

A Study on Awareness and Acceptance of the Public about Irradiated Food

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(Received : May. 14, 2016 Revised : Jun. 17, 2016, Accepted : Jun. 21, 2016)

Abstract : Use of radiation field appears to be about 52.0% of the highest part of the public to be leading authority in the future, as a target for the attention of high school students in irradiated food and Thus it can be seen in the country, the high school students surveyed close to the awareness of food irradiation was analyzed by conducting survey that students lack knowledge of the students about the radiation of interest is plentiful compared to interest. Also showed that 81.3% of all students, without knowing the difference between the sexes for the certification mark of irradiated food and food irradiation. Why students think positively irradiated food is as high as 37.3% showed the best pest removal, 38.9% was the highest of human harm is reason to think negatively of students irradiated foods. Opportunities and access to irradiated food and I think most students feel the need for men and women, and the lack of education for the students of irradiated food. Conclusions that we can continue to lead in the direction of the positive awareness of food irradiation to promote education for students with a TV and a TV 50.9% was the highest because of the "what do you want to receive training?". Most students also have opinions about the use of food irradiation as a school meal is enhanced by the use of food irradiation as a sanitary and 50.0% higher, while the students are still afraid of the research process, pollutant contamination, irradiation process it was found that the negative part, such as the high distrust. Students were positive in the investigation of the doctor or buy food students aware than before if you get proven in proving the stability of food to the most trusted institution or organization for irradiated food. It is preferable that the program on the awareness and improve knowledge and attitudes about the need to improve reliability by providing strategic social acceptance for nuclear and radiation used in the country.

Keyword : Radiation, irradiated food, school lunch, awareness, interest, knowledge

1. Introduction

1895 W. C. Roentgen studies using X-ray radiation since discovered this is a rapidly evolving and have been generally used in several fields such as industry and our lives. Particularly in the area of medical use is very conspicuous in addition, the use of medicine and radiation medicine, been used in various fields, such as agriculture, industry, and dating. However, as technology becomes useful development potential and risks of such accidents has existed. 2011 Fukushima

nuclear accident in Japan has rapidly increased interest in nuclear power, radiation to the public. Science and Technology has existed throughout human history have been and danger The problem with rising public concern, but recently who are taking on added importance.¹⁴ However, because nuclear power is technically difficult to access public information is greater fear comes from ignorant when viewed from the point that the public can judge the safety [5]. But through the development of media information, including nuclear power is increasing and the public's interest to the supply of irradiated food, nuclear parts scandal, Kori Nuclear Power Plant, increased interest in radioactive contamination of food, too. On the other hand, one of the things that most concern due to the Fukushima nuclear accident can have on our long-term adverse effects to human health, with the destruction of nature due to radiation leaks. The

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radioactive material released by the nuclear accident, as well as to absorb radionuclides in the soil by crops contaminate crops, soil and ultimately makes the body produce radioactive contaminated food [6]. Irradiated food is how to deal with ionizing radiation to improve the shelf life and quality of food through sterilization, insecticide, germination inhibition, maturity adjustment, such as by exposing the radiation energy over a period of time the food but the public are confused with radioactive contaminated food It is produced. This has been highlighted as an effective method of food preservation technology, secure distribution of food and in sanitary[7]. Rules on irradiated foods are allowed irradiation current, all of the world apply to the 230 licensed products in over 50 countries and, in the case of Korea, for potatoes, onions, garlic, miso and red pepper paste, dried vegetables, etc. 26 Food and there[8-11]. Irradiation sources, studies of our country, according to increase the use of irradiated foods that even though knowledge of the all most often little or even heard of many. In addition, that irradiated foods on its advantage rather than be reminded showed that the negative image of such radioactive contamination and GMO, fear or anxiety about radioactive first[12 13]. 2004 Food irradiation is allowed propelled expanding the scope of practice collapsed hit the opposition of consumer organizations, Occurred in June 2006 the government's pushing the radiation in the worst school lunch food poisoning incident in relapse prevention plan "one Fisheries' product ideas also had a controversial one case shows this plainly negative perceptions. However, the Ministry of Science and Technology published a report, the UN Food and Agriculture Organization (FAO), the World Health Organization (WHO), the International Atomic Energy Agency (IAEA), international organizations such as the Food and Drug Administration (FDA) to demonstrate that the safety of irradiated foods[14]. In addition, the Korea Atomic Energy Research Institute have secured the related technology made only social consensus if the public opinion is positive Irradiated Foods expansion of contains a sense of time problems, which can solve the poisoning risk of school lunch to investigate the radiation in food that is the position. In this study, we conducted a perception survey on irradiated foods on the basis of the results from conducted a survey on the sector in relation to nuclear or radiation and for students enrolled in Guangzhou middle high school most interested in going on irradiated food to look at the degree of recognition and acceptance. Also to use a degree of recognition and acceptance of irradiated food when used as a basis for school lunch by looking at the possibility of introducing positive perception of irradiated food.

2. Materials and Methods

2.1 The subjects and themes selected

From May 2015 to June results conducted a survey about the recent attention on nuclear targets. 200 of High, Middle school students in Gwangju, the interest on irradiated foods was highest at about 52.0%. From May 2015 to June results conducted a survey about the recent attention on nuclear targets. 200 of High, Middle school students in Gwangju, the interest on irradiated foods was highest at about 52.0%. (Table 1).

Table 1. Interest in nuclear

Item	Number of item
Irradiated food	104 (52)
Fukushima nuclear accident	32(16)
Nuclear corruption scandal	8(4)
Kori nuclear power plant	10(5)
Radioactive pollution food	46(23)
Total	200 (100)

2.2 Analysis Method

Reliability Analysis for the questionnaire items was performed Cronbach's α coefficient was not excluded Cronbach α coefficient of 0.5 or less. Details of the questionnaire items were used as points 5 points by Likert scale measures from July 2015 until September 2015, it was targeted to 200 of High, Middle school students nationwide survey method 1:1 were performed by one corresponding manner. Analysis of the questionnaire items are statistically significant when below were analyzed by Pearson correlation coefficient of the chi-square (χ^2), correlation t test (Independent Sample t-test), cross-analysis of independent samples, p values in all analyzed 0.05 It was considered significant.

3. Result

3.1 Classification of radiation

The reliability of the scale was measured in order to analyze the perception of irradiated foods. The same result appears and is reliable even when measuring the measurement object multiple times, means that the consistency between the parts that make up a certain surface. A method for verifying the reliability of the measurement variables used for a multi-item scale is available an item analysis, item analysis methods include various methods, but in the

present study by sniffing the items that inhibit the reliability of the multiple items excluded from the measurement tool the method was used Cronbach's α coefficient for increasing the reliability of the measurement tool. Reliability factor exploratory research can be seen that it shows a minimum of 0.50 confidence in the results section were all on the basis of at least 0.4, typically 0.5 or more means that the internal consistency suitable for the questionnaire used in this study (Table 2).

Table 2. Reliability Analysis result

Cause	No of Item	Cronbach's α
Interest and knowledge of the radiation	2	0.521
Awareness of the irradiated food	6	0.731
Access information of irradiated foods	6	0.772
Purchase intention of irradiated foods	3	0.626
Using irradiated foods in school meals	3	0.654

3.2 Attention and knowledge of the radiation

There is attention about the visible radiation that is 3.34, the girl was the man were higher than girls to 3.11 statistically significant difference men ($p < 0.05$). Knowledge of radiation men 2.71, women 2.60, men did not show a significant difference and I've found statistically higher than females ($p > 0.05$). Therefore, knowledge about the radiation can be seen that when viewed an average of 2.67 and two groups of men and women, concern about radiation is 3.24 to lack of knowledge is little compared to the attention (Table 3).

Table 3. Interest and knowledge of the radiation

	Interest in the radiation					Knowledge of the radiation				
	No (%)	Mean	SDa	t	p	N	Mean	SD	t	p
Male	179 (59.7)	3.34	0.89	2.34	0.02*	179	2.71	1.02	0.999	0.319
Female	121 (40.3)	3.11	0.78			121	2.60	0.81		
Total	300	3.24	0.85	300	2.67	0.94				

Note: *Standard deviation. The interaction effect was determined using a Independent Samples t-test. The unit is the number of Lickertis scale. $p < 0.001$.

3.3 Awareness of the irradiated food

Do you know a certification mark of irradiated foods? A man who knows the survey certification mark of 34 patients (19.0%), women 22 (18.2%), men

who do not know 145 patients (81.0%), women in the certification mark with 99 patients (81.8%) differences between men and women is almost never know about, students know 56 people (18.7%) 244 showed that students do not know than to (81.3%) is much less awareness of the certification mark that. But with a p -value $\chi^2 = 0.031$, $p = 0.859$ can be seen that there is no statistically significant difference between men and women with more than 0.05 (Table 4).

Table 4. Awareness of the irradiated food

		Gender		Total (%)	χ^2	p
		Male (%)	Female (%)			
symbol	Yes	34 (19.0)	22 (18.2)	56 (18.7)	0.031	0.859
	No	145 (81.0)	99 (81.8)	244 (81.3)		

Note: The interaction effect was determined using a χ^2 test. The unit is the number of person.

'Do you know about irradiated foods?' When on survey results hayeoteul an average of three points men 2.95, women 2.81, of all students are unaware that most of the students at 2.89 results for the liking of irradiated food radiation in men 3.24, women 3.28 All Students 3.26 Food is favorable for the investigation showed that more than average (Table 5).

Table 5. Knowledge and likability of the irradiated foods

	knowledge of the irradiated Foods					likability of the irradiated foods				
	N	Mean	SDa	t	p	N	Mean	SD	t	p
Male	179	2.95	1.08	1.282	0.201	179	3.24	0.95	0.416	0.678
Female	121	2.81	0.81			121	3.28	0.74		
Total	300	2.89	0.98	300	3.26	0.87				

Note: *Standard deviation. The interaction effect was determined using a Independent Samples t-test. The unit is the number of Lickertis scale.

Irradiated foods reason to think positively pests is 37.3%, and food poisoning suppression of 26.3%, permanence extended 20.0% of the food without chemicals or additives, sprouting inhibition of 10.3%, the fruit maturity delay of vegetables by 6.0% net appeared. Why, on the other hand think of irradiated food as a negative is the human body harm 38.9%, lack of information, 21.3% of irradiated food, and 19.8% fear of genetic mutations had an impact of 2 years, the reliability of the government's policy It decreased 11.1%, other 9.1%, net appeared to (Table 6).

Table 6. Benefits and concerns of irradiated foods

항목	No	Male (%)	Female (%)	Total (%)	χ^2	p
Benefits	food poisoning suppression	N 49	30	79	4.896	0.298
	%	27.4%	24.8%	26.3%		
	eliminating harmful insect	N 71	41	112		
	%	39.7%	33.9%	37.3%		
	inhibit germination	N 16	15	31		
	%	8.9%	12.4%	10.3%		
	preservation extended	N 36	24	60		
%	20.1%	19.8%	20.0%			
concerns	Delayed maturity	N 7	11	18	1.239	0.872
	%	3.9%	9.1%	6.0%		
	harm the human body	N 67	49	116		
	%	37.6%	40.8%	38.9%		
	lack of information	N 40	23	63		
	%	22.5%	19.2%	21.1%		
	reliability deterioration	N 21	12	33		
%	11.8%	10.0%	11.1%			
Others	genetic effects	N 33	26	59		
	%	18.5%	21.7%	19.8%		
	Others	N 17	10	27		
%	9.6%	8.3%	9.1%			

Note: The interaction effect was determined using a χ^2 test. The unit is the number of person.

Interest and knowledge of the radiation concerns and radiation knowledge, the result of substituting the Pearson correlation coefficient formula associations statistically significant between also knowledge, affirmative irradiated foods irradiated food radiation has a very high correlation to 0.492. Has positive knowledge of radiation and radiation interest also positive knowledge, food irradiation of food, irradiated food and irradiated food also has a low correlation with the 0.2 ~ 0.4 (Table 7).

Table 7. Interest and knowledge of the radiation, knowledge of the irradiated Foods, Pearson correlation coefficient between the positive degree

	Interst in radiation	Knowledge of the radiation	Knowledge of the irradiated food	Irradiated foods of positive degree
Interest in radiation	1	.492**	.344**	.267**
Knowledge of the radiation		1	.359**	.299**

	Interst in radiation	Knowledge of the radiation	Knowledge of the irradiated food	Irradiated foods of positive degree
Knowledge of the irradiated food	Pearson correlation coefficient		1	.361**
Irradiated foods of positive degree		Pearson correlation coefficient		1

Note: The interaction effect was determined using a correlation test. The unit is the number of Lickertis scale. **p < 0.01.

3.4 Information accessibility of irradiated foods

'A lot of opportunity to access information about food irradiation?' Man in question was 2.72, women 2.31, men and women feel that there is a full chance encounter seems the most showed an average of 2.55 p = 0.001, p value less than 0.05 and 0.001 were significant differences in the responses of men and women. The man responded Having the opportunity to access the information as compared to women. And man has asked to think about the necessity of information training for Irradiated Foods 3.74, women 3.81 male and female whole showed that most 3.77 to feel the need to p value showed the 0.443 men and women is not significant It did. And the this question of a doctor you want to receive information about offers, many people want to have the information available to the average of 3.48, and there was no significant difference between men and women. (Table 8).

Table 8. Accessibility of information

	Opportunities to access				
	N	Mean	SDa	t	p
Male	179	2.72	1.02	3.843	0.001**
Female	121	2.31	0.81		
Total	300	2.55	0.96		
	Need for education				
	N	Mean	SD	t	p
Male	179	3.74	0.84	0.768	0.443
Female	121	3.81	0.66		
Total	300	3.77	0.77		
	Want a variety of information				
	N	Mean	SD	t	p
Male	179	3.48	0.86	0.072	0.943
Female	121	3.49	0.83		
Total	300	3.48	0.85		

Note: aStandard deviation. The interaction effect was determined using a Independent Samples t-test. The unit is the number of Lickertis scale. **p < 0.01.

Contact information for students who were irradiated food by TV 38.2%, Internet 31.9%, 15.3% in education and learning, newspapers by 8.3%, other 6.3 percent. On the other hand, the students did not contact the information appeared information in TV 50.9%, education 23.3%, Internet 18.4%, newspapers by 4.3%, other 3.1% net. Important information students want to receive mainly provided for irradiated foods is highest with regard 54.2% reliability verification, and then to investigate the process is 18.1%, legal-related 11.4%, other 8.7%, Usage 7.7% net appeared (Table 9).

Table 9. Media access to information on irradiated foods

Information	Media	Gender		Total(%)	χ^2	p
		Male (%)	Female (%)			
Positive	TV	38(38.8)	17(37.0)	55(38.2)	6.46	0.167
	internet	32(32.7)	14(30.4)	46(31.9)		
	news paper	11(11.2)	1(2.2)	12(8.3)		
	education	11(11.2)	11(23.9)	22(15.3)		
	others	6(6.1)	3(6.5)	9(6.3)		
Negative	TV	46(52.9)	37(48.7)	83(50.9)	1.115	0.892
	internet	17(19.5)	13(17.1)	30(18.4)		
	news paper	3(3.4)	4(5.3)	7(4.3)		
	education	19(21.8)	19(25.0)	38(23.3)		
	others	2(2.3)	3(3.9)	5(3.1)		
Main	safety verification	85(47.8)	77(63.6)	162(54.2)	9.098	0.059
	investigation process	38(21.3)	16(13.2)	54(18.1)		
	relating to the law	25(14.0)	9(7.4)	34(11.4)		
	present status of use	15(8.4)	8(6.6)	23(7.7)		
	others	15(8.4)	11(9.1)	26(8.7)		

Note: The interaction effect was determined using a χ^2 test. The unit is the number of person.

Interest in radiation using the Pearson correlation coefficient formula, knowledge, irradiated foods chance to access information and the need for education, irradiated food-related information available to know the relevance of commitment you would like to feel the need for education of the results irradiated foods will students that want to be irradiated foods provide relevant information was seen also as high as 0.491 relevance of other topics were insignificant (Table 10).

Table 10. Interest and knowledge of the radiation, Opportunities to access and Need for education, Pearson correlation coefficient of the want to provide information on irradiated foods

		opportunities to access	need for education	want to provide information
interest in radiation	Pearson correlation coefficient	.219**	.237**	.304**
knowledge of the radiation	Pearson correlation coefficient	.327**	.114*	.198**
opportunities to access	Pearson correlation coefficient	1	.130*	.214**
need for education	Pearson correlation coefficient		1	.491**
want to provide information	Pearson correlation coefficient			1

Note: The interaction effect was determined using a correlation test. The unit is the number of Lickert's scale. **p < 0.01.

3.5 Purchase of irradiated foods

Radiation survey for the purchase experience of the food, the students have tried buying experience men and 23 (12.9%), women in 7 patients (5.8%), in all 30 patients (10.0%) of students buying experience this suggests that the findings. Students who are men buying experience is 155 people (87.1%), women 114 people (94.2%), the entire student 269 patients (90.0%) to obtain the result that the purchasing experience. Chi-square χ^2 = 4.064, each and value p This was written and = 0.044 p to see a meaningful difference between men and women show because value is less than 0.05. (11 table).

Table 11. Purchase experienced irradiated foods

		Gender		Total(%)	χ^2	p
		Male (%)	Female (%)			
Purchase experience	Yes	23 (12.9)	7 (5.8)	30 (10.0)	4.064	0.044*
	No	155 (87.1)	114 (94.2)	269 (90.0)		

Note: The interaction effect was determined using a χ^2 test. The unit is the number of person. *p < 0.05.

Most students buy irradiated food experiences ever buy, but the doctor usually is at least 3.23 to radiation was higher by 3.43 of a doctor to buy irradiated food in irradiated foods (Table 12).

Table 12. Purchasing of the irradiated foods and non-residual radiation

purchasing of the irradiated food					
	N	Mean	SDa	t	p
Male	179	3.23	0.93	0.055	0.957
Female	121	3.22	0.90		
Total	300	3.23	0.92		
purchasing of the non-residual radiation					
	N	Mean	SD	t	p
Male	179	3.51	0.98	1.794	0.074
Female	121	3.31	0.93		
Total	300	3.43	0.96		

Note: ^aStandard deviation. The interaction effect was determined using a Independent Samples t-test. The unit is the number of Lickertis scale.

Table 13. Pearson correlation coefficient of the purchasing of irradiated foods and non-residual radiation

		purchasing of the non-residual radiation	
interest in radiation	Pearson correlation coefficient	.186**	.256**
knowldege of the radiation	Pearson correlation coefficient	.080	.065
purchasing	Pearson correlation coefficient	1	.499**
purchasing of the non-residual radiation	Pearson correlation coefficient		1

Note: The interaction effect was determined using a correlation test. The unit is the number of Lickertis scale. **p < 0.01.

3.6 Think about school food use of food irradiation

Irradiated food for school lunch to using an idea for The student body showing a value of the 3.34 to the question to ask. Chi-square and $\chi^2 =$ value p 1.891, men and add 0.060, no meaningful differences between the response of the men and women can see (table 14).

Table 14. Think about the use of irradiated food in school meals

use of irradiated food in school meals					
	N	Mean	SD	χ^2	p
Male	179	3.40	1.13	1.891	0.060
Female	121	3.15	1.15		
Total	300	3.30	1.14		

Note: The interaction effect was determined using a χ^2 test. The unit is the number of person.

Points are expected to irradiated foods in favor of the student responses to the questionnaire as to the use in feed hygiene were 48.4%, 23.6%, nutritional value, taste 16.1%, 7.5% diversified diet, other 4.3% net. In contrast points that the students answered that they oppose the use of irradiated food to feed concerns are fears 23.2% of the food itself, radiation treatment, the correlation between contamination of food radioactive contaminants to 23.2%, irradiation process 20.4% disbelief, radiation treatment due to deterioration of the freshness and quality of 17.6%, due to the existing radiation treatment was seen compared to the high price of 15.5% pure was little difference between each item. (Table 15).

Table15. Benefits and concerns about the use of irradiated food in school meals

use of irradiated food	gender		Total (%)	χ^2	p	
	Male (%)	Female (%)				
benefits	taste	16 (15.2)	10 (17.9)	26 (16.1)	1.851	0.763
	nutrition	28 (26.7)	10 (17.9)	38 (23.6)		
	hygiene	50 (47.6)	28 (50.0)	78 (48.4)		
	diversification of the diet	7 (6.7)	5(8.9)	12(7.5)		
	others	4(3.8)	3(5.4)	7(4.3)		
concerns	Fear of food irradiation	13 (17.1)	20 (30.3)	33 (23.2)	5.143	0.273
	Distrust of food irradiation	16 (21.1)	13 (19.7)	29 (20.4)		
	High Price	11 (14.5)	11 (16.7)	22 (15.5)		
	Pollutant contamination	22 (28.9)	11 (16.7)	33 (23.2)		
	Deterioration of the freshness and quality	14 (18.4)	11 (16.7)	25 (17.6)		

Note: The interaction effect was determined using a χ^2 test. The unit is the number of person.

4. Discussion

The present study showed that the level of interest relating to food irradiation, radiation middle and high school students from across the country with increasing interest in nuclear energy and radiation was the highest. It rose sharply after exposure

nuclear power plant accident in the Chernobyl nuclear power plant explosion started in the former Soviet Union took place in 1986–2011, Fukushima [15]. But the situation is the lack of a lot of knowledge and information than concern for radiation, have a negative view of the radiation was passed in a negative perspective on irradiated food. So, it was found that irradiation of food and could see that confuse radioactive contamination in food is high in disbelief net negative view of fear of radiation contamination investigation process of the investigation process [15]. In order to change the negative perception of irradiated food in this condition is significant in this study were able to know that the students need to provide education and information. To promote students' view the negative thoughts with positive basic knowledge and information about irradiated food, and the difference between irradiated foods and food contaminated by radiation TV, internet, education, newspapers, etc. was examined to be valid. One of them students can expect that can instill a positive perception about irradiated food using a training program or advertise your TV (50.9%) of the medium 1 up to want to have a variety of information about irradiated food have. And purchasing experience of irradiated foods is very small, but got the result it has an above-average favorable. Regulations on food irradiation current, former and worldwide license applies to 230 products in over 50 countries. However, irradiated food is currently allowed in the country are potatoes, onions, garlic, and does not only 26 kinds, such as at night [15]. Therefore broaden the range of irradiated foods, imputed to those who do not have an increased positive perception buying experience confidence in the radiation plane after adjusting the price problem of food supplies in large quantities on the market increases the purchasing experience surveys Food the idea is that we could see a higher effect. In addition, as one after another filed by the school lunch poisoning and other problems using irradiated food insecurity is higher among parents and students to see school lunch would be able to boast the new measures. It is the improvement of hygiene students about the survey used in this study expect food to feed. However, a large effect of irradiated foods is that by removing the pests, bacteria increase the storage stability of the food inhibition roots, plant roots. Examples of leaving the old potato sprout buds sheds should eat it and remove the toxic substance called solanine. This plant germination or rooting to investigate the radiation because the shelf life is reduced. Parents of these effects, it will be able to inform students take advantage of the solution of irradiated food in school lunch issue. Finally, help the

Food Biotechnology and Food Science and Nutrition, radiology and understanding and knowledge about irradiated foods to students majoring involved and so on. The future direction of irradiated foods present a progress in all areas related to agriculture and industry, and is considered to be used as the basis for establishing a correct perception.

5. Conclusion

This study suggests that it is a negative view of the radiation in a nuclear power plant incident in Japan, including the correct education imperative for the development of irradiated foods leads to negative views about irradiated food. The results of this study showed that in most situations lacking many of the students knowledge on the other hand the high interest in the “radiation” and “irradiated food. Also showed that even though I have usually more favorable with respect to food irradiation, relevant experience and feel the need to write down the information provided education and information. That the irradiated food purchases Asked experience, the men (12.9%), a man more than twice than women as women (5.8%), purchase experience, but overall, only 10.0% students had irradiated food shopping experience. Asked purchase decision purchase decision showed higher results than when a relatively favorable response showed no radioactivity. Above average on the use of irradiated food in school lunch it showed a favorable response, that most expect the use of food irradiation in school lunch are the most anticipated improvements in sanitation. Point of concern was that research has discredited order and roughly the same proportion of fear, mixed with contaminants, the process of survey research process.

Acknowledgments

The Research has been conducted by the Research Grant of Gwangju Health University in 2014(3014027).

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