

## **POSSIBILITIES OF MINIMISING RISKS ASSOCIATED WITH THREATS TO SAFETY OF MEAT PRODUCTS**

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Key words: risk perception, meat safety, young consumers.

### **A b s t r a k t**

This paper analysed the opinions of young consumers on chemical contaminations of meat and on methods used by them to minimize hazards. The research was carried out from 2007 to 2009, involving 1568 full-time students at the University of Warmia and Mazury in Olsztyn. Students from the second to sixth (in the case of the Veterinary Medicine Faculty) years of study were polled using the methods of random sampling and indirect survey measurement.

It was found that the safety of meat products as perceived by consumers depended on their confidence in the legal regulations in force and in food producers, as well as on the provision of detailed information on potential risks. It was found that the knowledge of young consumers in the domain of chemical threats involved in meat was not systemized. It was also found that the year of study and the education profile constituted characteristics which differentiated the perception of risk and the methods of minimizing this risk.

## **MOŻLIWOŚCI MINIMALIZOWANIA RYZYKA ZWIĄZANEGO Z ZAGROŻENIAMI BEZPIECZEŃSTWA PRZETWORÓW MIĘSNYCH**

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### **A b s t r a k t**

Celem pracy było zbadanie opinii młodych konsumentów produktów mięsnych dotyczącej zanieczyszczeń chemicznych mięsa oraz sposobów minimalizowania zagrożeń. Badania realizowano w latach 2007–2009 wśród 1568 studentów studiów dziennych Uniwersytetu Warmińsko-Mazurskiego w Olsztynie. Badaniami objęto drugi, trzeci, czwarty, piąty i szósty (w przypadku Medycyny Weterynaryjnej) rok studiów. Zastosowano metodę losowego doboru próby. Badania przeprowadzono metodą pośredniego pomiaru sondażowego.

Wykazano, że postrzegane bezpieczeństwo produktów mięsnych jest uwarunkowane zaufaniem konsumentów do regulacji prawnych i producentów żywności, jak również dostarczaniem wyczerpujących informacji o potencjalnym ryzyku. Stwierdzono, że wiedza młodych konsumentów z zakresu zagrożeń chemicznych mięsa nie jest usystematyzowana. Wykazano, że rok studiów i profil kształcenia były cechami różnicującymi percepcję ryzyka i sposoby jego minimalizowania.

## Introduction

Risk in the context of consumer purchasing decisions is a form of uncertainty which consumers encounter when they cannot foresee important consequences of making a decision about the purchase of a product. Currently, consumers expect not only a wide choice of price-competitive, convenient and highly processed food products, but also fresh, tasty food with high nutritional values, but above all, safe food (JAKUBOWSKA, RADZYŃSKA 2010, pp. 381–385).

The identification of chemical contaminations of meat and its products has gained increasing significance in the face of increasing knowledge of consumers and their often disapproving approach to applied agricultural production methods and natural environmental pollution. Consumers believe the issue of chemical residues in food is closely linked with food quality and safety, particularly with the quality and safety of meat and its products (OBIEDZIŃSKI, KORZYCKA-IWANOW 2005, pp. 10–12). According to KOWALCZYK (2009, pp. 15), food safety includes such elements as the quality of food, its compliance with trade and market standards, its organoleptic, physicochemical and microbiological food properties and irregularities associated primarily with food adulteration. OZIMEK (2007, pp. 321–325) emphasizes that food quality and safety depend on multiple factors, among others, on the contamination level of the environment, proper measures used at each production stage and food preparation methods in households. URBAN (2005, pp. 14–17) showed that the presence or absence of foreign chemical compounds in meat products depends, among other things, on the impact of stock-farming stimuli, post-slaughter changes, processing methods and the storage of products until they are consumed. This shows that food safety is a multi-disciplinary field referring not only to food products, but also the methods and basic conditions of production and safety of agricultural production, the environment and wild animals (KOWALCZYK 2009, pp. 15).

Governmental organizations, as well as food producers, maintain liability for ensuring that toxic chemicals are not present in food at the stages that can negatively affect the health of consumers. In contrast to the microbiological contamination of food which causes instant alimentary intoxication, the consequences of chemical contamination very rarely cause acute poisoning.

However, they may produce pathological symptoms after a long time (WAWRZYŃIAK, PAWLICKA 2000, pp. 55–60). Owing to this specific behaviour, the levels of such chemical compounds consumed in food products must be checked to ensure there is no danger to consumer health. For this purpose, admissible levels are set regarding the contents of individual substances in food products and the observance of these levels is monitored (WHO 2004). This type of control is indispensable for protecting the health of consumers, as well as for facilitating the trade of food products. At the same time, careful attention must be paid to estimating the consumer health risks caused by the presence of toxic compounds in food products.

Consumers are becoming increasingly interested in issues relating to the presence of harmful chemical substances in food products. While assessing food products, they consider, among other things, information shown on the packaging, other consumers' opinions and data disseminated by the mass media. They purchase a specific food product not only based on its sensory features (appearance, smell), utility or aesthetic qualities, but also on any foreign substances it contains which could endanger their health (KRYSZTAŁIS, ARVANITOYANNIS 2006, pp. 164–176). POŚPIECH et al. (2006, p. 24) also identified other factors motivating a consumer to purchase a given food product. One of such factors is the availability of a given raw material on the market and its price. Although an increase in the price of meat and its products causes consumers to buy smaller quantities of expensive meat assortments, the consumers' expectations of quality are also increased.

A study by RADZYMIŃSKA et al. (2010, pp. 132–139) into the perception of foreign substances in food found that the level of consumer knowledge in this domain is diversified. Two groups of young consumers were distinguished based on their knowledge of food-related risks. The first group, the majority of consumers, were more aware of the occurrence of the chemical risks than of the microbiological risks in food. VERBEKE and VIAENE (1999, pp. 437–445) found that during the crisis in Belgium caused by BSE (Bovine Spongiform Encephalopathy), consumers' perception of health safety and the reliability of beef meat constituted a major problem in this regard. This event showed that in a situation with no information provided on a health hazard, consumers behaved completely differently than during a food-connected crisis, which produced a short-term perception of threat amongst consumers. Those issues gave rise to many debates, and several authors represented the topics linked with the perception of health hazards by food consumers (DE BOER et al. 2005, pp. 241–265, KNOWLES et al. 2007, pp. 43–67, LEIKAS et al. 2007, pp. 232–240, BREWER, ROJAS 2008, pp. 1–22). However, there is scarce data referring to how harmful chemical substances are perceived by young food consumers.

The objective of the research performed by JAKUBOWSKA et al. (2010, pp. 123–129) was to determine the perception of risks resulting from the presence of chemical compounds in meat products in relation to the demographic characteristics of the surveyed consumers. Additionally, the respondents were classified according to how they perceived the individual risk components. It was found that in the group of demographic characteristics, age was a factor influencing almost all the determinants of the perceived risk. Two key segments were identified based on how the surveyed consumers perceived the risk components. One segment of respondents (the majority of whom were aged between 45 and 54 years) were characterized by a higher level of knowledge, by the awareness of the presence of chemical compounds in meat products and by fears of the consequences of their effects. According to the opinions of consumers in this segment, both the legal regulations and the level of controlling the presence of chemical compounds were insufficient. In other research (JAKUBOWSKA et al. 2010, pp. 57–63), the same authors found that the risk involved in the purchase of meat products as perceived by consumers impacted the consumers' purchasing decisions. In the event of consumers perceiving a high risk, they are more likely to buy established, proven brands and products of guaranteed quality or to seek more information on products. Moreover, a consumer's country-of-origin-related biases (JAKUBOWSKA et al. 2010, pp. 29–37) were revealed between the risk perceived by the consumers and the methods used by them to reduce this risk.

The objective of this paper was to survey the opinions of young consumers on chemical contamination of meat and on possible methods they employ to minimize threats.

## **Subject and Methodology of Research**

The research was carried out from 2007 to 2009 using a survey of 1568 students. All of them were full-time students between the second and sixth (in the case of the Veterinary Medicine Faculty) years of study at the University of Warmia and Mazury in Olsztyn using the simple random sampling method (without replacement). The structure of the surveyed individuals is presented in Table 1.

The research was performed using the method of indirect survey measurement. The questionnaire form included issues connected with the perception of chemical threats in meat and meat products as well as risk-reducing methods. The items were modified from the work of YEUNG and YEE (2003, pp. 219–229) and YEUNG and MORRIS (2006, pp. 294–305) by excluding those items not related to chemical hazards. The respondents were requested to express their opinions using a 7-level Likert scale.

Table 1

## Sample profile

Variable	Number	[%]
Fields of science		
Economics	422	26.91
Agriculture	425	27.10
Veterinary medicine	123	7.84
Technical science	208	13.26
Law	192	12.25
Humanities	126	8.04
Biology	72	4.60
Year of study		
I	383	24.42
II	324	20.66
III	388	24.74
IV	263	16.77
V	173	11.03
VI	37	2.38

The results received were statistically tabulated with the use of basic statistics, i.e. mean and standard deviation. By applying a chi-squared test (known as  $\chi^2$  test), the impact of quality variables (the year and profile of studies) was determined on the perception and threat-minimizing methods.

## Results and Discussion

### Determinants of the Perceived Risk

Table 2 contains the opinions of young respondents polled referring to the major factors affecting the perceived risks connected with the presence of harmful chemical substances in meat and meat products. The analysis of the respondents' knowledge of the issues discussed showed that the information they had was insufficient. The respective views varied depending on the year of studies of the respondent and on his/her education profile (Table 2). The respondents found the use of growth hormones (GH) and antibiotics to breed and cure animals to be the main cause of the presence of harmful chemical substances in meat and meat products. Those opinions are supported by PURCELL and LUSK (2003, pp. 463–492) and OZIMEK et al. (2004, pp. 100–111), who also found a high percentage of food consumers believed that plant protection chemicals, antibiotics and additional substances were elements of food production which involved a high risk to consumers.

Table 2  
Determinants of risk perception in relation to year and fields of study of respondents

Opinion of Respondents		$x \pm SD$	Median	Year of study	Fields of science
				$\chi^2$ value	
Knowledge	Sources of chemical contamination in meat:				
	– environmental contaminants (dioxins, PCBs pesticides)	3.65 ± 1.84	3	83.36**	91.02**
	– animal husbandry (veterinary drugs, growth promoters)	5.88 ± 1.21	6	51.53	48.197
	– improper storage	5.06 ± 1.58	5	66.92**	68.25**
	– food preparation (nitrosamines, acrylamide)	4.13 ± 1.79	4	75.23**	62.73*
Information	Incomplete information about chemical hazards	4.39 ± 1.89	5	127.62**	165.04**
Awareness of consequences	Adverse effect on the environment	5.88 ± 1.22	6	40.83**	59.61**
	Adverse effect on future generations	5.97 ± 1.17	6	27.67	35.13
	Real risks are hidden from consumers	5.60 ± 1.27	6	62.65	55.45*
Concern	Concern about the consequences	5.29 ± 1.52	6	25.50	50.54
	Becoming more serious	5.56 ± 1.21	6	43.77*	52.59*
Control	Controlled by adequate regulations	3.36 ± 1.60	3	53.54**	62.87**
	Prevented by meat producers	5.32 ± 1.40	6	45.55*	62.91**

$x$  – mean value, SD – standard deviation

\* and \*\* – indicate statistical significance at the 0.05 and 0.01 levels, respectively.

It was found in this study that the young consumers were aware of the consequences resulting from the presence of harmful chemical substances in the analysed products. These results support the research results of MCCARTHY and BENSON (2005, pp. 435–445), who showed that consumers fear the impact of harmful compounds in food on their health, although they do not possess sufficient knowledge of this issue.

The education profile differentiated the respondents regarding their opinions on informing about the risk and impact of the compounds under analysis on the environment. The respondents expressed their fears concerning the effects of harmful compounds (5.29 ± 1.52) and their levels in meat and meat products (5.56 ± 1.21). This view seems reflected in the fact that the respondents also assessed the legal controls as very poor (3.36 ± 1.60). OBIEDZIŃSKI and KORZYCKA-IWANOW (2005, pp. 10–12) remark that control efficiency was so poorly assessed because the public generally believes that the efficiency of examinations and controls of food products on the market is also very poor from the point of view of the consumer health safety.

## Risk-Reducing Methods Applied by the Respondents

Table 3 represents an analysis of selected issues linked with the risk-minimizing methods applied by the consumers. The results found that the young consumers highly positively assessed the guaranteed quality of a product ( $5.82 \pm 1.30$ ), loyalty to the brand ( $5.67 \pm 1.32$ ), inspections in the state-run laboratories ( $5.32 \pm 1.56$ ) and the information shown on the packaging ( $5.31 \pm 1.48$ ) as factors to reduce the food-related risks. Neither the year of studies nor the education profile of the respondents differentiated the opinions on this issue, except for the variables: “purchase of a product inspected in a state-run laboratory” and “seeking information on the product’s packaging”.

Table 3  
Risk-reducing strategies in relation to year and fields of study of respondents

Risk-reducing strategies		$x \pm SD$	Median	Year of study	Fields of science
				$\chi^2$ value	
Brand loyalty	Purchasing the same brand that I purchased before	5.67+1.32	6	27.33	50.48
Quality assurance	Choosing meat with quality assurance	5.82+1.30	6	29.64	39.27
	Purchasing meat that has been tested by government laboratory	5.32+1.56	6	49.74*	83.35**
	Purchasing meat that has been tested by private laboratory	4.73+1.60	5	57.14**	64.52**
Product information	Reading the label for product information	5.31+1.48	6	44.56*	44.02
	Taking the advice of family and friends	5.13+1.46	5	44.23*	55.67*
Place of purchase	Purchasing a meat product that is available in all supermarkets	3.28+1.71	5	37.86	39.11

\* and \*\* indicate statistical significance at the 0.05 and 0.01 levels, respectively.

In the context of the present research, it should be stressed that the seeking of information, and, in particular, the analysis of the information on the packaging were highly positively assessed by the respondents. SZYMAŃSKI (2008, pp. 12–19) adds that despite very many detailed legal regulations and instructions on how the meat and meat products should be labelled, there are still many improperly labelled meat products on the market largely owing to different interpretations of the legal regulations in force. The respondents believe that choosing a proven, established brand can decrease the risks involved in the purchase of meat and meat products. GÓRALCZYK (2006,

pp. 26–32) says that the importance of meat product brands for consumers is higher than commonly believed. This finding is confirmed by GÓRSKA-WARSEWICZ (2006, pp. 41, 42), who found that consumers treat the brand of meat products as a synonym of a guarantee of quality and health safety.

DE BOER et al. (2005, pp. 241–265) state that consumers' knowledge and awareness of threats involved in food has increased during recent years; however, the risk as perceived by the consumers still differs from the risk found by the experts, and consumers still do not take scientific information into account. It was shown that the gender or nationality could be a variable differentiating the respondents in this range (JAKUBOWSKA et al. 2010, pp. 29–37). It was found that women had less confidence in the health safety of food than men (BERG et al. 2005, pp. 103–129), DE JONGE et al. 2004, pp. 837–849). It was demonstrated that young people perceived food-related risk essentially lower than older individuals (DOSMAN et al. 2001, pp. 307–317); however, the data on this issue is not unambiguous (KIRK et al. 2002, pp. 189–197, DE JONGE et al. 2004, pp. 837–849).

## Conclusions

The results indicate that the perception of meat and meat product safety depends on the confidence of consumers in legal regulations and food producers, as well as in the provision of exhaustive information on potential risks.

The survey found that young consumers are aware of the causes and reasons of risks involved in meat and meat products, but, at the same time, their knowledge is not systemized. It was also shown that the year of studies and the education profile constituted characteristics to differentiate the perception of risk and the methods of minimizing it.

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