

## Summary of PhD thesis

# Investigation on purchasing habits and consumption of functional foods, in particular lactose-free dairy products

**dr. Erika Szabó**

Supervisor: dr. László Ózsvári

Co-supervisor: dr. Gyula Kasza



UNIVERSITY OF VETERINARY MEDICINE  
Postgraduate School of Veterinary Medicine

Budapest, 2023.

Supervisors:

.....

dr. László Ózsvári PhD, MBA  
Full Professor, Head of Department  
Department of Veterinary Forensics and Economics  
University of Veterinary Medicine Budapest  
Supervisor

.....

dr. Gyula Kasza PhD  
Associate Professor  
Department of Applied Food Science  
University of Veterinary Medicine Budapest  
Co-supervisor

Doctoral candidate:

.....

dr. Erika Szabó

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## **1. Introduction and aims of the study**

As science develops, the importance of food, nutrition and lifestyle in health-conscious consumer behaviour is increasingly coming to the fore. The widespread recognition of food-related diseases, sensitivities and allergies contributes to the consumption of functional foods, which developed for people with altered physiological conditions, such as lactose-free products. The proportion of people with lactose intolerance in Hungary is steadily increasing, so the demand for these types of products is expected to grow.

The functional food market was in Japan the first to develop into a distinct food category, in the United States, products with added fortified ingredients are the most popular, while in Europe and Hungary, products tailored to specific needs are more popular, although this market segment is still in its infancy. Hungary has a very large number of arable and horticultural crops and animal products whose functional ingredients in some cases exceed the nutritional and biological value of the same varieties produced in other geographical areas. Domestic functional products therefore have competitive agricultural and food advantages, and their production

can be economically viable with technological innovation and a well-defined consumer demand.

Hungarian consumers' awareness of food choices - in particular healthy eating and knowledge of safe, traceable systems - is considered to be lagging behind, at a very low level globally, but is on the rise. Consumers' product choices are largely determined by their subjective perceptions and preferences, so proper market segmentation is key to the correct marketing of functional foods, and for this, it is essential to study the habits and expectations of the targeted consumer groups. Our research was focused on the consumers' perception of the domestic lactose-free product market, and the results of this research will effectively support the successful market introduction of a new functional product. The main objectives of the research were:

- Identifying the Hungarian market segment of lactose and gluten-free foods and to explore their purchase motivations.
- Identifying the Hungarian lactose-sensitive consumers, their attitudes towards lactose intolerance, lactose-free and dairy products.

- Assessing the knowledge of lactose intolerance, pro-, pre- and synbiotics, and the communication sources used by consumers.
- Identifying where consumers purchase food that could be the stage for a new product.
- Assessing the willingness and extent of consumers to pay for a lactose-free product to define an approximate price of a new product that consumers would find acceptable.
- Identifying the value-added factors of lactose-free milk.

## **2. Summary of the results**

Research was methodologically based on a large-scale (n=1002) personal questionnaire survey, in which most of the questions were closed-ended, in addition to multiple-choice and self-administered questions. The survey was representative according to age, gender and place of residence by statistical regions (NUTS-2) based on the 2016 HCSO microcensus. Sampling took place in July and August 2018. Based on the results of the survey, the number of regular consumers of lactose-free products in our country is estimated to be more than 1.5 million (every fifth resident) in 2018, so it is worthwhile for dairy operators to consider this direction for product development.

### ***2.1. Examination of consumers of "free from" products***

In the analysis of our sample (n=1002), we identified a significant group of consumers (n=78) who frequently consume both lactose- and gluten-free foods, who were distinguished as a "free from" group from the average

consumer. This group accounts for 7.8% of our sample, which could mean more than 600,000 adult consumers ate "all free" in 2018 in Hungary. There were significantly more women in this group, with 66.7%, compared to 52.1% of the group of regular consumers. Excluding the gender distribution, the attitudes of consumers towards lactose- and gluten-free products could not be explained by their sociodemographic characteristics.

More respondents in the 'free consumer' group paid attention to healthy eating and informed choice, and their attitudes towards these were significantly higher (average score 4.27 out of 5), and the quality of food was a more important factor for them (4.48/5) compared to the "ordinary" consumers (mean 3.87/5, or 4.34/5). Consumers in the "Freefrom" group were willing to pay more for foods that they considered "healthy" (4.25/5) and this product attribute was significantly more important to them (4.08/5) than to the "ordinary" consumer group (3.93/5, or 3.33/5). It is worth pointing out to consumers that lactose-free dairy products are not healthier than the basic versions and that their development is aimed at ensuring that lactose intolerant people can also enjoy milk and dairy products with excellent nutritional value, not at producing a healthier version.

The choice of lactose- and gluten-free products was medically justified for only a minority of consumers. 35.9% of the "Freefrom" group ate lactose- and gluten-free foods without experiencing symptoms or having any health problems in their family. Overall, 51.3% of the „Freefrom” group self-taught themselves to eat a gluten-free diet. This for the 2018 Hungarian adult population (8,063,258), representing approx. 320,000 consumers, which has a significant public health risk.

Our further analyses showed that a part of the group was suspected of having orthorexia nervosa, as the main behaviours associated with the disease include a higher consumption of dietary supplements (47.22%) and a higher than average attention to diet (45.83%), which were typical of a fraction of the average consumer (24.0% and 28.9% respectively). However, we emphasise that this potential consumer group is not a target group for new product development, as this could reinforce the perpetuation of the psychological disorder, but our results draw attention to this phenomenon, the clinical relevance of which may be of interest.

## ***2.2. Lactose intolerant consumers survey***



The other group of consumers was the lactose intolerant group, which was filtered and identified from a full sample based on the question "Do you have a lactose intolerant person in your family?" (possible answers: "yes, me; yes, family member; none"). The proportion of personally affected in the sample was 10.4%, and in this group, half of the women (49.3%) and a third of the men (34.6%) have seen a doctor for lactose intolerance, while the other half self-diagnose themselves as lactose intolerant. A significant association was obtained between gender and the presence of a medical diagnosis ( $p=0.001$ ) and between gender and the frequency of consumption of lactose-free products ( $p<0.05$ ). A higher proportion of women (71.0%) regularly consumed lactose-free products than men (55.5%). A particularly high proportion of people under 30 years of age and those with a high school education had a Likert score of 4 and 5 for lactose-free consumption. In our survey, we found a high proportion of lactose intolerant people (19.8%) who did not even consume lactose-free dairy products. Furthermore, there was also a part of the group who claim to be lactose intolerant but did not particularly care about this condition, typically not seeking out lactose-free products. Women (83.9%) were the most likely to be

concerned about lactose intolerance and to spend money to avoid its symptoms, so they are already a safe target group, compared to 56.0% of men.

The majority of men with lactose intolerance did their shopping with family, and by their own admission, most of them did not or hardly ever consumed lactose-free products, which raises the question of whether the family does not support the men's lactose-free diet or whether the men do not wish to pay attention to it, or whether it is not desirable to discuss digestive problems within the family. In view of the above, men could also be potential consumers if they are informed in a clear and informative way about the negative impact of long-term untreated diseases on their health and quality of life.

The whole sample (n=1002) had a negative perception of milk healthiness, with the negative perception being even higher for people with lactose intolerance than for the average shopper. Furthermore, they were no more concerned about the lower calcium intake and resulting osteoporosis that is typical of their group, suggesting a low awareness of the nutritional benefits of milk, and therefore an awareness campaign among them would be recommended. In addition to the one-off medical certificate, it would be advisable to provide for ongoing

health checks as a condition for the financial support they receive under the legislation in order to establish and monitor the effectiveness of the diets and to encourage health awareness and dietary vigilance among lactose-sensitive people.

### ***2.3. Awareness of lactose intolerance symptoms and pro-, pre- and synbiotics among consumers***

Consumers' knowledge of lactose intolerance and the role of functional, pro-, pre- and synbiotics in nutrition was assessed by self-administered questions, designed to elicit both superficial and real knowledge from respondents. The overall sample has a high level of knowledge of lactose intolerance symptoms, but a low level of knowledge of functional dairy products that help digestion and alleviate lactose intolerance symptoms. Respondents were most aware of the role of probiotics, 19.8% of the total sample have a correct knowledge of probiotics. Those who have only heard of them but did not know them accurately make up 61.6% and 56.4% of the population for probiotics and prebiotics respectively, and 28.1% for synbiotics. The highest level of knowledge about probiotics is presumably due to their presence in

advertisements over a longer period of time, therefore it is recommended to use educational advertising and educational material about pre- and synbiotics on the subject in connection with the marketing of these types of products. The less lactose-free part of the sample, the product labels "live flora" and "probiotic" were preferred by different means, and in all cases the Hungarian name was preferred („live flora”), which should be taken into account when designing marketing texts.

For the overall sample, the most common source of information on food and nutrition was the internet news sites and blogs (3.9 on a 5-point scale), followed by reliable "word of mouth" (3.48/5): family, friends, relatives, and then social networking sites (3.32/5). The place to communicate a new product is therefore primarily the internet, and direct consumer experience of the product, for example through tasting involving dietitians, can also be highly beneficial and can easily spread through the acquaintances.

#### ***2.4. Preferred shopping locations used by consumers***

The availability of the products will determine the potential customers and knowing where consumers want to buy can outline a potential gap in the market. Regarding the place of purchase, the whole sample, regardless of the consumption of the lactose-free product, primarily in larger shopping centres bought the food and farmers' markets were the second most important place of purchase. For a healthy food, the Hungarian produce and the small-scale producer were beneficial attributes for the whole sample, so there would be a demand for domestic product.

#### ***2.5. Assessing the willingness and extent of consumers of lactose-free products to pay***

In examining consumers' willingness to pay, we found that the more often a lactose-free product was consumed, the greater the concern about and willingness to pay to avoid digestive problems and lactose intolerance, so the primary target audience for a new product is the lactose-free consumer. However, nearly 15% of the sample were less likely to consume lactose-free products, but had a

degree of digestive distress that they were willing to pay for, so raising awareness of the benefits of lactose-free dairy products for the digestive system could also make this group regular consumers.

The most common probiotic products for improving digestive problems are yoghurts, which were consumed in a full sample. When examining the prices of normal, lactose-free and probiotic yoghurts as reported by consumers in 2018, we found that for the full sample, the price of the small-canned yoghurt they bought [144 (+/- 79) HUF] was the same as the price of probiotic [135 (+/- 72) HUF] and lactose-free yoghurts [136 (+/-60) HUF], which were considered favourable. However, on average, they would still pay almost 35% more for these products, even though they were already more expensive. The level of income had a greater influence on the prices set by consumers than the frequency of consumption of a lactose-free product. For example, those on above average incomes value the affordable price of probiotic and lactose-free yoghurt by 13 to 15 HUF more than those on modest incomes, with the expensive price boundary being 22 and 51 HUF higher. Repeating this study in the current world economic situation and comparing its

findings with the previous results obtained here could yield valuable results.

## ***2.6. Exploring the added value of lactose-free milk***

For the consumer sample we studied, we found it worth highlighting the following features, which, if widely publicised, could lead to additional demand for lactose-free dairy products:

- Lactose-free dairy products combined with pro-, pre-, and synbiotic content can provide relief or a solution to symptoms of digestive problems, which occurs in 39.5% of the total sample, and can also help to achieve normal body weight.
- Lactose-free milk and dairy products can also facilitate digestion in people with lactase enzyme, it can help a stressed intestinal tract.
- Lactose-free milks have a distinctively sweeter taste because of this, less sugar or sweetener is needed, which can be an advantage for people with diabetes or those on a diet to lose weight. 9.5% of the sample we surveyed paid more attention to their diet because of their diabetes, and a high proportion of people looked

for foods with reduced sugar content when shopping. Of the total sample, 58% were overweight or obese and nearly half were affected by weight loss and dieting for weight loss, which could mean approximately 4,600 000 people in the 2018 national adult population.



### **3. New and novel scientific results**

1. The consumption of lactose-free products of the adult Hungarian population is multicausal: the personal exposure (6.1% of the adult population), the family member involvement (3.4% of the adult population), and the concern for a healthy lifestyle and diet (2.8% of the adult population) is most often behind consumption.
2. The significant proportion of self-reported lactose intolerant consumers (42%) have no medical diagnosis, at the same time the proportion of lactose intolerant women with a medical diagnosis was significantly higher than that of lactose intolerant men.
3. The frequency of consumption of lactose-free products by lactose-intolerant consumers was influenced from sociodemographic aspects only the gender of the respondents (women consumed more frequently).
4. In Hungarian society there is a significant number (6%) of consumers who consumes both lactose and

gluten-free products (“free from consumers”) without a medical diagnosis.

5. 89.9% of the adult Hungarian consumers known or heard about the probiotics while in case of prebiotics this proportion was 68.8%, and only for synbiotics 33.9%.

#### **4. Publications related to the topic of the dissertation**

##### ***4.1. Publications published in peer-reviewed scientific journals with impact factor***

Kasza, Gy., Szabó, E., Izsó, T., Ózsvári, L.: Why do consumers prefer lactose- and gluten-free food products (even when they don't need to)? *Nutrients*. (accepted)

Szabó, E., Szakos, D., Kasza, Gy., & Ózsvári, L.: The analysis of the target group of lactose-free functional foods for product development. *Acta Alimentaria*, 50(2). 153-161, 2021.

Szabó E., Szakos D., Kasza Gy., Ózsvári L.: Legal background and institutional system of milk hygiene in Hungary, *Hungarian Veterinary Journal*, 141(3)., 181-191. 2019.

Szabó E., Ivanyos D., Kasza Gy., Ózsvári L.: The history of milk hygiene regulations in Hungary, *Hungarian Veterinary Journal*, 140, 565-575. 2018.

#### ***4.2. Publications in peer-reviewed scientific journals without impact factor***

Szabó E., Ózsvári L.: Awareness of lactose-free products and pro-, pre- and synbiotics among consumers, Journal of Food Investigation: Special edition I., 1-51., 2020.

Németh A., Szabó E., Kasza Gy., Ózsvári L.: Development of lactose free, functional dairy Foods based on consumer survey, Gradus, 7, 26-29. 2020.

#### ***4.3. Presentations at international conferences***

Szabó E., Szakos D., Kasza Gy., Ózsvári L.: Legal background and institutional system of milk hygiene in Hungary, In: Szenci, O.; Brydl, E. (ed.) The 29th International Congress of the Hungarian Association for Buiatrics, Proceedings, 70-75. Hévíz, Hungary, 13-16. November 2019.

#### ***4.4. Presentations at Hungarian conferences***

Szabó, E., Kasza, Gy., Szakos, D., Ózsvári, L.: Food consumption habits of lactose-intolerant customers. Hungarian Academy of Science, Academic Reports, Budapest, Hungary: University of Veterinary Medicine, 2020.

Németh A., Szabó E., Kasza Gy., Ózsvári L.: Development of lactose-free functional foods based on a consumer survey, In: Hoyk, Edit (ed.) Environmental Science and Analytical Workshop Conference: Abstract volume, 38-39., Kecskemét, Hungary: Neumann János University Faculty of Horticulture and Rural Development, 30. April 2019.

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Szabó E., Ivanyos D., Kasza Gy., Ózsvári L.: Development of the legal framework of milk hygiene, In: Sótónyi, P.; Gálfi, P.; Vörös, K.; Magyar, T. (ed.) Hungarian Academy of Science, Academic Reports, 31. Budapest, Hungary: University of Veterinary Medicine, 2019.

Szabó E., Ivanyos D., Kasza Gy., Ózsvári L.: The history of milk hygiene regulations in Hungary, In: Szalka, É. (ed.) Sustainable agriculture and environment, 200 years of the Óvár Academy - past, present, future. XXXVII Óvár Science Days, Conference publication II. volume, 35-41.: Mosonmagyaróvár, Hungary, Széchenyi István University, Faculty of Agricultural and Food Science, 9-10. November 2018.