

# ***Awareness of lactose-free products and pro-, pre- and synbiotics among consumers***



*Picture is for illustration only*

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# *Awareness of lactose-free products and pro-, pre- and synbiotics among consumers*

**KEYWORDS:** lactose intolerance, consumer awareness, lactose-free products, probiotics, prebiotics, synbiotics

## 1. SUMMARY

In our article, the extent of consumer awareness related to lactose intolerance and the consumption of lactose-free products is examined from the perspective of the development of milk-based lactose-free products. The survey was conducted with in-person questionnaire interviews, in which we inquired, among other things, how well consumers are aware of the symptoms of lactose intolerance, its treatment options, as well as how much they know about products that support the intestinal flora (pro-, pre- and synbiotics), which can help digestion. This provides useful information about the potential range of consumers and can also contribute to the successful planning of product marketing.

## 2. Introduction

### 2.1. Lactose intolerance and lactose-free products

Lactose, a disaccharide, is broken down in the human body by the enzyme lactase into the monosaccharides glucose and galactose during digestion, and these can be absorbed from the intestinal tract and then utilized at various locations in the body [1]. In lactose-free products, lactose is broken down into the two above-mentioned monosaccharides by some method (e.g., enzymatic hydrolysis) [2], so in practice, such products can be utilized more easily even by people who are not lactose intolerant with one fewer degradation process and less energy consumption.

In the body of a lactose intolerant person, the enzyme lactase to be produced in the small intestine is congenitally absent or dysfunctional (primary lactose intolerance) [3, 4], or its functioning is inadequate because of intestinal problems or antibiotic treatment (secondary lactose intolerance) [5]. Lactose, which enters the body, thus proceeds from the duodenum to the jejunum without being broken down, where it causes diarrhea or borborygmus through its osmotic effect, and then its degradation by the microflora produces gases and acids in the distal ileum and the colon, causing bloating, intestinal cramps and

abdominal pain. This type of digestion may also cause constipation, nausea or vomiting. In addition, extraintestinal symptoms such as headache, memory impairment, fatigue, muscle and joint pain, allergy, arrhythmia and enuresis may occur [6].

### 2.2. Pro-, pre and synbiotics

Probiotics are living food ingredients, strains of bacteria of human origin, that have a beneficial effect on the human body and are able to colonize the intestinal mucosa. Most of the experience have been accumulated from the use of *Lactobacillus* and *Bifidobacterium* found in yogurt and other fermented dairy products [7]. Prebiotics are natural nutrients, which are typically the exclusive nutrients of probiotics, they promote their proliferation and predominance [8]. These are oligosaccharides (e.g., fructooligosaccharides, lactulose) that inhibit the colonization by pathogens, but help the colonization by and growth of probiotic bacteria [9]. Synbiotics are a combination of pro- and prebiotics, such as dairy products for the preparation of which both types of substances are used [8].

The complex, dynamically changing community of microorganisms living in the human intestinal system exerts its biological effect by forming a close unit with the entire body. Its formation begins at birth with the

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passage through the birth canal, then the quantitative and qualitative composition of the initial microflora changes under the regulation of the B lymphocytes of the immune system. Among other things, the intestinal flora inhibits the growth of pathogens, enhances intestinal motility, stimulates the immune system, ensures the permeability of the mucosa. Human data suggest that the probiotics used are effective in cases of antibiotic-induced diarrhea, travelers' diarrhea and pouchitis, they help to restore the microbiological balance of the intestinal tract [9].

Each person's intestinal flora is quite individual, so it is difficult to determine a single, generalizable intestinal flora composition, and to define a specific healthy one. However, it is characteristic that the optimal intestinal flora shows a high degree of stable species diversity. The opinion on their significance is influenced by research findings, which make them seem increasingly

important, for example because of their role in the development of the central nervous system and the regulation of behavior (anxiety, depression, social bonding, eating disorders, risk-taking behaviors) [10].

### 2.3 Consumer awareness and decision making

Consumer product choice is fundamentally determined by their subjective perceptions and preferences, so adequate market segmentation is key to the proper marketing of functional foods, for which it is essential to study the habits and expectations of the target consumer groups [11]. One of the biggest difficulties in communication is conveying reliable, understandable and credible information to consumers. In addition to research, development and innovation, raising consumer awareness and their continuous education play a key role in the market success of functional foods [12, 13, 14].

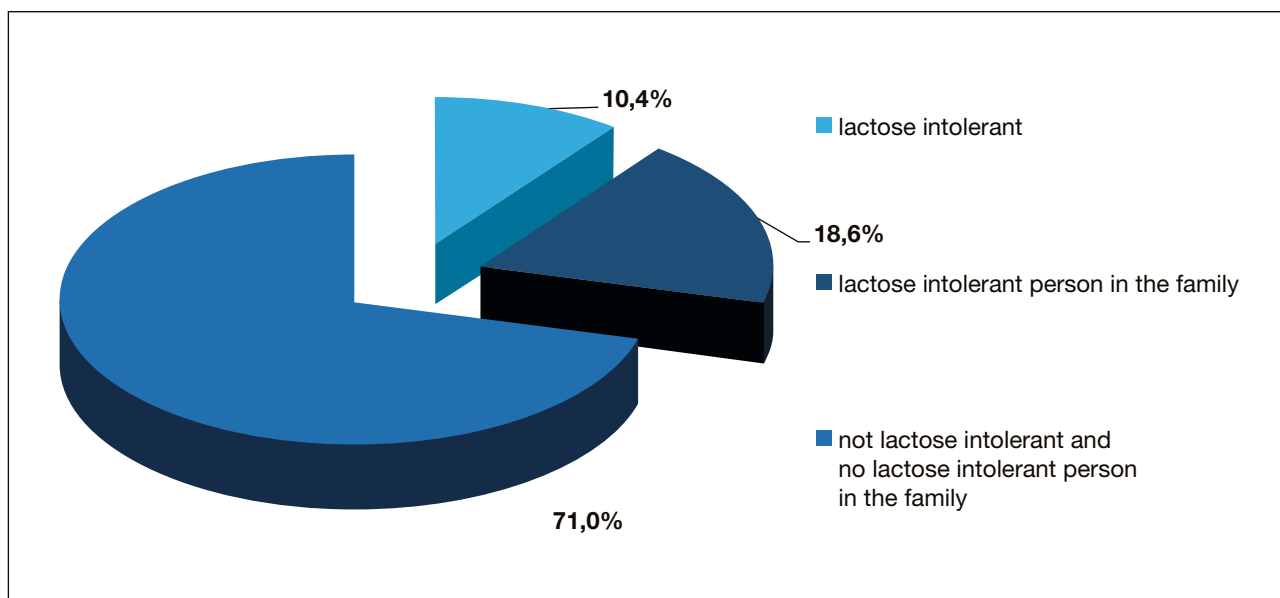


Figure 1. Involvement of the whole sample in lactose intolerance (n=952)

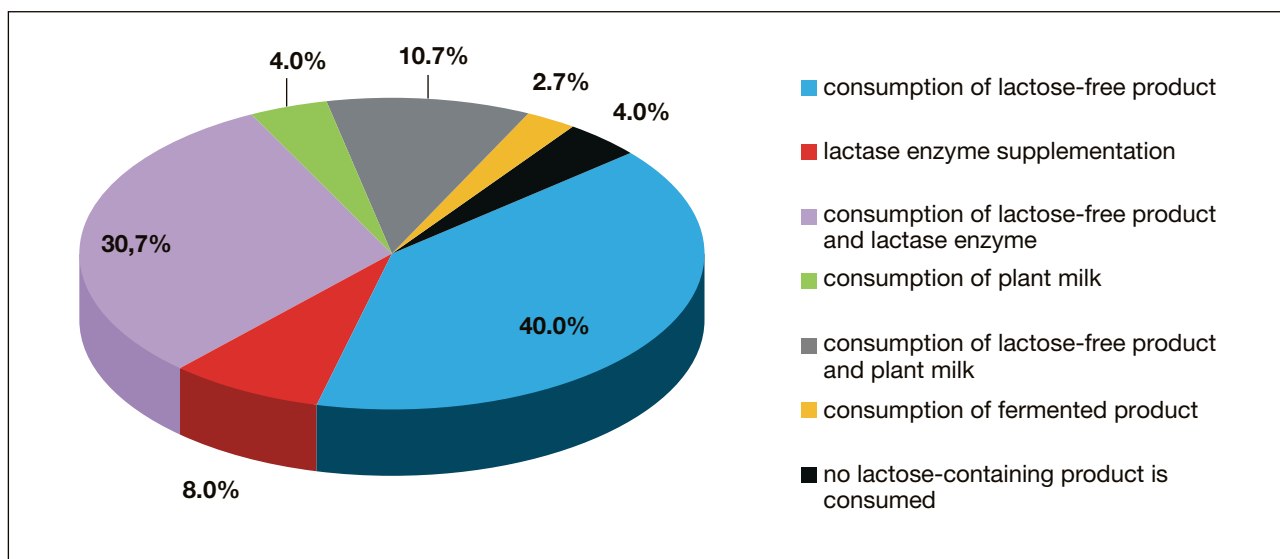


Figure 2. Distribution of responses of lactose intolerant consumers regarding symptom-free consumption of dairy products (n=75)

The aim of our study was to assess the level of consumer awareness of lactose intolerance and the consumption of products that support the intestinal flora and aid digestion (pro-, pre-, synbiotics, lactose-free products), to promote the development of milk-based lactose-free products [15].

### 3. Materials and methods

From a methodology point of view, the research consisted of in-person questionnaire interviews with a large number of people (1002). Based on the 2016 CSO microcensus, data collection was representative in terms of age, gender and place of residence by planning-strategic regions (NUTS-2). Sampling locations included major cities and smaller settlements from all over the country. Sampling took place in July and August of 2018. The opinions recorded in the questionnaires were registered and analyzed using a spreadsheet program (Microsoft

Office Excel). A qualifying variable was inserted next to text answers, in accordance with the answer being correct, incorrect or close. This variable was compared to the corresponding multiple-choice question.

## 4. Results and discussion

### 4.1. Consumer awareness of lactose intolerance

In our current study, consumers' knowledge of lactose intolerance was assessed, based on their answer to the question „What do you think the symptoms of lactose intolerance are?”. Consumers were examined dividing them into groups on the basis of their answer to the question „Is there a lactose intolerant person in your family?”, since being involved in lactose intolerance may affect knowledge of its symptoms (Figure 1).

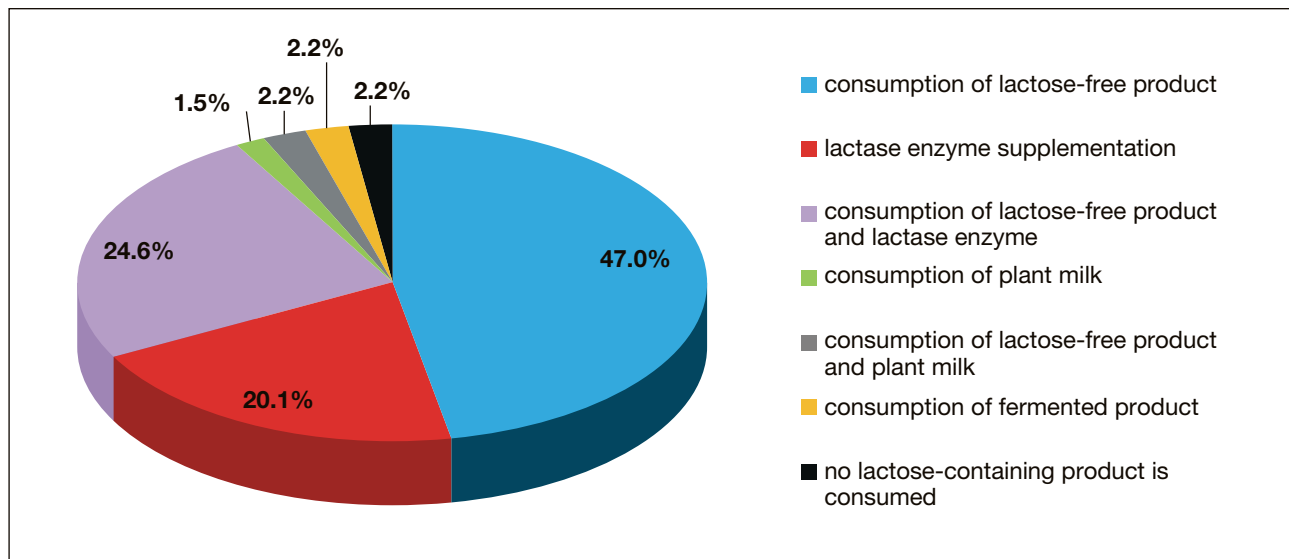


Figure 3. Distribution of responses of consumers with lactose intolerant family members regarding symptom-free consumption of dairy products (n=134)

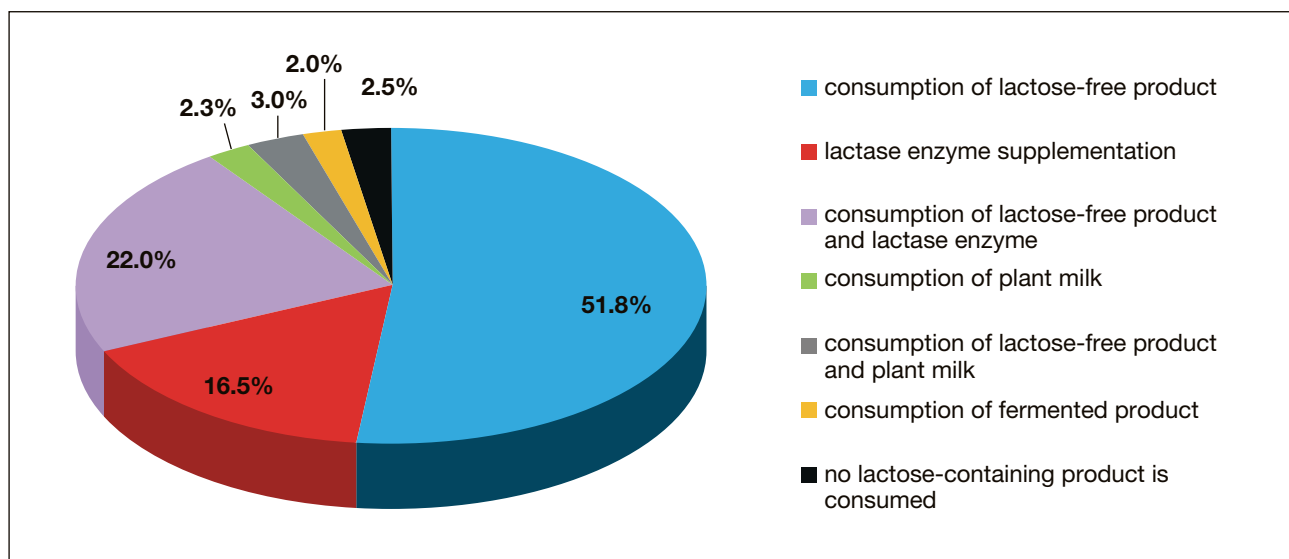


Figure 4. Distribution of responses of consumers not involved in lactose intolerance regarding symptom-free consumption of dairy products (n=400)

The responses to the question “What are the symptoms of lactose intolerance?” of the groups based on the involvement in lactose intolerance were evaluated quantitatively and, based on this, the responses within each group were divided into three further groups: correct (e.g., „indigestion”, „bloating”, „diarrhea”), close (e.g., „depending on the level of intolerance, immunosuppressive”) and incorrect (e.g., „not processed by the body”) answers. The result thus obtained (**Table 1**) shows that the consumers interviewed by us are aware of the symptoms of lactose intolerance, regardless of their involvement in it. The symptoms of lactose intolerant people, indigestion, diarrhea, bloating, cramps and the appearance of skin rashes after the consumption of milk or dairy products have been correctly described by them.

We were also curious about what customers think about the possibilities of consuming dairy products related to lactose intolerance, so their answers to the question „In your opinion, how can a lactose intolerant person consume dairy products without exhibiting symptoms?” were surveyed. Once again, consumers were compared in the above-mentioned three groups according to their involvement in lactose intolerance,

and response categories were formed according to the textual responses (**Figures 2-4**). Regardless of the involvement in lactose intolerance, for the way lactose intolerant persons can consume dairy products, most people listed lactose-free products, followed by this and enzyme supplementation, and the third most frequent response was enzyme supplementation alone.

Dietitians primarily recommend the consumption of lactose-free milk and dairy products for lactose intolerant people, as well as the supplementation of the enzyme lactase and, to diversify the diet, plant drinks enriched with vitamins and minerals. Depending on the degree of individual tolerance, traditional sour milk products, semi-hard, hard and long-maturation cheeses can also be consumed [16].

#### 4.2. Consumer awareness of pro-, pre- and synbiotics

In the questionnaire, the questions were compiled in a way that allowed us to identify the superficial and real knowledge of the respondents. For the first case, 3 multiple-choice questions were used, in which consumer awareness could be provided by

Table 1. Responses regarding the symptoms of lactose intolerance according to the involvement in lactose intolerance (n=687)

Answer regarding the symptoms of lactose intolerance:	Is there a lactose intolerant person in your family?		
	respondent	family member	no
correct	100.0%	98.0%	98.0%
close	0.0%	2.0%	1.1%
incorrect	0.0%	0.0%	0.9%

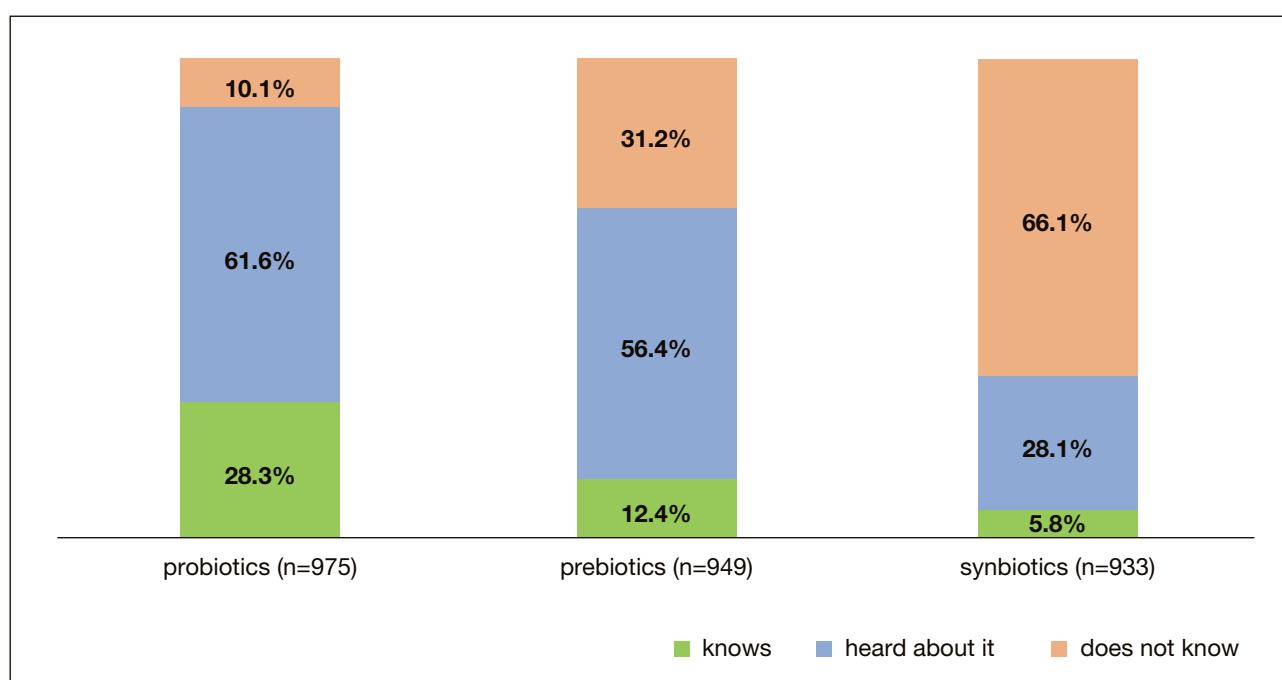


Figure 5. Consumer knowledge on the role of pro-, pre- and synbiotics in nutrition, based on a yes/no question

self-declaration (e.g., „Do you know what role pro/pre/synbiotics play in nutrition?“). Real knowledge was assessed by open ended questions (e.g., „If you know the role of pro/prebiotics play in nutrition, please summarize your knowledge in a few words.“). In the case of yes/no questions, responses of the whole sample were evaluated (**Figure 5**), and the responses (knows, heard about it) were compared to the text answers, which were evaluated quantitatively (correct, close, incorrect) (**Figure 6**) and the correctness of the knowledge was determined.

Of the entire sample, 28.3% said in the multiple-choice question that they know what a probiotic is, of these, 84.1% answered the following open ended question, and 85.3% of them were indeed aware of the role of probiotics in nutrition. For the entire sample (n=1,002), 19.8% knew correctly what probiotics were for. A previous study in Hungary found that 57.8% of respondents knew what the term „probiotic“ meant [17], and in another Hungarian study, the proportion of those who knew about the beneficial effects of digestion promoting foods (live flora, probiotic yogurts), based on self-declaration, was 76% [18]. Of those who were unaware of the role of probiotics in nutrition but had already heard of them, 16.1% answered the open ended question. 7.9% of the total sample (n=1,002) were uncertain but knew correctly the role of probiotics.

Of those who believed they knew the role of prebiotics (12.4%), 73.7% answered the open ended question, and 43.7% of these had the correct knowledge. For the whole sample (n=1,002), their proportion was 3.8%. Of those who did not know exactly the role of prebiotics in nutrition, but already heard of them,

7.7% answered the open ended question. They were uncertain in their knowledge, but still 29.3% of them correctly described the role of prebiotics. For the whole sample (n=1,002), their proportion was 1.2%.

In the case of multiple-choice questions, there is a clear decline in consumers' knowledge of pro-, pre- and synbiotics. Respondents are most aware of the role of probiotics, 28.3% of the total sample says they know them, while only 12.4% know prebiotics and 5.8% know synbiotics. For probiotics, 19.8%, and for prebiotics, 3.8% of the total sample have the correct knowledge. Those who have only heard of these but do not know them thoroughly represent 61.6% and 56.4% for pro- and prebiotics, respectively, while 28.1% for synbiotics. Accordingly, the proportion of those unfamiliar with the above concepts increased inversely (10.1%, 31.2% and 66.6 %).

The lack of knowledge regarding the effects of foods containing pro-, pre- and synbiotics on the intestinal flora is evidenced by the responses of the consumers interviewed regarding these products. Awareness of probiotics is the greatest, presumably due to their presence in advertisements for a longer period of time. Information about pre- and synbiotics were almost completely missing from consumers' knowledge.

In a consumer study of the role of functional foods (such as pro-, pre- and synbiotics, as well as lactose-free products) in disease prevention, consumers have identified functional foods as a way to treat gastrointestinal problems after a lifestyle change [19], thus, these types of products are considered to be useful despite the fact that they are not fully aware of their exact mechanisms of action [20].

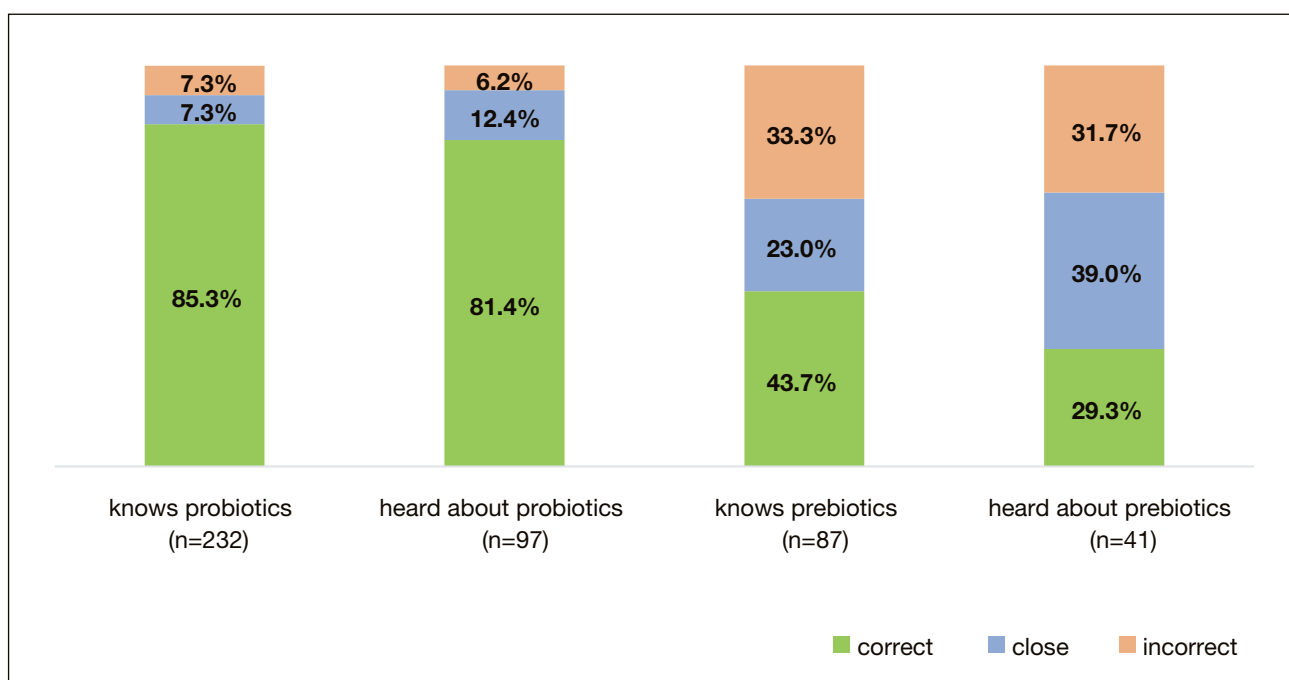


Figure 6. Consumer knowledge on the role of pro- and prebiotics in nutrition, based on an open ended question

According to the survey of Jasák [21] in Hungary, consumer knowledge of the benefits of the products has the strongest impact on the consumption of functional foods and they trust this category, however, the study of Szűcs et al. [22] showed that Hungarian educational programs on health care and conscious disease prevention are incomplete and, accordingly, children's knowledge of foods shows a mixed picture [23, 24]. According to domestic surveys of food consumer behavior, communication on food safety should be multifaceted and should be targeted at different consumer groups [12, 25, 26, 27]. The surveys of Kiss A. et al. [28, 29] have shown the extent to which incorrect product information influences the perception and consumption of dietary supplements of adolescents engaged in sports activities in their spare time, while the sources of this information are often the professionals who deal with them. An assessment of the factors influencing the purchase of a dairy product imitation resulted in the fact that the willingness to purchase is significantly influenced by the perceived value for money of the product, the culinary ability, knowledge, awareness of the respondent, and the general preference of the original product, as well as the often misleading packaging [30].

In the case of Hungarian products, it may be particularly important for consumers to be properly informed about dairy products that support the intestinal flora, as a domestic survey showed that consumers prefer milk and dairy products of domestic origin [31], thus, in certain health conditions, their beneficial effects may provide an incentive to choose them.

The consumer group studied by us is basically well informed about lactose intolerance, regardless of personal involvement, so consumers are well aware of this condition and its symptoms. More than 60% of the respondents consider lactose-free products and the supplementation of lactase enzyme to be the appropriate way for lactose intolerant people to consume dairy products. Consumers are therefore aware of the existence of milk-based lactose-free products and link it to lactose intolerance. Lactose-free milk and dairy products, on the other hand, can be useful not only for organisms unable to break down lactose, but also for people that possess the lactase enzyme, since they facilitate digestion by removing a breakdown step, which can be especially beneficial for organisms with other intestinal problems. Identification and exploitation of such value-added factors can be a key issue for the domestic dairy industry [32]. Since such a property of a product is not highlighted in marketing communication, the goal of lactose-free products is only associated with lactose intolerance by consumers, which may affect product consumption. When planning marketing, it could be worthwhile to draw consumers' attention to this feature of the product.

## 5. Conclusions

Due to the importance of the role of the intestinal flora in the human body and the effect of the diet on its composition, it would be important to increase consumer knowledge regarding foods that support the balance of the microflora. The effects of products that support the intestinal flora and aid digestion are directly related to the functioning of the intestinal system and, thus, to food digestion and the maintenance of human health, their knowledge can greatly influence product choice, so it would be important to fill this gap, for example, with educational materials, advertisements and other information opportunities.

## 6. Acknowledgment

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