to 41.7% (n=115). In addition, respondents were not aware about the method or process of irradiation food 61.6% (n=170). 44.6% (n=123) of them, were not sure and know that irradiation had also been utilized for non-food production. On the other hand, they believed and were aware that irradiated food require special labelling (47.1%, n=130) while 33.0% (n=91) respondents were not aware and noticed food irradiation was approved by the government.

Table 1. Awareness and Knowledge of Food Irradiation

No	Items	n	%
1	I am aware about the food irradiation.		
	Yes	100	36.2
	Mix feeling	88	31.9
	No	88	31.9
2	I know food irradiation helps in preserving foods.		
	Yes	103	37.3
	Mix feeling	88	31.9
	No	85	30.8
3	I often buy irradiated food at the hypermarket.		
	Yes	38	13.8
	Mix feeling	161	58.3
	No	77	27.9

4	I have heard about food irradiation.		
	Yes	105	38.0
	Mix feeling	56	20.3
5	I know the method/process of food irradiation.		
	Yes	39	14.1
	Mix feeling	67	24.3
6	I know irradiation has also been utilized for non-food production.		
	Yes	45	16.3
	Mix feeling	123	44.6
7	I believe irradiated foods require special labelling.		
	Yes	130	47.1
	Mix feeling	109	39.5
8	I am aware food irradiation approved by the government.		
	Yes	48	17.4
	Mix feeling	137	49.6
	No	91	33.0

N=276

#### Consumer's Attitude and Trust towards Food Irradiation

Looking at the consumer's attitude and trust towards food irradiation descriptive statistics (Table 2), it is revealed that the majority of respondents believed irradiation process will destroy bacteria easily ( $M=3.10$ ). Respondents also expressed eating irradiated food do not present a long term health risk and slightly agreed ( $M=2.98$ ). Similar notion was given to the eating irradiated food does not cause genetic damage ( $M=2.94$ ) and irradiation process does not make food radioactive ( $M=2.93$ ). Consumer's felt that irradiated food is safe to consume and they believed that irradiated food do not create some unique chemical changes in the food ( $M=2.92$ ). In addition, consumer's reported that they are willing to buy or purchase irradiated food ( $M=2.88$ ), believed irradiation does not damage food and did not ruin their flavor, odor and texture ( $M=2.82$ ) were slightly agreed. Same thing goes to the packaging of irradiated food that must be labelled with the words "treated with radiation" or "treated by irradiation" ( $M=2.23$ ).

Table 2. Mean Score of Consumer's Attitude and Trust towards Food Irradiation

No	Items	M	SD
1	I am willing to buy/purchase irradiated food.	2.88	.928
2	I believed eating irradiated food does not present a long-term health risk.	2.98	.817
3	Irradiated food is safe to consume.	2.92	.768
4	The irradiation process does not make food radioactive.	2.93	.629
5	Irradiation does not create any unique chemical changes in the food.	2.92	.603
6	Eating irradiated food does not cause genetic damage.	2.94	.612

7	Irradiation process will destroy bacteria easily.	3.10	.798
8	The packaging of irradiated food must be labelled with the words “treated with radiation” or “treated by irradiation.”	2.23	.821
9	Irradiation does not damage foods and did not run their flavor, odor and texture.	2.82	.670

N=276

### Discussion

This study empirically investigates the understanding and awareness of consumer's towards food irradiation. In regards to consumers' awareness and knowledge, the findings clearly revealed that Malaysian consumers, especially in UiTM Penang agreed that they are aware about food irradiation although they were not knowledgeable of the method or process of food irradiation. In addition, respondents also agreed that irradiated food requires special labelling to increase their awareness and knowledge about food irradiation. This finding was supported by Bensky (2001) who mentioned that labels must bear a statement such as “treated with radiation” or “treated by irradiation”. On the other hand, Robson and Payne (1988) mentioned that there is no scientific or public health reasons for the labelling of irradiated foods. Essentially, consumers insist that labelling of irradiated foods must be included so that they can make informed decisions and make their own choices between irradiated and non-irradiated foods.

Besides, positive information may increase insight among consumers while negative information may decrease the consumer insight (Lyndhurst, 2009). It will cause consumers to perceive risk and less acceptance of food irradiation products. High degree of knowledge about food irradiation also cause positive behavior which consumers are willing to buy or purchase this food products because they know it will not be harmful to consume. Some believe consumers would reject irradiated foods, but the market study indicates that when provided with basic information about the process, they absolutely would choose irradiated foods if industry provides a safety benefit (Fox J, 2002). Consumers demand more information from trustworthy resources about the process of food irradiation. Some additional information or advices especially from medical professionals, pharmacies and food scientists would enable consumers to reach informed and healthful dietary choices. The consumer needs to be informed and educated. Information about food irradiation would not reduce consumer concern, but it allows choices to be based on fact, rather than mistrust and confusion (Inoue, 2000). Therefore, food retailers should impose a publicity campaign to bring the food irradiation among consumers so that they will take in a further understanding and knowledge about food irradiation. In order to promote food irradiation, food retailers should emphasize the impact of food irradiation on safety, taste and nutritional value in their advertising efforts (Spaulding et.al, 2006) because the more consumers know the information given, the more likely they are accepting in purchasing it.

In summation, there are many researchers that have demonstrated the significant relationship between consumers' attitude and perception towards food irradiation (Malone, Jr, (1990). In recounting to the consumers' awareness and knowledge, most of the consumers are aware about the food irradiation and looking from the consumers' attitude, they also believe that irradiation will destroy bacteria easily. Even though they did not recognize the method or process of food irradiation, they hope and believed food irradiation does not present a long-term health risk. This is in line with the study by Malone. Jr, (1990) who expressed the

success of irradiated food product is depending on consumer acceptability. Consumers would not be receptive of any product if they did not believe in it. Consumer will purchase a product if they are convinced and trust safety and wholesomeness of, while considering the pleasing appearance it may have. Hence, it is recommended that food retailers play a vital role in distributing the information close to food irradiation so the young generation will experience a better perception towards food irradiation. Other than that, all level of society and higher associations are required to put some effort in order to change the skeptical minds of consumers about food irradiation.

### **Conclusion**

In this study, knowledge plays a critical part in evolving the consumer's attitude and trust towards food irradiation. Level of knowledge and understanding of the consumers will influence their insight towards risk and benefits of food irradiation. This study revealed majority of consumers have learned and understand about food irradiation, but they know little about it. The outcomes of this study will help consumer's understanding and awareness about food irradiation change and believe the irradiated foods also a good choice to have in everyday healthy lifestyle. Nevertheless, this study has a limitation that needs to be addressed. The data collection process is limited at UiTM Penang campus only as relative location; thus, the result could not be comprehensible to all consumers in Malaysia. In addition to this, the results of data collection might be different if the study was conducted in other places or country due to the cultural influences towards food irradiation. It is advisable to include all the consumers within Malaysia (including Sabah and Sarawak) for future research. This allowed future researchers to gain greater responses as well as wider perspectives. On the other hand, the further analysis or depth analysis for example the relationships between the variables should be done to gain depth analysis result. Finally, the conclusions of this study add to the body of evidence concerning consumer's acceptance and perception of food irradiation in Malaysia.

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