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CONSUMER ACCEPTANCE AND WILLINGNESS TO PURCHASE IRRADIATED FOODS IN THE UNITED STATES

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ABSTRACT

Objective: To determine consumer acceptance of food irradiation and willingness to purchase irradiated foods, increase consumer knowledge of irradiated foods and determine the impact of an educational component on consumer attitudes by utilizing the Targeting Outcomes of Programs (TOP) hierarchy.

Design: Consumers completed a survey consisting of food safety information and the acceptance and willingness to purchase irradiated meat. The educational component included a display explaining food irradiation and two brochures were available.

Setting: The educational and research program was conducted in grocery stores and a large community event on separate Saturdays

Participants: Two-hundred fifty-one consumers participated in the initial survey and 77 participated in the follow-up survey.

Main Outcome Measure: Initial survey, follow-up survey and taste-test survey.

Analysis: Frequency distribution, t-test, Chi Square and the Bonferroni formula procedures in SAS.

Results: Awareness of irradiated food products increased from 14% to 56% ($p<0.05$). Significant differences ($p < 0.05$) were found among correct (85%) to incorrect (15%) answers in the knowledge survey. From the follow-up survey, a 14% ($p < 0.05$) increase of participants was either likely or very likely to purchase irradiated food if it was available at their supermarket. Also 83% agreed or strongly agreed that they were more comfortable purchasing and using irradiated meat as compared to 63% from the initial survey.

Conclusions and Implications: The educational program, based on Bennett=s Hierarchy for Targeting Outcomes of Programs, increased consumer acceptance of irradiated meat.

INTRODUCTION

The public=s concern about food safety has increased. Despite efforts to help control food spoilage and improve safety, food microbiological hazards still exist (1). It has been estimated

that foodborne diseases cause approximately 76 million illnesses in the United States each year (2). Meat and poultry account for approximately 2.5 to 2.9 million illnesses and 1,000 to 1,200 deaths annually (3). Much of this is due to risky food handling and consumption behaviors by consumers while preparing raw meat or poultry at home (4, 5, 6, 7). Educating consumers about the risks involved with improper handling and cooking raw meat and poultry may help to reduce foodborne illness (8). However, despite educational efforts, some consumers are unwilling to improve their food preparation methods (9). Food irradiation, an alternative production process, can reduce or eliminate microorganisms that contaminate food or cause spoilage. This process involves briefly exposing food to a radiant energy source such as gamma rays, X-rays or electron beams. The irradiation of food has been found to be a safe process which poses no toxicological or microbiological hazards and insignificant changes in nutritional value (10). Currently, in the U.S., irradiated foods such as spices, herbs, dry vegetable seasonings, some fresh fruits, vegetables, poultry and beef are available in select markets.

Irradiation destroys at least 99.9% of common foodborne pathogens (e.g., *Salmonella*, *Campylobacter*, *E. coli* O157:H7, *Listeria monocytogenes*) that may be found in or on red meat and poultry (11). Ground beef is at a higher risk for contamination due to the grinding process that may spread pathogens, which may be present on the surface of the meat, throughout the ground beef. The U.S. Centers for Disease Control and Prevention (CDC) reported that nearly half (49%) of *E. coli* O157:H7 diseases and approximately 3% of the *Salmonellosis* cases each year were attributed to the consumption of insufficiently cooked ground beef (12).

Demand for irradiated food products depends on acceptance by consumers. Knowledge about irradiation is low and may be attributed to uncertainty about consumer attitudes towards food irradiation (13). Concerns tend to focus on the safety of food irradiation, such as changes in nutritional value, hazards associated with food irradiation and labeling of irradiated foods. In 1997, a national survey found that 69% of supermarket consumers incorrectly believed that irradiated foods posed a health risk (14).

Consumer demand for irradiated foods is increasing. In 2001, approximately 50% of the population was ready to buy irradiated foods, other adults were either unwilling (32%) or not sure (19%) (13). Among adults willing to buy irradiated meat or poultry, only 23% were willing to pay more for irradiated ground beef and only 25% were willing to pay more for irradiated chicken than for the non-irradiated product (13). Johnson and coworkers (15) reported that more consumers were willing to buy irradiated products in 2003 than in 1993 (69% versus 29%). Females, older consumers, and those with lower income levels tend to be more concerned about irradiation (16, 17). Also the presence of children under 18 in the household was associated with opposition to irradiation (13, 16).

Vickers and Wang (18) tested the overall taste likeness, toughness, flavor and texture of irradiated and non-irradiated ground beef and found equal preference for both samples. Subjects rated the irradiated beef patties juicier than the non-irradiated ground beef and found flavor, texture and toughness equal for both samples. Benefit information and sample identification increased the hedonic attribute ratings of the patties, when compared with the group that received no benefit information and no sample identification (18).

The more consumers know about this technology, the more willing they will be to embrace it (19). According to a General Accounting Office (GAO) report, the key to consumer acceptance is education (10). Marketing tests have shown that if consumers are first informed about what irradiation is, its benefits and its purpose is clearly indicated, they are less concerned about irradiation and more willing to choose an irradiated food product (17, 20, 21). Even a minimal presentation of the facts related to food irradiation can lead to significantly less concern over this technology. Researchers have concluded that the attitudes of conventional consumers can be positively influenced by an educational effort and, the influence is most effective when the consumer can interact with someone knowledgeable about irradiation (22, 23, 24).

When developing our research project we utilized Bennett=s Hierarchy for Targeting Outcomes of Programs (TOP) (25).

TOP focuses on outcomes in planning, implementing, and evaluating programs. TOP is used to assess the degree to which the outcome targets are reached. Intermediate outcomes at the KASA (knowledge, attitude, skills, aspirations) level of TOP hierarchy focus on knowledge gained/retained, attitudes changed, skills acquired, and aspirations changed.

The consumer will eventually dictate the future of irradiation technology. Educating consumers on the process of irradiation is essential for increasing demand of irradiated food products. The objectives of this study were to determine consumer acceptance of food irradiation and willingness to purchase irradiated foods, increase consumer knowledge of irradiated foods and determine the impact of an educational component on consumer attitudes by utilizing the Targeting Outcomes of Programs (TOP) hierarchy.

METHODS

After approval by the Institutional Review Board, Extension Educators, members of the Nebraska Beef Council and the Nebraska Grocery Store Association were asked to participate with this project. Approval was also granted by six grocery stores and a major community event located in Nebraska.

Research was conducted in a similar manner at each site on two Saturdays. Extension Educators and employees of the Nebraska Beef Council were trained on how to conduct the survey, taste test and provided background information to help them educate the public on food irradiation, prior to conducting the project. These volunteers were present at each of the displays to distribute surveys, prepare the beef samples, and answer any questions that consumers may have. Consumers were randomly approached to participate in the study before they were able to view the educational display. Participation in the study was voluntary. Those individuals involved in the research were first provided with a consent form explaining the research study. Participants were then asked to complete the survey and provide their name and address so that a follow-up survey could be mailed to them in three months. Participants would receive a meat thermometer upon completion of the follow-up survey. The process for mailing the post surveys was modified from Dillman (26).

Survey Development

Survey questions were developed to assess knowledge and acceptance of food irradiation and basic food safety knowledge. Questions were placed into categories: 1) acceptance, 2) food safety knowledge, 3) irradiation knowledge, 4) use of irradiated foods, and 5) awareness of irradiated foods. Demographics questions were also included. Some of the questions that were used had been taken, by permission, from a similar survey (27). Prior to conducting this research at the selected locations, surveys were reviewed by three professionals and modified based on their comments. A follow-up survey was sent to participants three months after completion of the initial survey. The follow-up survey consisted of similar questions from the initial survey excluding the demographic questions.

A brief, four question taste-test survey was adapted from Rickey and Younce (27) to determine acceptance of irradiated ground beef. The taste test was optional.

Educational Display Development

Two displays were set up at each location: 1) an educational display that provided basic food safety and food irradiation materials as well as two educational brochures and 2) a display that consisted of materials needed to prepare and serve irradiated beef for the public.

For the educational display a tri-fold, table top display board was created which incorporated information on irradiation, such as a picture of the radura symbol and labeling terminology, examples of thermometers, proper cooking temperatures to ensure doneness and pictures of how to properly check the temperature of ground beef. Two brochures were available from Nebraska Extension and the Nebraska Beef Council: 1) >Frequently Asked Questions About Food Irradiation' (28), listed questions and answers about food irradiation, organizations who say irradiated food is safe and where consumers can get additional information about food irradiation and 2) >Get Grilling (29), =gave basic information of food irradiation, grilling food safety tips and recipes. Survey materials and complimentary food safety magnets were present at the educational display.

The taste test display was placed in a location separate from the educational display. A grill to prepare raw samples of

irradiated beef, a heating unit to maintain proper temperature of the samples, serving materials, and sanitation supplies were located at this display. Participants could sample a portion of a ground meat patty.

Statistical Analysis

The data were analyzed using the SAS system program (30). Statistical analysis included frequency distribution, paired t-test, Chi Square and the Bonferroni formula was used to compare those participants who completed the initial survey with those completing the follow-up survey. Significance was determined at a p-value of 0.05. Simple univariate procedures were used to calculate percentages.

The data were placed into the same categories as the questions on the survey. Scores were determined for acceptance, food safety knowledge and irradiation knowledge by categorizing questions accordingly. A value was assigned to each response. A high score would indicate a more positive attitude or more knowledge. For example: an acceptance score was obtained by combining seven variables pertaining to consumer acceptance of irradiation and each variable was given a rating of 1-5, with 1 being the most negative and 5 being the most positive.

Data from the initial survey were analyzed to determine frequencies and demographic comparisons. Comparisons were made between the data from the initial and follow-up surveys to determine changes in acceptance, food safety knowledge, irradiation knowledge, awareness and current usage of irradiated food products. Comparisons between the initial and follow-up data were made only on the seventy-seven individuals who completed the follow-up survey. Initial scores were compared to follow-up scores and a t-test was conducted on each to determine levels of significance.

RESULTS & DISCUSSION

This education/research project provided an opportunity to informally educate consumers on basic food safety techniques for handling ground beef and on the process of irradiation and to determine consumer acceptance and consumer willingness to purchase irradiated foods.

Demographics

Two hundred fifty-one subjects participated in this study. Out of the 251 initial participants, 77 (31%) completed and returned a follow-up survey (Table 1). Comparisons were made within the initial survey and between those individuals who completed the initial survey with those who completed both the initial survey and follow-up survey. Significant difference was found with age ($P < 0.05$). There was a trend toward significance for those individuals who had children ($P=0.06$). Income ($P=0.17$), ethnicity ($P=0.12$) and gender ($P=0.53$) were not significant.

Table 1

Demographic Characteristics of initial and follow-up survey participants

Demographic Characteristics	Initial survey (n)	Total (%)	Follow-up survey (n)	Total (%)	P value
GENDER	N = 251		N = 77		0.53
Female	161	64	53	69	
Male	60	24	18	23	
No indication	30	12	6	8	
AGE	N = 222		N = 72		0.02
19-29	35	16	9	13	
30-39	54	24	14	19	
40-49	58	26	17	24	
50-59	38	17	13	18	
60-69	25	11	13	18	
70 and above	12	5	6	8	
INCOME	N = 209		N = 67		0.17
Less than $10,000	20	10	4	6	
$10,000-$30,000	71	34	19	28	
$30,001-$50,000	65	31	24	36	
$50,001 and above	53	25	20	30	
ETHNICITY	N = 220		N = 72		0.12
White/Caucasian	202	92	66	92	
African Am/Black	5	2	2	3	
Hispanic	7	3	2	3	
Asian/Pacific Islander	4	2	0	0	
Am. Indian/Alaska Native	0	0	0	0	
Other or unknown	2	1	2	3	
CHILDREN AT HOME	N = 221		N = 71		0.07
No	104	47	38	54	
Yes	117	53	33	46	

Initial survey participants (n=251) were divided into two groups: 1) the 174 participants who completed the initial survey but did not return the follow-up survey and 2) the remaining 77 who completed both the initial and follow-up surveys. Significant differences (Table 2) were found in food safety knowledge and irradiation acceptance. These findings suggest that those individuals (n=77) who completed both the initial and follow-up surveys were initially more negative towards the process of irradiation compared to those individuals who completed only the initial survey.

Table 2

Comparison of Participants within the Initial Survey

QUESTION	P VALUE
Food Safety Knowledge	
Which of the following are ways consumers can maintain the safety of their food?	
Sanitize kitchen surfaces.	**0.002**
Irradiation Acceptance	
I am comfortable purchasing and using irradiated meat.	**<0.0001**
I feel that irradiating food is an effective method for destroying harmful microorganisms in meat.	**<0.0001**
I would be willing to pay more for irradiated meat.	**<0.0001**
I plan to purchase irradiated meat in the future.	**<0.0001**
I would choose an irradiated meat product over a comparable non-irradiated meat product.	**<0.0001**

Awareness and Use of Irradiated Food

Participants were asked questions concerning awareness and current use of irradiated foods. Only 14% of the respondents were very aware/somewhat aware of irradiated meat at the time of the initial survey. Three months following this survey, awareness of irradiated meat increased to 56% ($P<0.0001$). Participants were initially asked about their current use of irradiated food; 93% either did not use or did not know if they currently used irradiated food. On the follow-up survey, individuals were asked about past purchases of irradiated foods and 89% indicated that they did not purchase or did not know if they purchased irradiated meat in the past three months. For awareness and use of irradiated foods, significant differences ($P<0.05$) were found when the responses form the two surveys were compared.

Food Safety Knowledge

Overall, 88% of participants answered the food safety questions correctly on the initial survey and 89% answered the questions correctly on the follow-up survey. Approximately 8% of the participants could be considered risky food handlers and their follow-up results did not differ from that of the initial survey. Initially, when asked about the safety of keeping raw meat on the top shelf of the refrigerator 45% answered 'no', 33% of the respondents answered 'yes' and 22% did not know. Results from the follow-up survey showed a 4% increase in those correctly answering this question. A slight (2%) increase was found among those answering >don=t know.=

When consumers cook ground beef patties, they often believe that visual indicators can determine doneness. Research has demonstrated that using a visual indicator is an inaccurate measure of doneness (3, 31, 32). Questions were asked to determine what consumers know about properly checking beef for doneness. When asked if beef is considered safe to eat if the interior is slightly pink, there was a 12% increase in respondents answering no when compared with the initial survey. When asked about the internal temperature, a 9% increase in respondents answering 'yes' to beef being considered safe to eat if cooked to an internal temperature of 160 degrees Fahrenheit; a 9% increase in those answering 'no' to beef is not considered safe to eat if the interior is brown; and a 5% increase in those answering 'no' to beef is not considered safe when the juice runs clear.

Results were combined to obtain a food safety knowledge score. The mean of the difference scores for the food safety knowledge score was 0.34+1.46. A t-test was conducted to examine the effects of an educational component on knowledge of food safety. According to Bennetts= Hierarchy (25), an increase in knowledge is necessary before a change in attitude can occur. A significant ($P < 0.05$) change in consumer=s food safety knowledge was observed after receiving information on food safety.

Irradiation Knowledge

Consumers were asked numerous questions regarding knowledge of food irradiation such as how irradiated meats are

identified and various organizations that approve of the process. A majority of the respondents (85%) did not know how irradiated meats are identified and on the initial survey, only 9% correctly answered the question about irradiated foods being identified by a special symbol called the radura and 12% on the follow-up survey.

Results were combined to obtain an irradiation knowledge score. The mean of the difference scores for irradiation knowledge was 0.49+1.80. A significant (P=0.01) change in consumers irradiation knowledge was observed after receiving information on food irradiation.

Irradiated foods have been considered safe by the American Medical Association (33), the United States Food and Drug Association (33), the World Health Organization (33), the American Dietetic Association (34) and the Institute of Food Technologists (35). When comparing responses of the initial and follow-up surveys, significant (P=0.01) differences were found in correct responses.

Consumer Acceptance of Irradiated Food

Due to the large number of consumers who are unfamiliar with food irradiation, it is important to provide information that is accurate and informative. Consumer reluctance to accept irradiated food products is due in part to a lack of information.

Results from the initial surveys indicated that 48% of the participants were either 'likely' or 'very likely' to purchase irradiated food if it was available at their supermarket. This acceptance increased to 62% after conducting the follow-up survey which was surprising in that this group (n=77) tended to be more negative towards irradiating food on their initial survey. Also, there was a 13% decrease in those who were uncertain if they would purchase irradiated foods. This demonstrates that additional information provided to consumers can have a positive effect on the acceptance of irradiation. After completing the follow-up survey, 83% 'agreed' or 'strongly agreed' that they were more comfortable purchasing and using irradiated meat as compared to 63% from the initial survey and there was a 20% decrease in those indicating no opinion. Similar results were found in a simulated market study in Georgia (22). The proportion choosing irradiated

ground beef increased from 52% to 71% after information about the irradiation process was provided (22).

Irradiated foods are required to be labeled with the radura symbol and the words Atreated by irradiation.@ Negative connotations may be associated with the words used to label irradiated food such as Aradiation@ and Airradiation,@ and these may be considered as barriers to consumer acceptance. After conducting our follow-up survey, more consumers (42%) preferred the term >cold pasteurization= over >irradiation= in regard to irradiated meat labeling as compared to the initial survey (29%). A consumer survey focused on comparing the terms Airradiation@ and Apasteurization@ concluded that the majority of participants appeared to be influenced more by the microbial safety of the alternatives rather than by the labels (36).

Eighty-one percent of those participating in our follow-up survey felt that irradiating foods is an effective method for destroying harmful microorganisms in meats. This was a 22% increase when compared to the initial survey. Initially 41% indicated they would choose an irradiated meat product over a comparable non-irradiated meat product, after completing the follow-up survey, this number increased by 8%. These findings suggest that consumer education programs could reduce consumer concerns about irradiation and increase demand for irradiated foods.

In the follow-up survey, fewer consumers (27%) were willing to pay more for irradiated meat as compared to the initial survey (33%). Fewer participants (31%) plan to purchase irradiated meat in the future as compared to those completing the initial survey (45%) ($P<0.05$). It is important to remember that those participants completing the follow-up survey were more negative towards the irradiation of food products. Frenzen et al. (3) found that approximately 50% of the population was ready to buy irradiated foods, 32% of the population was unwilling to buy these products and 19% was not sure. They also found that of the adults willing to buy irradiated meat or poultry, only 23% were willing to pay more for irradiated ground beef. Fox and Olson (37) found that consumers are sensitive to the price of irradiated foods. In a test

that compared irradiated and non-irradiated chicken breasts, sales of irradiated chicken breasts dropped from 43% when there was no price difference to 19% when there was a 10% premium was added to the irradiated product.

Consumer Taste Test

Participants voluntarily took part in a taste test. Consumer=s were asked whether they had ever tasted irradiated meat prior to this sampling, if they felt the irradiated meat tasted different than the non-irradiated meat, if they would purchase irradiated meat if made available to them locally, and how they feel about irradiated meat. A majority (88%) of the participants had not ever tasted irradiated meat prior to this sampling. Seventy-two percent indicated that irradiated meat did not taste different than non-irradiated meat. The samples were presented unaltered, without seasoning or any addition flavorings. Several individuals stated it would taste better with seasoning. This may have altered some of these results. Eighty-five percent of those surveyed would definitely or probably purchase irradiated meat if made available locally. We also found that 73% indicated they either liked or liked irradiated meat very much and 24% disliked irradiated meat.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Educating consumers on the process and benefits of irradiation can help to increase acceptance and alleviate concerns about irradiation. Providing accurate information concerning irradiation to the public may determine whether more consumers are willing to buy and pay more for irradiated food products, expanding the market for irradiated foods. Increasing awareness is another key to help increase consumer demand.

The information provided to the participants was effective in increasing the knowledge of and a positive attitude toward the process. This research provides strong evidence that consumer acceptance of food irradiation is related to their level of knowledge about the process. Nearly all consumers responded with a more favorable opinion of food irradiation on the follow-up survey as compared to that of the initial survey (83%). A small number of consumers remained skeptical toward food irradiation. According to the Bonferoni results, the 77 respondents who completed the

follow-up survey may be those who are less accepting or more skeptical towards the process of irradiation as compared to those who had not completed the follow-up survey.

The time that the initial surveys were conducted was prior to the Consumer Reports publication, The Truth About Irradiated Meat (38). Such reports could affect the participant acceptance of irradiation of food products but we were unable to examine that effect. Although most consumers indicated that they are in favor of the process of irradiated foods and would try irradiated foods, many do not plan to purchase irradiated foods in the future possibly due to availability. Irradiated meats were available to consumers through Omaha SteaksJ, SchwansJ and one of the grocery store chains at the time of the survey. Furthermore, many consumers would not be willing to pay more for irradiated foods and some indicated it would depend on the actual cost if they would purchase irradiated foods.

Irradiation education is of particular importance for specific at-risk groups. Such at-risk groups include children less than five years of age, older adults and individuals whose immune response is compromised by illness or disease. Educational efforts should be directed at parents of young children and adults over 50 to reduce the risk of foodborne illness. Grocery store and meat managers need to be educated about the process as they are responsible for providing safe products to consumers and may be asked questions pertaining to food irradiation.

Our results indicated that a display with professionals available to provide educational information and product tasting was effective in educating consumer audiences about irradiation. In addition, those who tended to be more negative toward irradiation changed their attitude. Bennetts= Hierarchy for Targeting Outcomes of Programs (TOP) (25) was effective in the development and delivery of this educational program.

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Джулія Олбрайт. ***Споживчі потреби і купівельна здатність купувати опромінені харчові продукти в Сполучених Штатах.***

Ця стаття описує освітній / дослідний проект, який дає можливість неформального ознайомлення споживачів з основними техніками безпеки обробки яловичого фаршу. Дослідження надає можливість визначити потреби споживачів та їх купівельну спроможність придбання описаних продуктів.

Джулия Олбрайт. ***Потребительские потребности и покупательская способность приобретать облученные пищевые продукты в Соединенных Штатах.***

Эта статья описывает образовательный / исследовательский проект, который дает возможность неформального ознакомления потребителей с основными техниками безопасности обработки говяжьего фарша. Исследование предоставляет возможность определить потребности потребителей и их покупательскую способность приобретения описанных продуктов.

ЗМІСТ

ЕКОНОМІЧНІ НАУКИ

СІЛЬСЬКОГОСПОДАРСЬКІ НАУКИ

ВИМОГИ ДО ОФОРМЛЕННЯ СТАТЕЙ

До друку приймаються статті, що відповідають вимогам ВАК і мають такі необхідні елементи: постановка проблеми у загальному вигляді та її зв'язок із важливими науковими чи практичними завданнями; аналіз останніх досліджень і публікацій, в яких започатковано розв'язання даної проблеми і на які опирається автор, виділення невирішених раніше частин загальної проблеми, яким присвячується дана стаття; формулювання цілей статті (постановка завдання); виклад основного матеріалу дослідження з повним обґрунтуванням наукових результатів; висновки з даного дослідження і перспективи подальших розвідок у даному напрямку.

З метою дотримання вищезазначених вимог до наукової статті слід жирним шрифтом виділити такі елементи статті: постановка проблеми, аналіз актуальних досліджень, мета статті, виклад основного матеріалу, висновки і перспективи подальших досліджень.

Статті, які не відповідають вимогам ДАК України, до друку не приймаються.

Обсяг статті – до 10 повних сторінок. Розміри полів: ліве – 20 мм, праве – 20 мм, верхнє – 20 мм, нижнє – 20 мм, до 30 рядків на сторінці.

Статті необхідно готувати за допомогою текстового редактора Microsoft Word. Шрифт статті – Times New Roman Cyr, через інтервал 1,5, розмір – 14 pt.

Назва статті має бути короткою (до 10 слів), адекватно відбивати її зміст, відповідати суті досліджуваної наукової проблеми. При цьому слід уникати назв, що починаються зі слів: «Дослідження питання…», «Деякі питання…», «Проблеми…», «Шляхи…», в яких не відбито достатньою мірою суть проблеми.

Анотації (українською, російською та англійською) набирати курсивом 12 кеглем. Виклад матеріалу в анотації має бути стислим і точним (близько 50 слів). Слід застосовувати синтаксичні конструкції безособового речення, наприклад: «Досліджено…», «Розглянуто…», «Установлено…» (наприклад, «Досліджено генетичні мінливості… Отримано задовільні результати…»).

Анотація статті англійською мовою (від 250 до 300 слів) та ключові слова англійською мовою (від 5 до 10 слів). Треба надати професійний переклад анотації статті англійською мовою (завірений печаткою бюро перекладів або відділу кадрів підпис викладача кафедри іноземних мов вашого ВНЗ). Бажано надати цю розширену анотацію українською (російською) мовою.

Анотація англійською мовою повинна бути структурованою (слідувати логіці опису результатів у статті), інформативною (не містити загальних слів); оригінальною (не може бути калькою російськомовної анотації); змістовною (відображати основний зміст статті та результати досліджень).

Посилання в тексті подавати тільки у квадратних дужках, наприклад [1], [1, 6]. Посилання на конкретні сторінки наводити після номера

джерела, потім через кому сторінку (маленьке с.), далі її номер (наприклад: [1, с. 5]). Якщо далі йде інше джерело, то ставити його номер через крапку з комою в тих самих дужках (наприклад: [1, с. 5; 4, с. 8]).

Усі цитати, мова оригіналу яких є іншою, подавати мовою Вісника й обов'язково супроводжувати їх посиланнями на джерело і конкретну сторінку.

Не робити посторінкових посилань, а подавати їх у дужках безпосередньо в тексті.

На всі рисунки й таблиці давати посилання в тексті. Усі рисунки мають супроводжуватися підрисунковими підписами, а таблиці повинні мати заголовки.

Рисунки виконувати у редакторі Microsoft Word за допомогою функції «Створити рисунок», а не виконувати рисунок поверх тексту. Написи на рисунках виконувати засобами Microsoft Word з тим, щоб редактор мав можливість зробити в них необхідні виправлення. У разі використання інших програм для створення рисунків надавати редакції на кожний рисунок окремий файл фотмату TIFF (незжатий – uncompressed) або формату JPG (найкращої якості – best quality).

Таблиці виконувати у редакторі Microsoft Word за допомогою функції «Додати таблицю». Кожна таблиця повинна займати не більше одного аркуша при розмірі шрифта TIMES тексту таблиці не менш ніж 12 кегль.

Формули у статтях по всьому тексту набирати у формульному редакторі MS Equation – 3.0, шрифт TIMES, 10 кегль.

Автори мають дотримуватися правильної галузевої термінології (див. держстандарти).

Терміни по всій роботі мають бути уніфікованими.

Між цифрами й назвами одиниць (грошових, метричних тощо) ставити нерозривний пробіл.

Скорочення грошових та метричних одиниць, а також скорочення млн, млрд, метричних (грн, т, ц, м, км тощо) писати без крапки.

Якщо в тесті є абревіатура, то подавати її в дужках при першому згадуванні.

Література, що приводиться наприкінці публікації, повинна розташовуватися в порядку її першого згадування в тексті статті й бути оформлена відповідно до ДСТУ ГОСТ 7.1:2006. Номер у списку літератури має відповідати лише одному джерелу.

Список використаних джерел повинен містити не менше 10 посилань, з яких не менше 7 на зарубіжні видання. Самоцитування – не більше 30%.

Обов'язкова наявність списку літератури англійською мовою (не виключає списку літератури мовою статті). Літературу не обов'язково перекладати англійською мовою. Її можна транслітерувати. Офіційна транслітерація українського алфавіту латиницею регламентується постановою Кабінету Міністрів України від 27 січня 2010 р. № 55. Офіцій-

ний трансліт онлайн – http://translit.kh.ua/?passport. Транслітерація російського алфавіту латиницею онлайн – http://www.translitor.net/.

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На диску повинен бути 1 файл з текстом статті, названий прізвищем автора (Стаття_Прізвище), файл з розширеною англійською анотацією (Анотація_Прізвище) та, при необхідності, файли з рисунками, графіками тощо.

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ЗРАЗОК ОФОРМЛЕННЯ СТАТТІ

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Текст анотації українською мовою **(50-60** слів**)**
Ключові слова: 4-7 ключових слів або словосполучень**.**

* Текст статті *

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L. Prokopenko, L. Chornolata. Name of the article.
Text of annotation англійською мовою **(50-60** слів**)**
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