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Survey Research on Knowledge, Attitude and Action of Adults about Irradiated Foods

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Abstract

Objects: This research is to provide basic information for invigoration of irradiated foods by investigating statistically significant difference about knowledge, attitude and action on irradiated foods, depending on demographical characteristics. **Methods/Statistical Analysis:** This research subjected on adults of 19 and over. Survey was conducted from 2 Feb. 2015 to 28 Feb. 2015. 416 Respondents inhabit in provinces including Jeollabuk-do and living in capital area as Seoul and Kyeong-ki-do were selected by convenience sampling and data was collected by self-administration method. **Findings:** We find the following results. First, average score of knowledge level on irradiated foods was 9.62 out of 15, relatively high score compared to preceding research subjected on high school students, as respondents were the adults here. Secondly in attitude aspect of food irradiation, only 'habitat' factor showed statistically significant difference in significance level of 5%. Third, about practice level toward food irradiation, as whether checking food irradiation when buying, checking level of rays and recommendation to other, variables like 'marriage', 'religion' and 'habitat' showed statistically significant difference in significance level of 5%. Fourth, as a result of correlation analysis to see if there is statistically significant correlation among knowledge, attitude and practice level toward food irradiation, knowledge and attitude showed statistically significant correlation positively. **Improvements/Application:** This study is expected to be used in education or promoting plans, dispelling misunderstanding of food irradiation.

Keywords: Correlation Coefficient, Food, Irradiation, Significant Test

1. Introduction

Irradiation is food processing development which prevents coming out buds and stop proliferation of microorganism or bugs by exposing gamma-rays or electron beam. Food irradiating technology has been developed for last half century by multiple researches around advanced countries and is evaluated as useful method stable in microbiological, toxicological, genetic, nutritional aspects more than any other sanitation method1.2. International organizations such as Food and Agricultural Organization (FAD), International Atomic Energy Agency (IAEA), World Health Organization (WHO), etc. has reported that all foods examined as under 10 kGy in average have no toxicological defect and no nutritional, biological problems³. Amount of radiation set for food irradiation is under 10 kGy generally, but France permits up to 11 kGy, USA and Argentina permits up to 30 kGy of irradiation in the case of

perfect sterilization and long-term storage⁴. Accordingly, food irradiation is increasing all around the world recently. However consumers don't have specific information about stability of irradiated food; they have vague anxiety about safety and it is hard for them to make decision related to foods irradiated⁵. Moreover, it is true that there had been numerous arguments about using irradiated foods before the exact confirmation of safety by several authoritative international organizations, due to Unique Radiolytic Products (URP) observed from some foods in various radiation levels. Also, negative awareness about the radiation has been spread out because of the nuclear accident in near Fukushima, Japan. Considering from that, people in nation are worrying about safety of irradiated foods and they are expected to show less acceptance of that foods. Also in USA, where irradiated foods are more generalized, only 50% of the consumers purchased irradiated foods^Z

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and even people with purchasing intent showed worries about safety and taste, nutritional effect of irradiating⁸. Furthermore, only 11% of respondents answered that irradiated foods are safe in survey subjected on Turks².

Despite that, as new food storage and manufacturing technology for prevention of food borne disease and for hygienic food production base is needed, method of food irradiation is expected to be new hygienic technology which can complement weakness of chemicals like preservative or fumigant, such as harmfulness to human body and environmental pollution problem. Accordingly in our nation, revised amendment on 'standard of food indication' by Korea Food and Drug Administration is being applied since January, 2014, to not to use the term 'radiation' in the package of irradiated foods. This is considered as to invigorate food irradiation by eliminating negative image like regarding radiation as radioactive matter. In Korea, foods permitted to irradiate for sterilization, insecticides and anti-germination are potato, onion, garlic, chestnut, raw mushroom, dried mushroom, grains, pulses and its powder, starch, dried meat, fish and shellfish, enzyme food, ginseng products, composite seasoning products, etc. Like this, despite irradiation of foods is necessary and is being enacted in actual, people, the consumers, have very little awareness and knowledge of irradiated foods, even having vague anxiety. This could be an obstacle in invigorating food irradiation which already had been turned out to be harmless to the human body and environment. Therefore education and promotion is needed to dispel misunderstanding of food irradiation and to invigorate it; basic data about knowledge, attitude and practice of consumers about food irradiation is essential. Accordingly, this research will develop survey questions based on preceding researches and will investigate statistically significant difference about knowledge, attitude and practice of food irradiation depending on demographical characteristics. Moreover after understanding correlation of that knowledge, attitude and practice of food irradiation, comparison with preceding researches will be done to contribute to invigoration of food irradiation by providing basic information.

2. Research Methods

2.1 Research Design and Organizing Survey Questions

Main purpose of this research is to provide basic data for invigorating food irradiation by analyzing knowledge, attitude and practice of general consumers toward irradiated foods. As survey was chosen as data collecting method, survey questions were developed. Research¹⁰, subjected on elementary, junior high and high school students, research¹¹ subjected on high school students, research¹² which compared awareness range of college students about radiation, research investigated educational effects on teachers related to food and nutrition, etc. were referred in the process of survey development. Survey questions are broadly divided into 3 sections; each related to knowledge, attitude and practice, potential problems were revised by conducting pilot survey before the field survey. An outline of the research tool is as Table 1.

2.2 Data Collecting

There are many preceding researches dealing with knowledge or attitude toward food irradiation, subjected on high school students and younger. However as actual consumers of the irradiated foods are adults, this research subjected on adults of 19 and over. Survey was conducted for about 4 weeks, from 2 Feb. 2015 to 28 Feb. 2015. 416 Respondents inhabit in provinces including Jeollabuk-do and living in capital area as Seoul and Kyeon-ki-do were selected by convenience sampling and data was collected by self-administration method¹³.

2.3 Ethical Consideration of the Research

To protect the respondents, purpose of the research, confidentiality, no risk of quitting responding, right to quit depend on free will were guided before collecting data

Table 1. Survey organizing and contents

Section	Contents	Number of questions
Demographical factor	Gender, marriage, job, age, religion, education level, region, awareness level, path of information acquirement, educational experience, etc.	10
Knowledge on irradiated foods	Concept, safety of food irradiation and allowed foods	15
Attitude toward irradiated foods	Intent to buy, necessity, intent to have education, relation to the health of irradiated foods	10
Practice on irradiated foods	Whether checking food irradiation when buying, checking level of rays and recommendation to others	5

and all respondents agreed. About 10 minutes were taken for the responding, small amount (2,000 won) was given to the respondents as appreciation.

2.4 Data Analyzing

First of all, undependable answers were eliminated through pre-process and rests of the answers were analyzed statistically using IBM SPSS2114. Descriptive statistics was used to investigate demographical characteristics, while t-test, variance analysis, etc. were used to find difference in total score of knowledge, attitude and practice section toward food irradiation. Above this, relation among knowledge, attitude and practice was investigated through correlation analysis and the results were compared with preceding researches.

3. Results

3.1 Characteristics of Respondents

Total 416 people, 199 (47.8%) males and 217 (52.2%) females responded to the survey, 263 (63.5%) of them married and 151 (36.5%) of them were single. They showed percentage of following in educational level; 222 (53.8%) college graduates (including in college students), 160 (38.7%) high school graduates, 21 (5.1%) junior high graduates and 10 (2.4%) above graduate school graduates, in religion section; 226 (55%) with no religion, 100 (24.3%) Christians, 41 (10%) Catholics and 31 (7.5%) Buddhists. Most of the respondents were relatively young, 23.3% was teenager, 37.0% was the twenties, 10.3% was the thirties, 18.3% belonged to the forties and 11.1% belonged to the fifties and above. About 3 times of respondents inhabited in provinces compared to capital region; 316 (76%) of province inhabitants and 100 (24%) of capital region inhabitants. Meanwhile, 75.2% of whole respondents showed negative answer on the awareness level of food irradiation, in order of 'don't know (180)>'Don't know at all (133)'>'Normal (57)'>'Know a little (41)'> 'Know very well (5)'. For the path of information acquirement, 202 respondents (48.6%) answered 'never heard of', while acquisition from media source was most frequent to 142 people (34.1%). Lastly, most of the respondents (403 respondents, 96.9%) never had an education about food irradiation.

3.2 Knowledge Level on Food Irradiation

Average score of knowledge level on irradiated foods measured by 15 questions was 9.62 (standard deviation

3.153), relatively high score compared to 1.71 in average out of 10 in the research which subjected on high school students. Result of statistic significant difference test of knowledge for demographic factors is as Table 2. Factor of 'marriage' and 'age' showed significant difference in significance level of 5%, while habitation showed p-value of 0.056, significantly different in 10% of significance level. That is, married people more than singles, younger people more than middle-aged and capital area inhabitants more than province inhabitants were statistically having more knowledge about irradiated food. Especially in age, as knowledge level becoming lower in average and higher in distribution as age getting older, it is considered that school education had helped to improve knowledge level about food irradiation as in research. Contrast to this, factors like gender (male<female), educational level (under high school graduates<over college students), religion (Buddhist<No religion<Catholic<Christian) showed no significant difference statistically. Meanwhile 98 respondents (23.6% out of 100%) got high score of over 13, 65.3% among them were younger generations under the twenties, much higher than the older generations (34.7%).

Table 2. Statistical significant difference test on knowledge level (*:p<0.05)

		Average	Standard deviation	Test static	p-value
Gender	Male	9.46	3.147	t=-0.979	0.328
Gender	Female	9.76	3.159	l=-0.9/9	
Manniaga	Married	9.89	3.091	. 2246	0.019*
Marriage	Single	9.14	3.208	t=2.346	
Education	Under high school graduates	9.41	2.953	t=-1.190	0.235
level	Over college students	9.78	3.302		
	Buddhist	9.29	3.035		0.563
	Christian	9.99	3.030		
Religion	Catholic	9.61	3.169	F=0.683	
	No religion	9.50	3.243		
	Teenagers	10.19	2.807		0.035*
Age	Twenties	9.77	3.199	F=2.889	
	Thirties	9.60	3.064	1'=2.009	
	Over Forties	8.98	3.309		
Habitat	Capital area	10.14	2.971	t=1.915	0.056
Havitat	Province	9.45	3.195	(-1.913	

3.3 Attitude toward Irradiated Foods

As a result of measuring purchasing intent, necessity, intent to have education, relation to health with total 10 questions using Liker five-point scale method, average was 30.57 and standard deviation was 6.131. Compared to the result of research that subjected on high school students and showed 11.67 in average out of 20, result is substantially the same. Therefore it is considered that there exists no big difference between adults and high school students in the aspect of attitude toward irradiated foods. Result of statistic significant difference test of attitude for demographic factors is as Table 3. Only the 'inhabitant' factor showed significant difference in significance level of 5%, rest of factors had no significant difference. While, though it is not significantly different, female more than male and younger generations under twenties more than middle-aged over thirties took up a positive attitude toward food irradiation, it could be a meaningful result connected to the result of Table 2.

Table 3. Statistical significant difference test on attitude toward food irradiation (p<0.05)

		average	Standard deviation	Test static	p-value
Gender	Male	30.08	6.124	t=-1.570	0.117
Gender	Female	31.02	6.117	t=-1.5/0	
Manniana	Married	30.59	6.322	4 0 0 0 0	0.946
Marriage	Single	30.54	5.847	t=0.068	
Educational level	Under high school graduates	30.90	5.471	t=0.883	0.378
level	Over college students	30.36	6.609		
	Buddhist	29.55	6.752		0.302
Religion	Christian	31.47	5.616		
	Catholic	31.24	4.847	F=1.221	
	No Religion	30.38	6.371		
	Teenagers	31.79	5.984		0.115
Age	Twenties	31.12	5.960	F=1.986	
	Thirties	29.53	6.967	r=1.900	
	Over Forties	30.52	6.076		
Habitat	Capital area	29.42	5.562	t=-2.294	0.023*
павна	Province	30.93	6.265	ι=-2.294	0.023*

3.4 Practice Level about Food Irradiation

Measuring practice level; whether checking food irradiation when buying, checking level of rays and recommendation to others with 5 questions composed with "yes (2 points)" and "no (1 point)", the average score was 6.09 and standard deviation was 1.351. Result of statistic significant difference test of practice level for demographic factors is as Table 4. Factors such as marriage, religion and habitat showed statistically significant difference in significant level of 5%. For religion, respondents were divided into 2 groups, (Buddhist) and (Christian, Catholic, No religion) as a result of post analysis using Duncan method. Related to Table 2 and Table 3, knowledge on irradiated foods had no difference between people living in capital area and province, while province inhabitants took up more positive attitude and practice level toward irradiated foods.

3.5 Correlation of Knowledge, Attitude and Practice Level on Food Irradiation

Correlation analysis was done to see if those three categories show statistically significant difference; 3 categories

Table 4. Statistical significant difference test on practice level toward food irradiation (*:p<0.05)

-				-	
		Average	Standard deviation	Test static	p-value
Gender	Male	6.04	1.315	t=-0.844	0.399
Gender	Female	6.15	1.383	ι=-0.844	
Manniago	Married	5.98	1.237	t=-2.241	0.026*
Marriage	Single	6.31	1.515	t=-2.241	
Educational	Under high school graduates	6.09	1.437	t=0.029	0.977
level	Over college students	6.09	1.274		
	Buddhist	6.81(b)	1.537		0.011*
	Christian	6.17(a)	1.471		
Religion	Catholic	6.05(a)	1.341	F=3.784	
	No religion	5.97(a)	1.219		
Age	Teenagers	6.06	1.314		0.282
	Twenties	5.95	1.244	F=1.277	
	Thirties	6.19	1.277	1-1.2//	
	Over Forties	6.26	1.521		
Habitat	Capital Area	5.85	1.201	t=-2.082	0.038*
חמטונמנ	Province	6.17	1.388	12.002	0.030*

Table 5. Correlation Coefficient among knowledge, attitude and practice level on irradiated foods(*:p<0.05)

	Knowledge	Attitude	Practice level
Knowledge	-	0.393*	-0.050
Attitude	0.393*	_	0.091
Practice level	-0.050	0.091	_

are knowledge composed of 15 questions about concept, safety of food irradiation and allowed foods, attitude composed of 10 questions about intent to buy, necessity, intent to have education, relation to the health of irradiated foods and practice level composed of 5 questions about whether checking food irradiation when buying, checking level of rays and recommendation to others. As a result, knowledge and attitude showed significantly positive correlation as on Table 5. Therefore, it means that people with higher level of knowledge about food irradiation are likely to have more positive attitude toward irradiated foods. In spite of this, as knowledge and attitude are not significantly correlated with practice level, it is considered that there still exists distrust for the safety of food irradiation.

4. Conclusion and Suggestions

Food irradiating technology has been developed for last half century by multiple researches around advanced countries and is evaluated as useful method safe in microbiological, toxicological, genetic, nutritional aspects more than any other sanitation method. Though standard is little bit different depend on countries, about 56 nations are allowing food irradiation today. Korea allows food irradiation for the purpose of sterilization, insecticides and to prevent buds coming out from potato, onion and garlic, 50 kinds of foods are allowed to be irradiated in USA and UK, 40 kinds allowed in France. Contrast of that, Japan is sensitive about radiation that they allow only 1 kind of food to be irradiated, our nation also still have deep worries about safety of irradiated foods. However from various preceding researches, food irradiation is a necessary technology and has no serious problem in safety, it rather should be more invigorated. As education and promotion about safety of food irradiation is needed for that, this research was conducted to investigate present condition and to collect basic data. Results were as following.

First, average score of knowledge level on irradiated foods was 9.62 out of 15, relatively high score compared to preceding research subjected on high school students, as respondents were the adults here. In significant difference test on knowledge level, factors like 'marriage' and 'age' showed statistically significant difference in significant level of 5%. That is, people living in capital area were statistically having higher knowledge level than people living in provinces, moreover, older generations showed lower level of knowledge and higher distribution in this aspect.

Secondly in attitude aspect of food irradiation, only 'habitat' factor showed statistically significant difference in significance level of 5%. While, though it is not significantly different, female more than male and younger generations under twenties more than middle-aged over thirties took up a positive attitude toward food irradiation.

Third, about practice level toward food irradiation, as whether checking food irradiation when buying, checking level of rays and recommendation to other, variables like 'marriage', 'religion' and 'habitat' showed statistically significant difference in significance level of 5%. Especially linked to the results above, knowledge on irradiated foods had no difference between people living in capital area and province, while province inhabitants took up more positive attitude and practice level toward irradiated foods.

Fourth, as a result of correlation analysis to see if there is statistically significant correlation among knowledge, attitude and practice level toward food irradiation, knowledge and attitude showed statistically significant correlation positively. That is, people with higher level of knowledge on irradiated food showed more positive attitude toward them. In spite of that, as knowledge and attitude are not significantly correlated with practice level, it is considered that there still exists distrust for the safety of food irradiation. Especially related to practice level, proportion of answering "yes" to the question 'I check the amount of ray irradiated when buying foods' was the lowest to 12.6%, "yes" to the question 'I check whether the food is irradiated or not when purchasing' was low in the second place, to 13%. Compared to that, 31.5% of respondents answered "yes" for the question 'I purchase the food if the amount of irradiation is within adequate range'. It means these factors should be considered to invigorate practice level of irradiated foods; education and promotion should be primarily focused on the factor with low proportions of answer "yes".

Subjected on the adults, result of this research has coincidence in some parts with research which showed there is no difference in practice level in spite of difference in knowledge and attitude due to acquirement of information and educational experience, with research which showed that people with higher knowledge level on food irradiation don't necessarily prefer irradiated foods. Therefore to invigorate food irradiation, active promotion about the safety aspects pointed out above should be done based on this research, after selecting demographic subjects.

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