

## PREFERENCES OF FUNCTIONAL FOOD WITHOUT OR WITH GENETICALLY MODIFIED TECHNOLOGY IN THE PERSPECTIVE OF PERCEIVED HEALTH RISK RELATED TO METABOLIC SYNDROME

Marzena Jeżewska-Zychowicz<sup>1</sup>, Lidia Wądotowska<sup>2</sup>, Marzena Danowska-Oziewicz<sup>2</sup>,  
Maria Daniel Vaz de Almeida<sup>3</sup>, Barbara Stewart-Knox<sup>4</sup>

<sup>1</sup>Department of Organization and Consumption Economics, Warsaw Agricultural University, Warsaw, Poland;

<sup>2</sup>Department of Human Nutrition, University of Warmia and Mazury, Olsztyn, Poland;

<sup>3</sup>Faculty of Nutrition and Food Sciences, Porto University, Porto, Portugal;

<sup>4</sup>School of Biomedical Science, University of Ulster at Coleraine, Coleraine, Northern Ireland UK

Key words: functional food, genetically modified food, metabolic syndrome, perceived health risk

The objective is to investigate the importance of perceived health risk for consumers' preferences to purchase functional food without and with genetically modified technology. An interview-assisted questionnaire on attitudes towards the metabolic syndrome, potential agro-food technologies and genetics in nutrition was applied within a Polish representative sample of 1005 adults.

There was a tendency to consider central obesity as medium-risk condition (34.5%), high blood pressure as high and very high-risk condition (42.4%), high stress level as both medium- (34.0%) and high and very high-risk conditions (38.1%). Both high cholesterol and high blood sugar were considered as low- (34.2% and 39.5%, relatively) and high- and very high-risk conditions (36.7% and 34.2%, relatively). The functional food products were preferred by higher amount of respondents in comparison with the same functional products including genetic modifications. The perceived health risks related to metabolic syndrome correlated with intentions to eat only two products representing functional food produced with and without using GM technology – poultry and butter.

### INTRODUCTION

The concept of functional food products is still unclear in the EU [Urala & Lähteenmäki, 2007]. In working definition of functional food it is written "if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body" [Diplock *et al.*, 1999]. An important role in functional food choices plays trust in health-related information [Verbeke, 2005].

GM production is often outspokenly opposed to by consumer groups, and even by environmental organizations, especially in Europe [Magnusson & Koivisto Hursti, 2002; Bredahl, 2001]. Public opposition to GM foods can be explained, in part, by the importance of the unknown and dread risk characteristics in perception of food risks. On the other hand consumers are not well informed about which products contain GM ingredients [Finucane & Holup, 2005]. Previous studies indicate that consumers have quite negative attitude towards GM food [Grunert *et al.*, 2003; Magnusson & Koivisto Hursti, 2002; Koivisto Hursti & Magnusson, 2003; Rowe, 2004].

Consumers express interest in issues relating food to health [Fagerli & Wandel, 1999; Rozin *et al.*, 1999]. Healthiness is an important criterion for purchase and a parameter of quality for many consumers [Magnusson *et al.*, 2001].

The objective of the present study is to investigate the importance of perceived health risk for consumers' preferences to purchase functional food without and with genetically modified technology. The aim is to answer the question if genetic modifications decrease the consumer's interest in purchase of functional food.

### MATERIALS AND METHODS

The data were collected under the LIPGENE project (FOOD-CT-2003505944; 6PR UE). An interview-assisted questionnaire on attitudes towards the metabolic syndrome, potential agro-food technologies and genetics in nutrition, consisting of 12 close-ended questions and an additional open-ended item, was applied [de Almeida *et al.*, 2006]. A representative sample of 1005 adults (aged 15 years and upwards) was selected in Poland. Data collection took place in June 2005. The survey was included in an omnibus research study.

Sample characteristics is presented in Table 1.

To measure perceived health risks related to metabolic syndrome, participants were asked to rank five risk factors from "no health risk" (0) to "extremely high risk" (10). The respondents ranking after changing the codes to following: 1 - no risk (0 from the original scale); 2 - low risk (1-3), 3 - medium risk

TABLE 1. Characteristics of clusters according to sample characteristics.

	Total	Clusters		
		Low risk cluster N=274	Medium risk cluster N=327	High risk cluster N=352
Gender				
Men	48.2	48.5	44.8	51.7
Female	51.8	51.5	55.4	48.3
Age *				
15-24 y	23.0	28.8	23.9	17.1
25-34 y	18.0	21.9	15.1	18.0
35-44 y	16.3	16.1	16.8	15.9
45-54 y	17.0	15.0	16.8	19.0
55-64 y	15.1	12.0	16.5	16.2
65-79 y	10.6	6.2	11.1	13.8
Working status				
Working	43.4	46.7	43.3	40.8
Not working	56.6	53.3	56.7	59.2
Educational level*				
Primary	21.4	16.1	24.1	23.0
Secondary	30.2	34.8	30.1	26.4
Higher education	48.4	49.1	45.7	50.6
Health conditions				
High cholesterol*	6.4	3.5	6.8	10.5
High blood pressure*	11.2	2.0	16.2	16.4
Higher amount of fat around middle*	13.3	5.9	17.8	17.3
High blood sugar*	3.7	1.6	3.6	6.5
High stress level	16.3	16.1	18.8	17.0

\*p&lt;0.05

(4-6), 4 - high risk (7-9) and 5 - very high risk (10 from the original scale) were used to classify the population into three clusters (Table 1). Characteristic of clusters according to socio-demographic features of the sample is presented in Table 1.

To collect data related to preferences to purchase functional food with and without GM technology, participants were asked to indicate their preferences to eight food products (butter, cheese, egg, milk, red meat, fish poultry and yoghurt). One list included "foods produced with healthy fat" and the other, the same foods "developed through GM technology".

## RESULTS AND DISCUSSION

There was a tendency to consider central obesity as medium-risk condition (34.5%), high blood pressure as high- and very high-risk condition (42.4%), high stress level as both medium- (34.0%) and high- and very high-risk conditions (38.1%). Both high cholesterol and high blood sugar were considered as low- (34.2% and 39.5% relatively) and high- and very high-risk conditions (36.7% and 34.2% relatively).

The perceived low risk cluster was presented by 28.8% of respondents, the medium risk one by 34.3% and the high risk cluster by 36.9% of the population (Table 2).

The acceptance of "foods produced with healthy fat" was differentiated. The favorite options were fish, cheese, butter and poultry "with healthy fat". The acceptance of all foods developed through genetic modification technology decreased markedly. The biggest difference in indications related to fish, cheese and butter, the smallest one to red meat and eggs (Figure 1). About

TABLE 2. Characteristics of clusters according to the health risk (mean value based on the health risk level from 1 to 5 points scale).

Diseases	Clusters		
	Low risk cluster N=274	Medium risk cluster N=327	High risk cluster N=352
High cholesterol	1.46	2.94	4.30
High blood pressure	1.45	3.17	4.52
Higher amount of fat around middle	1.54	2.69	3.66
High blood sugar	1.40	2.66	4.34
High stress level	2.11	3.14	4.10

TABLE 3. Preferences to purchase selected products with healthier fat (without and with GMO) according to clusters distribution (p&lt;0.05).

Products with healthier fat	Low risk cluster N=274	Medium risk cluster N=327	High risk cluster N=352
Poultry with healthier fat (without GMO)	19.7	27.6	27.2
Butter with healthier fat (without GMO)	23.0	25.6	31.5
Butter with healthier fat with GMO	13.1	14.8	20.5
Poultry with healthier fat with GMO	12.8	20.7	19.3

18% of the population (18.1%) would not choose any of the proposed functional foods with GM, and this proportion decreased to 14.6% in the case of functional food without GM.

The results showed that Polish consumers would not like to accept GM food if it was developed to be beneficial to them – with healthy fat. Other studies showed that consumers may actually be willing even to pay a premium for a GM food which is beneficial to them [Lusk, 2003].

There were statistically significant correlations between preferences towards poultry and butter with "healthier fat", also developed through GM technology, and clusters based on the level of perceived health risks. More respondents representing medium and high risk cluster preferred poultry with healthier fat (without GM and with GM) than from low risk cluster. Butter with healthier fat (without GM and with GM) was preferred by more persons from high risk cluster in comparison with other clusters (Table 3). It can be stated that using GM technology in producing poultry and butter with healthier fat caused the decrease of the respondents' preferences to purchase them in all clusters. The bigger differences in ratings were observed in relation to butter (decrease about 10%) than to poultry (about 7%) – Table 3.

## CONCLUSIONS

The results indicated that using GM technology in producing functional food products caused the decrease of respondents' preferences to purchase them. The perceived health risks related to metabolic syndrome correlated with

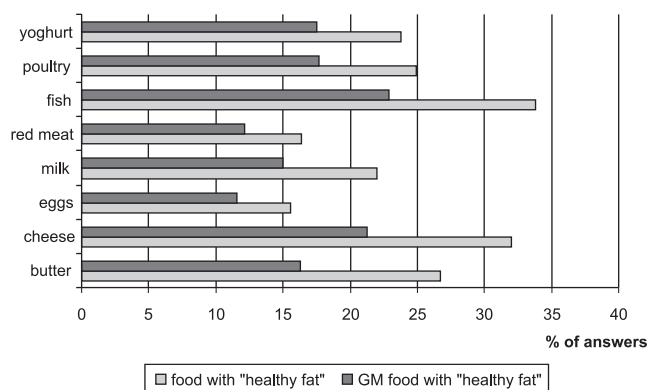


FIGURE 1. Preferences of selected food with "healthy fat" produced with and without GM technology.

intentions to eat only two products representing functional food produced without and with GM, namely poultry and butter. It can be stated that further nutritional education concerning the role of functional food is needed in Polish society.

## REFERENCES

- Bredahl L., Determinants of consumer attitudes and purchase intentions with regard to genetically modified foods – results of a cross-national survey. *J. Consumer Policy*, 2001, 24, 23-61.
- De Almeida M.D.V., Pinahão S., Stewart-Knox B., Parr H.J., Gibney M.J., A six-country European survey on consumer attitudes to the metabolic syndrome, genetics in nutrition and potential agro-food technologies: questionnaire design methodology. *Brit. Nutr. Found., Nutr. Bull.*, 2006, 31, 138-144.
- Diplock A.T., Agget P./J., Ashwell M., Bornet F., Fern E.B., Roberfroid M.B., Scientific concepts of functional foods: issues for the future. *Brit. J. Nutr.*, 1999, 81,1-27.
- Fagerli R.A., Wandel M., Gender differences in opinions and practices with regard to a "healthy diet". *Appetite*, 1999, 32, 171-190.
- Finucane M.L., Holup J.L., Psychosocial and cultural factors affecting the perceived risk of genetically modified food: an overview of the literature. *Soc. Sci. Med.*, 2005, 60, 1603-1612.
- Grunert K.G., Bredhal L., Scholderer J., Four questions on European consumers' attitudes toward the use of genetic modification in food production. *Innov. Food Sci. Emerg. Technol.*, 2003, 4, 435-445.
- Koivisto Hursti U.-K., Magnusson M.K., Consumer perception of genetically modified and organic foods. What kind of knowledge matters? *Appetite*, 2003, 41, 207-209.
- Lusk J.L., Effects of cheap talk on consumer willingness-to-pay for golden rice. *Am. J. Agric. Econom.*, 2003, 85, 840-856.
- Magnusson M.K., Koivisto Hursti U.-K., Consumer perceptions of foods produced by means of genetic engineering. *Appetite*, 2002, 39, 9-24.
- Magnusson M.K., Arvola A., Koivisto Hursti U.-K., Lberg L., Sjöden P.-O., Attitudes towards organic foods among Swedish consumers. *Brit. Food J.*, 2001, 103, 209-226.
- Rowe G, How can genetically modified foods be made publicly acceptable? *Trends Biotechnol.*, 2004, 22, 107-109.
- Rozin P., Fischler C., Imada S., Sarubin A., Wrzesniewski A., Attitudes to food and the role of food in life in the USA, Japan, Flemish Belgium and France: possible implications for diet-health debate. *Appetite*, 1999, 33, 163-180.
- Urala N., Lähteenmäki L., Consumers' changing attitudes towards functional foods. *Food Qual. Pref.*, 2007, 18, 1-12.
- Verbeke W., Consumer acceptance of functional foods: socio-demographic, cognitive and attitudinal determinants. *Food Qual. Pref.*, 2005, 16, 45-57.

## PREFERENCJE WZGLĘDEM ŻYWNOŚCI FUNKCJONALNEJ PRODUKOWANEJ BEZ I Z ZASTOSOWANIEM GENETYCZNYCH MODYFIKACJI A ODCZUWANE RYZYKO CHORÓB DIETOZALEŻNYCH

Marzena Jeżewska-Zychowicz<sup>1</sup>, Lidia Wądołowska<sup>2</sup>, Marzena Danowska-Oziewicz<sup>2</sup>,  
Maria Daniel Vaz de Almeida<sup>3</sup>, Barbara Stewart-Knox<sup>4</sup>

<sup>1</sup>Katedra Organizacji i Ekonomiki Konsumpcji, SGGW, Warszawa, Poland;

<sup>2</sup>Katedra Żywnienia Człowieka, Uniwersytet Warmińsko-Mazurski w Olsztynie, Olsztyn, Poland;

<sup>3</sup>Faculty of Nutrition and Food Sciences, Porto University, Porto, Portugal;

<sup>4</sup>School of Biomedical Science, University of Ulster at Coleraine, Coleraine, Northern Ireland, UK

Celem pracy była analiza poziomu odczuwanego ryzyka wystąpienia chorób dietozależnych i jego związku z deklarowanymi preferencjami względem wybranych produktów żywnościowych reprezentujących żywność funkcjonalną wyprodukowaną bez udziału lub z udziałem genetycznych modyfikacji. Badanie przeprowadzono w reprezentatywnej grupie 1005 dorosłych respondentów.

Ponadprzeciętna ilość tłuszczu odkładającego się na brzuchu została uznana jako czynnik średniego ryzyka (34,5%) wysokie ciśnienie krwi jako czynnik wysokiego i bardzo wysokiego ryzyka (42,4%), wysoki poziom stresu jako czynnik średniego (34,0%), wysokiego i bardzo wysokiego ryzyka (38,1%). Wysoki poziom cholesterolu oraz duża ilość cukru we krwi określono zarówno jako czynniki niskiego (odpowiednio: 34,2% i 39,5%), jak i wysokiego oraz bardzo wysokiego ryzyka (odpowiednio: 36,7% i 34,2%). Produkty reprezentujące żywność funkcjonalną były preferowane przez większy odsetek badanych w porównaniu z tymi samymi produktami, gdy zastosowano w nich genetyczne modyfikacje. Stopień odczuwanego ryzyka chorób dietozależnych istotnie korelował z deklarowanymi preferencjami względem takich produktów zawierających „zdrowszy tłuszcz” jak drób i masło, zarówno w przypadku gdy wyprodukowano je z zastosowaniem lub bez zastosowania genetycznych modyfikacji.