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A survey on rabbit meat perception and consumption in seven countries

Katalin Szendrő[1], Antonella Dalle Zotte[2], Nikoletta Fülöp[1], Mónika Zita Nagy[1]*

[1]*Institute of Agricultural and Food Economics, Kaposvár Campus, Hungarian University of Agriculture and Life Sciences, Kaposvár, Hungary*
[2]*Department of Animal Medicine, Production and Health, University of Padova, Padova, Italy*

**Corresponding author: szendro.katalin@uni-mate.hu*

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Abstract: The aim of the study was to examine the rabbit consumption habits and opinions of people living in countries that regularly consume rabbit meat. Snowball sampling of data collection was used, a total of 1 860 error-free questionnaires were evaluated. Most of the completed questionnaires came from Hungary, Italy, Spain, China, Poland, France and Mexico. It is to note that 21.3% of respondents have not yet consumed rabbit meat: China (32.1%), Hungary (24.7%), Poland (22.4%), and France (4.8%). The main reasons for not consuming rabbit meat were emotional reasons (22.3%), it does not fit their dietary habits (15.7%). There are 28.7% of respondents who consume rabbit meat once or twice a year, 18.6% less often and 21.9% monthly. It was most often (weekly and monthly) consumed in Spain (25.3% and 36.8%), in Italy (15.3% and 36.2%), in France (1.6% and 38.7%, respectively). Men, aged 40 to 59, secondary school graduates, and those having a higher income eat rabbit meat more often than other groups. The highest scores (near to 4.5 on a 1–5 scale) were given for the health aspects of rabbit meat, such as high protein, omega-3 fatty acids and vitamins, and low fat and cholesterol contents. In order to encourage the consumption of rabbit meat, different marketing campaigns should be carried out in each country, depending on the standard of living, production intensity (large-scale or small-scale) and place of purchase (supermarket or local market). It is paramount to make the younger generation aware of the excellent and health-protective properties of rabbit meat.

Keywords: attitude; consumer; food; opinion; *Oryctolagus cuniculus*

Consumption of meat (animal protein) played a decisive role in the evolution of *Homo sapiens*. The increasing amounts of animal products into the diet were essential in the evolution of the human brain (Aiello and Wheeler 1995). Meat is an important part of a healthy diet for all people, especially for pregnant and lactating women, children and the elderly. It supplies high-quality protein, essential amino acids and micronutrients such as iron (Fe), zinc (Zn), selenium (Se), vitamin A and vitamin B12, and

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folic acid (Simpson et al. 2019). In present times, even in Western countries, there is a great risk of malnutrition (iron deficiency, anaemia, sarcopenia, vitamin B12, Zn, and Se deficiency, obesity). It is therefore essential to gain a better understanding of the contribution of terrestrial animal foods to healthy diets in order to improve human nutrition (FAO 2023a). Based on its nutritional and dietary properties, rabbit meat is recommended for children by WHO (Escriba-Perez et al. 2019). At the same time, a long list has been drawn up which opposes meat consumption: health risk, food safety, food security, sustainability, greenhouse gas emissions, using too large land areas and too much water, animal welfare, animals are fed grains that could be consumed by people, etc. (Kildal and Syse 2017). So, there is a contradiction between the need to consume meat and the environmental impact of its production and its health risk. However, a recent study by Stanton et al. (2022) identified a fatal scientific flaw in the study on the health risks of red meat published in the 2019 Global Burden of Diseases, Injuries, and Risk Factors Study (Murray et al. 2020), and new and updated reviews and meta-analyses covering all dietary risk factors are requested, and subjected to full independent peer review. Opponents of meat consumption are much more active than those interested in meat production. Carbon footprint and greenhouse gas emission of rabbit breeding is quite small (Cesari et al. 2018).

Rabbit meat belongs to the group of white meats without any health risk. Rabbits consume cellulose-rich forages and convert them into protein (meat) without competing with humans for food (Cullere and Dalle Zotte 2018). At the same time, rabbit meat is very healthy being low in fat, cholesterol and sodium content and it is rich in high biological value proteins and omega-3 fatty acids and some micronutrients (Dalle Zotte and Szendro 2011). With feed supplements, its functional value can be further improved (Dalle Zotte and Szendro 2011).

Rabbit meat consumption is not popular worldwide. It is mainly limited to the Mediterranean region like Algeria, Cyprus, Egypt, France, Italy, Malta, Portugal, Spain, and some other European countries like Belgium, Czech Republic, Germany and Luxembourg (Cullere and Dalle Zotte 2018). Thus, compared to the meat consumption of different animal species, rabbit meat is usually between the 4th and 6th position (Szczepaniak et al. 2004; Villanueva et al. 2015; Szendro 2016; Escriba-Perez et al. 2017; Sanah et al. 2020). According to the European Commission (2017), the rabbit meat consumption (*per capita* per year) is the highest in Malta and in the Czech Republic (> 3 kg), followed by Spain and Portugal (1 to 1.5 kg), France and Italy (0.5 to 1 kg), Belgium and Germany (0.1 to 0.5 kg) and the rest of EU Member Countries (< 0.1 kg). Between 1998 and 2017, in some traditionally rabbit meat-consuming European countries, such as Spain, Italy and France (Trocino et al. 2019), rabbit meat consumption decreased, especially among the young consumers (Gonzalez-Redondo and Contreras-Chacon 2012). In Spain a media campaign was built up by the support of doctors, dieticians, nurses and other professionals to inform consumers and to promote the consumption of rabbit meat as an excellent food, which is healthy and essential in the Mediterranean diet. As a result, the rate of decline has temporarily decreased (Gonzalez-Redondo and Rodriguez-Serrano 2012).

Commercial large rabbit farms are typical in the EU, however there is a very high proportion of rabbit meat originated from backyard farms with direct sales (34%) (European Commission 2017). The rest of the world is characterised by small-scale production (e.g. Africa, America, most part of Asia) (Lukefahr et al. 2004), while China has more and more large rabbit farms, and most of the rabbit meat is produced in Sichuan, Shandong, Chongqing, and Henan provinces (Li et al. 2018). On the other hand, the development of rabbit meat production in developing countries is a realistic goal for several reasons: e.g. rabbit is a herbivorous animal that can be fed fibre-rich feed and by-products that are not suitable for human consumption, it is not a competitor for humans. It requires very low investment in the backyard economy. Both women and children can take care of them. Rabbit meat is a high-quality, protein-rich, healthy food (Lukefahr 2010; Wongnaa et al. 2023).

It is worth considering that, although rabbit farming is a very small sector of the world's animal husbandry, it represents an important livelihood support or a significant part of the business for many owners of large farms, slaughterhouses, cages and feed manufacturers.

The aim of the survey was to update information about the consumption of rabbit meat, and to analyse some of the factors influencing its rejection or frequency of consumption, such as country, gender, age, education and household income.

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MATERIAL AND METHODS

Sampling methods

A global consumer study was conducted. Among non-probability sampling techniques, snowball sampling of data collection (Goodman 1961) was used meaning that the structured survey was given to an initial group of respondents (those who used the Internet) selected randomly. Respondents were encouraged to locate other members of the target population whom they know, i.e. friends, relatives, colleagues, etc. Since in the case of China, the online questionnaire reached only a few people directly, we asked a colleague for help who was primarily able to engage university students and staff. Multiple responses were excluded since the system allowed only one response/IP address. The total number of responses was 1 860. Subgroups were formed based on the background information: country, gender, age, education level and household income. The distribution of respondents is shown in Table 1.

In the questionnaire, we emphasised that the survey was anonymous and asked for their consent in the first point to publish the results in a scientific paper.

Table 1. The distribution of the sample

Description	Number	%
Total respondents	1 860	100
Countries and regions		
Spain	229	12.3
Italy	242	13.0
France	69	3.7
Poland	198	10.6
Hungary	420	22.6
Rest of Europe[1]	234	12.6
China	201	10.8
Rest of Asia[2]	84	4.5
Mexico	59	3.2
Rest of America[3]	70	3.8
Africa	54	2.9
Gender		
Female	983	52.8
Male	877	47.2
Age, year		
< 29	575	30.9
30–39	402	21.6
40–49	396	21.3
50–59	329	17.7
> 60	158	8.5
Education background		
College, university	1 693	91.0
Secondary school and below	177	9.0
Household income		
Live very well and with a high enough income to set money aside	289	15.5
Live well but can only set little money aside	947	50.9
Just enough, but cannot set any money aside	429	23.1
Not enough for a proper living	86	4.6
No answer/don't know	109	5.9

[1]Rest of Europe: mainly from Czech Republic, Greece, Romania and Slovakia; [2]rest of Asia: mainly from India, Indonesia, Iran and Turkey; [3]rest of America: mainly from Colombia, USA and Canada

Data analysis

Only faultless questionnaires were evaluated. SPSS software (v.10.0) was used for analysing the questionnaire. Frequency distributions, cross tables (for determining the relation of a variable to the background variables and to other involved variables) and one-way analysis of variance (ANOVA) (for Likert-scale questions, using the characteristics of rabbit meat as dependent variables and country, gender, age, education and household income as independent variables) were used in the evaluation of the questionnaire. In addition, mean calculations and significance analysis (χ^2-probe) were performed. The significance of differences was tested by Tukey post hoc test. For background variables, those respondents were excluded from the analyses whose proportion did not reach 3%, due to the low number of items.

RESULTS AND DISCUSSION

Distribution of non-rabbit-meat consumption

The proportion of non-rabbit consumers in the total surveyed population was 21.3% (Figure 1). It was more common among women than among men (27.5% and 15.1%, $P < 0.001$).

The 50–59 age group was less frequent among the non-rabbit consumers, whereas the youngest ones consumed rabbit meat the least often (Table 2).

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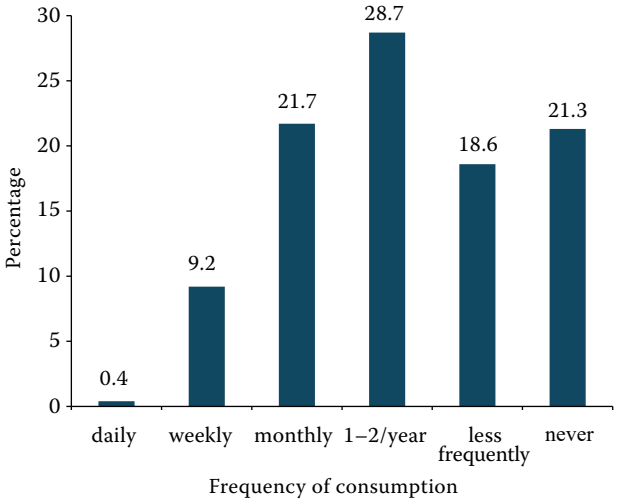

Figure 1. Frequency of rabbit meat consumption (%)

According to the education level there was no difference between the groups. The proportion of non-consumers of rabbit meat was between 5 and 10% in major consumer countries (France, Italy, Spain and Mexico). In Poland and Hungary, it was almost a quarter of respondents, while it reached one-third in China (Table 3). Previously, higher values were published in Spain (Buitrago-Vera et al. 2016; Escriba-Perez et al. 2019) and in Poland (Szczepaniak et al. 2004).

Reasons for rejecting rabbit meat consumption

Two prevailing reasons for rejecting the consumption of rabbit meat were the "emotional reason", and the fact that they had "never tasted" it (Figure 2). There was also a significant proportion of those who felt that "rabbit meat did not fit in my dietary habits". The least frequent answers were "it is complicated to prepare", "cannot afford it", and "religious reasons".

Most of the reasons for reducing or excluding the meat consumption can be divided into personal health and moral reasons (animal health, animal welfare, effect of animal breeding on environment, etc.) (De Backer and Hudders 2015). However, according to Vanhonacker et al. (2013) most people do not take into account ecological issues in their consumer choices.

In the present study "emotional reasons" of rejecting rabbit meat were more frequent among women than among men (44.4% and 13.2%, respectively; $P < 0.001$), whereas "I don't know where to buy" was more common among men (men 26.4% and women 10.3%; $P < 0.001$). The latter is presumably related to the fact that women buy food more often than men.

Table 2. Effect of consumer age on the frequency of rabbit meat consumption

Frequency	Age (year)					*P*-value
	18–29	30–39	40–49	50–59	> 60	
Daily	0.4	0.6	0.0	0.4	1.6	0.236
Weekly	7.3^{a}	6.5^{a}	9.3^{a}	15.2^{b}	11.3^{ab}	0.002
Monthly	16.8^{a}	21.2^{ab}	24.4^{bc}	29.5^{c}	18.5^{ab}	< 0.001
1–2 times per year	29.1	32.2	25.3	28.0	28.2	0.380
Less frequently than a year	19.4	17.5	20.1	14.8	22.6	0.305
Never	26.9^{c}	22.0^{bc}	20.9^{b}	12.1^{a}	17.7^{ab}	< 0.001

$^{a–c}$Means in the same row with different superscripts differ at $P < 0.05$ level

Table 3. Effect of nationality on the frequency of rabbit meat consumption

Frequency	Spain	Italy	France	Poland	Hungary	China	Mexico	*P-value*
Daily	0.0^{a}	0.6^{ab}	0.0^{a}	0.0^{a}	0.0^{a}	0.5^{ab}	4.0^{b}	0.009
Weekly	25.3^{d}	15.3^{c}	1.6^{a}	6.2^{ab}	2.2^{a}	2.7^{a}	24.0^{cd}	< 0.001
Monthly	36.8^{d}	36.2^{d}	38.7^{d}	17.4^{bc}	14.7^{b}	4.8^{a}	38.0^{d}	< 0.001
1–2 times per year	21.1^{b}	31.6^{bcd}	43.5^{d}	29.8^{bcd}	33.7^{cd}	33.7^{cd}	18.0^{ab}	< 0.001
Less frequently than a year	6.8^{a}	6.8^{a}	11.3^{ab}	24.2^{c}	24.7^{c}	26.2^{c}	6.0^{a}	< 0.001
Never	10.0^{ab}	9.6^{a}	4.8^{a}	22.4^{bcd}	24.7^{cd}	32.1^{d}	10.0^{ab}	< 0.001

$^{a–d}$Means in the same row with different superscripts differ at $P < 0.05$ level

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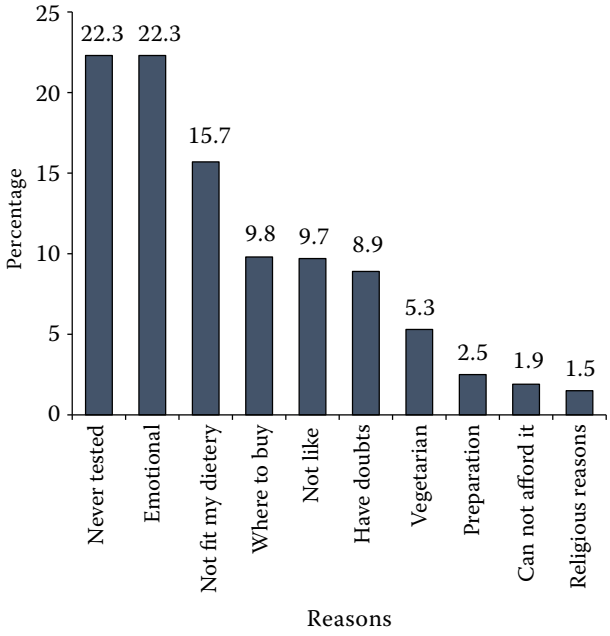

Figure 2. The reasons for rabbit meat rejection (%)

Young people, especially those under 29, most often (46.9%) answered "I don't know rabbit meat" ($P < 0.001$) and "I don't know where to buy" 22.1%) ($P < 0.05$) compared to the other age groups. The answer of "Its preparation is complex" was most frequent (14.7%) among respondents aged 50–59 years ($P < 0.05$).

In terms of the educational background, a significant difference was found in one case, with a higher proportion of high school graduates answering "I can't afford it" than those with the university degree (8.6% and 2.3%, respectively; $P < 0.05$).

Due to the low family income, a relatively high proportion of respondents answered "I can't afford it" (not sufficient income: 15.4% and the other groups: 1.4–2.2%; $P < 0.001$).

Examining each country, Chinese (60.7%), Hungarian (37.6%), Mexican (33.3%) and Polish (31.6%) respondents most often answered "I don't know rabbit meat". The "emotional reason" was high among Italian (62.5%), Spanish (52.6%), Polish (36.8%), and Hungarian (35.3%) respondents. In Mexico, China and Poland, most people answered "I don't know where to buy" (66.7, 26.2 and 23.7%, respectively). The answer of "It doesn't fit in my dietary habits" was high in Hungary (30.6%), and that of "Its preparation is complex" in Italy (15.6%) and Poland (10.5%). The ratios of vegetarians were the highest in Italy (18.8%), in Poland (18.4%) and in Spain (15.8%).

Especially in the case of China, which is the world's largest producer of rabbit meat, it was surprising that a large proportion of respondents answered "I don't know rabbit meat". Being mainly pork-eaters, more than half of their meat consumption is pork (34 kg/year/*capita*), followed by poultry, beef and mutton. The consumption of other meats (including rabbit meat) is only 0.48 kg/year/*capita* (FAO 2023b). It can be assumed that in the FAO database, which is based on estimates, the production of rabbit meat in the countryside has a high weight, while it is less known in cities (the questionnaire was mostly filled out by university students).

In a previous study, "Absence of consumption habit" was the second (37.7%) reason for rabbit meat rejection among Spanish university students (Gonzalez-Redondo et al. 2010), whereas among children it was only 3.6% (Escriba-Perez et al. 2019), however „Not purchased/not consumed at home" was also high (Escriba-Perez et al. 2019). This is also an important opinion for Polish young people (Szczepaniak et al. 2004).

According to previous studies, some people avoid consuming rabbit meat because of its sensory perception: they do not like it. Among Spanish students the ratio was 48.5% (Gonzalez-Redondo et al. 2010), and among children it was 40.9% (Escriba-Perez et al. 2019). Among Hungarian consumers the "I don't like" response was 19.9%, with higher values for women than for men (Szendro 2016). Among Polish (Szczepaniak et al. 2004) and Chinese (Gao and Zheng 2016) consumers, the response rate was comparable. In Mexico, however, this is not among the most important reasons for refusing the rabbit meat consumption (Olivares et al. 2004).

Among Spanish university students, mainly female and young respondents (about 5%) rejected the rabbit meat consumption for emotional and moral reasons (Gonzalez-Redondo et al. 2010; Escriba-Perez et al. 2019). In Hungary, the emotional reasons were very high (37%) (Bodnar and Horvath 2008). In another study, 7.9% of men and 28.4% of women felt sorry for the rabbits (Szendro 2016). The reason why respondents "feel sorry" is mainly due to the fact that rabbits are also companion animals (Gonzalez-Redondo et al. 2010). The reason for this is that, in general, women are more concerned about animal welfare and environmental protection than men (Ruby 2012).

In some countries, not knowing where to buy rabbit meat plays an influential role. In Mexico,

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limiting factors of rabbit meat consumption are lack of market promotion (59.0%) or lack of selling points (37.6%) (Olivares et al. 2004). Even in China (23.3%; Gao and Zheng 2016) and in Hungary (10%; Szendro 2016; 13.6%; Bodnar and Horvath 2008) this factor is relevant.

The price of rabbit meat is not usually very competitive, especially in comparison with poultry (Petracci et al. 2018). Nonetheless, the price of rabbit meat was not generally a determining factor: 7.0% in China (Gao and Zheng 2016), 7.1% in Mexico (Olivares et al. 2004), 5.6% in Hungary (Szendro 2016), with the exception of one study where 46% of respondents found the rabbit meat too expensive (Bodnar and Horvath 2008). It seems that in countries where living standards are moderately high, the food price is not even raised as an issue.

In Hungary, 8% (Bodnar and Horvath 2008) or 1.7% (Szendro 2016) of respondents have indicated their eating habits as vegetarian or vegan, so their diet does not include meat or food of animal origin, respectively.

Frequency of rabbit meat consumption

Generally, 78.5% of respondent already tasted rabbit meat. Half of the respondents eat rabbit meat once or twice a year or monthly, however less frequent consumption was near to 18.6% (Figure 2).

In the present study, it emerged that men consume rabbit meat more often than women. Significant differences were found between the two genders in the proportion of weekly (12.0% and 6.4%, $P < 0.001$) and monthly (23.9% and 19.6%, $P < 0.0.05$) consumers. This result confirms previous studies (Szendro et al. 2020; Gonzalez-Redondo et al. 2010), the latter referring to university students.

The reason why men consume more meat than women is unclear, some authors claim the existence of a positive correlation between meat consumption and masculinity (Love and Sulikowski 2018), and the fact that women have emotional resentment against killing rabbits and eating their meat (Gonzalez-Redondo et al. 2010; Buitrago-Vera et al. 2016).

There was a significant difference in weekly and monthly frequency between age groups. The 50–59 age group consumed rabbit meat most often, whereas the youngest ones consumed rabbit meat the least (Table 2). This trend indicating an increased consumption of rabbit meat with the advancing age of consumers confirms previous observations (Szendro 2016; Escriba-Perez et al. 2017). Once again, this relates to the general attitude of the younger generation which associates meat consumption with detrimental effects on the environment, animal welfare and other moral issues (Stoll-Kleemann and Schmidt 2017; Crovato et al. 2022).

Results showed that the consumption frequency of rabbit meat is higher in people with the lower education background than in those with higher education. The difference in weekly consumption was significant (16.0% *vs* 8.5%, for secondary school and below vs university graduates; $P < 0.05$). However, infrequent consumers among university graduates were more common (29.5% and 21.3%, $P < 0.05$). Similar observations were reported by Escriba-Perez et al. (2017).

In the current survey, rabbit meat consumption seems to be affected by household income. Consumers with low incomes consume rabbit meat less often, and the difference in monthly consumption was significant. However, a Spanish study (Escriba-Perez et al. 2017) observed an inverse relationship between social class and frequency of rabbit meat consumption: the lower and lower-middle social classes consumed rabbit meat more frequently than the upper-middle and upper-income groups. The reason for the contradictory result may be that it does not matter where the respondents buy rabbits: more expensive from a supermarket or cheaper from a local market or producer or even raised by the consumers themselves. It may also be related to the income that consumption frequency is lower in households with children than in those without children (Escriba-Perez et al. 2019).

The consumption of rabbit meat has old historical roots. The archaeozoological data indicate that the original range of the rabbit was in the Iberian Peninsula and in the south of France (Callou 1994). During the Middle Ages, it spread to a larger part of the Mediterranean area (Branco et al. 2000). For gastronomic reasons, the Romans began rearing rabbits (Dalle Zotte 2014). At the same time, rabbit and hare consumption in Mexico also has a long history. Rabbit captivity and breeding were recorded. They could also be bought at Mayan markets (Sugiyama et al. 2017). Rabbit meat is well accepted

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in the Mediterranean countries, however, it is not a traditionally consumed meat in Anglo-Saxon countries (Gonzalez-Redondo et al. 2010).

There were significant differences in the frequency of rabbit meat consumption by the respondents of each country (Table 3). Mexicans consume rabbit meat the most often. They are followed by Spanish, Italian and French respondents. The proportion of monthly or more frequent consumption is 66.0, 62.1, 52.1 and 40.3%, for Mexicans, Spanish, Italian and French, respectively. In contrast, the consumption frequency is very low in China (8%).

Garcia-Lopez et al. (2006) studied the rabbit meat consumption in a rural community in Mexico, noting a very high frequency of rabbit meat consumption, when rabbits were present on the family farm. The rabbit breeders have also a regular self-consumption in Hungary (Bodnar and Horvath 2008), which could be equally common in several countries.

According to Escriba-Perez et al. (2017) Spanish people generally consume rabbit meat slightly less frequently than what observed in the present study. However, more frequent consumption was reported in another study (Buitrago-Vera et al. 2016).

In Hungary, similar (Szakaly et al. 2009a) or lower frequencies were published (Szendro, 2016). According to Bodnar and Horvath (2008) 70% of the Hungarians consume rabbit meat only once or twice a year. The frequency of rabbit meat consumption is also low in Poland (Szczepaniak et al. 2004). A recent survey of Italian consumers (Crovato et al. 2022) reported consumption frequencies similar to those found in our study, with lower weekly consumption (11.5% *vs* 15.3%) and higher monthly (40.9% *vs* 36.2%) and annual consumption (45.5% *vs* 31.6%).

In China, the frequency of rabbit meat consumption is very low mainly in the urban areas (Gao and Zheng 2016). However, consumption has been steadily increasing due to the commercial promotion of rabbit meat, and the rabbit meat market is expected to have a great potential in the future.

Opinions about rabbit meat

It is to note that 87.7% of the respondents, who are not vegetarian or vegan, have eaten rabbit meat with some frequency.

On a 1 to 5 scale, rabbit meat was given very high values with around 4.5 for "healthy" and related properties (Figure 3). A similar value was given for "easy digestible". The "taste" (4.26), "easy to prepare" (3.72), "meat for the rich" and "low price" (3.30 and 3.23, respectively) received a higher-than-average score. The lowest scores were given for "meat for the poor" and "unclean meat".

Hungarian, Mexican and Polish respondents generally gave the highest scores for health-related characteristics (Table 4).

Interestingly, the three traditional rabbit meat consumers from Mediterranean countries (Spain, Italy and France) gave slightly lower scores. Chinese respondents also gave a low score for the health characteristics. The "easily digestible" and "tasty" characteristics were rated as good by the Mexican, Polish and Hungarian people. Instead, French and Spanish respondents gave lower values to these qualities. There is a contradiction in the perception of "meat for the rich" and "meat for the poor", as the Chinese and Hungarians rated both characteristics high, whereas Mexicans and Spanish rated them as low. This may be due to the fact that the source of supply may have been different. Respondents who purchase the rabbit meat from local market or farms, especially the own farm, consider it cheap, while those who buy it in supermarkets consider it expensive. For "low

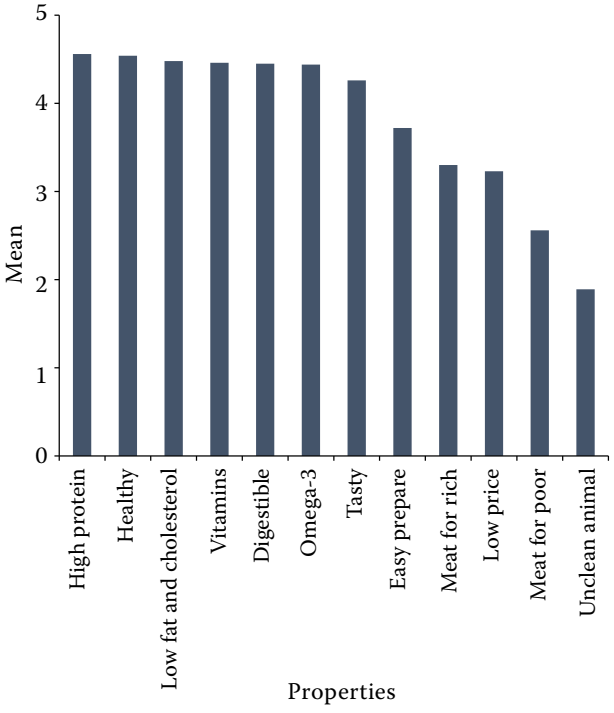

Figure 3. Opinions of respondents on some properties of rabbit meat, on a 1 to 5 scale

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Table 4. Characteristics of rabbit meat according to respondents in different countries, on a 1 to 5 scale

Characteristics	Mean							SE	*P*-value
	Spain	Italy	France	Poland	Hungary	China	Mexico		
Healthy	4.47	4.40	4.37	4.65	4.63	4.36	4.75	0.059	< 0.001
High protein	4.45	4.33	4.40	4.59	4.75	4.47	4.71	0.060	< 0.001
Low fat and cholesterol	4.39	4.36	4.41	4.44	4.63	4.41	4.53	0.036	0.022
Omega-3	4.20	4.28	4.43	4.35	4.67	4.48	3.98	0.083	0.007
Vitamins	4.24	4.41	4.19	4.47	4.70	4.43	4.34	0.063	0.008
Easily digestible	4.33	4.43	4.31	4.58	4.55	4.29	4.54	0.047	0.044
Tasty	3.91	4.27	3.96	4.52	4.41	4.23	4.54	0.095	< 0.001
Easy to prepare	3.60	3.00	3.31	3.67	4.09	3.94	4.02	0.151	< 0.001
Low price	3.37	3.14	2.84	2.63	3.44	3.74	3.54	0.150	< 0.001
Meat for the rich	2.22	2.94	2.88	3.49	3.92	3.72	2.29	0.254	< 0.001
Meat for the poor	1.83	2.54	2.10	1.90	3.14	3.40	1.98	0.239	< 0.001
Unclean animal	1.51	1.76	1.51	1.44	2.12	2.73	1.43	0.183	< 0.001

SE = standard error

price," French and Polish respondents gave lower-than-average scores, while the highest scores were given by Chinese and Mexican respondents. Here again, the reason for the difference between the countries may be that the rabbit meat is procured primarily from commercial markets or breeders. The results of "unclean meat" (in the religious sense) received a low score, which would indicate that there is no prejudice against rabbit meat for most religious or other reasons, although there are exceptions, e.g. followers of the Alevi-Bektashi (Wilson and Yilmaz 2013). Presumably, few of those who have a religious prejudice against rabbit meat completed the questionnaire.

Generally, taste plays a major role as a reason for eating meat (Richardson et al. 1994). Spanish respondents compared different meats, and rabbit received the second position in healthy and low fat after chicken, however, in case of tastiness, only turkey got a lower position (Montero-Vicente et al. 2018). According to their opinion when they choose food items, their nutritional value is more important than their taste (Buitrago-Vera et al. 2016), which is similar to the scores given for rabbit meat. On a 1-5 scale the highest scores (4.44 to 4.16) were given to "clean and healthy meat", "many nutritional properties", "quick and easy to cook", "high-quality meat", while "tasty with flavour" received 3.86 score (Montero-Vicente et al. 2018). For the young (under 18 years of age), the most important benefits provided by rabbit meat are low fat (24.4%) and heathy (16.7%), while nutritional values (rich in vitamins, digestible or delicious) received lower values than 5% (Escriba-Perez et al. 2019).

In Hungary, rabbit meat was considered the healthiest after chicken (Szendro 2016). In particular, its high protein, unsaturated (mainly omega-3) fatty acids, certain vitamins and minerals, and low fat and cholesterol content were highlighted. In their opinion, the scores for "tasty" and "simple preparation" descriptors (on a 1–5 scale) were above the average (3.8 and 3.3, respectively), whereas the "low price" descriptor was scored 1.9. In another study (Szakaly et al. 2009b), the authors found a similar evaluation order.

As regards Mexico, it appeared from a recent survey that the knowledge of the nutritional value of rabbit meat is limited. The low level of fat content was mentioned only by 32.3% of the consumers, whereas 11.4% of them knew that the rabbit meat is rich in proteins (Olivares et al. 2004). At the same time, in the present study (Table 4) the opinion of respondents was in line with the general statement (Figure 3). Like in Mexico, the knowledge of the nutritional qualities of rabbit meat is limited in China. Only the high protein and low-fat contents are known by most of the respondents (Gao and Zheng 2016).

Similar to other studies (Wardle et al. 2004), in the present study women tend to pay more attention to healthy eating and they usually influence the meat consumption. This is evidenced by the fact that women provided significantly higher scores (4.51–4.64) for all health-related characteristics than men (4.33–4.49). No significant differences

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were obtained in the other descriptors. This is supported by a recent study (Sanah et al. 2020) where it was found that women generally consume rabbit meat for its nutritional value, whereas men for the good taste, tenderness and easy digestibility.

Respondents older than 40 years gave a higher score on "easy digestible" than younger ones ($P < 0.05$). Interestingly and controversially, the youngest gave one of the highest scores for both "meat for the rich" and "meat for the poor". No more significant differences were found in other descriptors.

In the present study, significant differences were obtained in education and family income only in the case of "meat for the rich". The highest values were attributed to the poorest and most poorly educated people, supporting the results of Montero-Vicente et al. (2018).

CONCLUSION

Rabbit meat is generally little known, but there are big differences between countries. Although it is very popular in Mediterranean countries (Spain, Italy, France), the same cannot be said for most countries in the world. Therefore, by recognising the consumer perception and needs, rabbit meat producers in all countries have the opportunity to develop their own marketing strategy, tailored to local needs and opportunities. In countries traditionally consuming rabbit meat, the marketing campaign should focus on containing and halting the decline and promoting rabbit meat as a healthy food. In countries where demand is strong and price is not an issue, it is worth offering rabbit meat with a higher functional value (rabbit feed supplemented with omega-3 fatty acids or selenium). In Mexico or China, it is necessary to popularise the nutritional benefits of rabbit meat and expand its availability. In these countries, it is worthwhile to supply as much rabbit meat as possible to local markets, while backyard rabbit breeding would provide an opportunity to supply people with healthy animal products. Since the young people consume rabbit meat less often, it is necessary to pay special attention to them and make them know and love rabbit meat from an early age (kindergarten, school). Among women, the consumption of rabbit meat has a strong emotional motivation, therefore great emphasis must be placed on demonstrating comfortable housing conditions that meet animal welfare expectations.

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Conflict of interest

The authors declare no conflict of interest.

REFERENCES

Aiello LC, Wheeler P. The expensive-tissue hypothesis: The brain and the digestive system in human and primate evolution. Curr Anthropol. 1995 Apr;36(2):199-221.

Bodnar K, Horvath J. Consumers' opinion about rabbit meat consumption in Hungary. In: 9th World Rabbit Congress; Jun 10–13, 2008; Verona: 1519-21.

Branco M, Ferrand N, Monnerot M. Phylogeography of the European rabbit (Oryctolagus cuniculus) in the Iberian Peninsula inferred from RFLP analysis of the cytochrome b gene. Heredity. 2000 Oct;85:307-17.

Buitrago-Vera J, Escriba-Perez C, Baviera-Puig A, Montero-Vicente L. Consumer segmentation based on food-related lifestyles and analysis of rabbit meat consumption. World Rabbit Sci. 2016 Sep;24(3):169-82.

Callou C. Modifications de l'aire de repartition du Lapin (Oryctolagus cuniculus) en France et en Espagne, du Pleistocène a l'époque actuelle. Etat de la question. [Modifications of the distribution range of the rabbit (Oryctolagus cuniculus) in France and Spain, from the Pleistocene to the present day. State of the question.]. Anthropozoologica. 1994;21:95-114.

Cesari V, Zucali M, Bava L, Gislon G, Tamburini A, Toschi I. Environmental impact of rabbit meat: The effect of production efficiency. Meat Sci. 2018 Nov;145:447-54.

Crovato S, Pinto A, Di Martino G, Mascarello G, Rizzoli V, Marcolin S, Ravarotto L. Purchasing habits, sustainability perceptions, and welfare concerns of Italian consumers regarding rabbit meat. Foods. 2022 Apr 21;11(9):1205.

https://doi.org/10.17221/123/2024-CJAS

Cullere M, Dalle Zotte A. Rabbit meat production and consumption: State of knowledge and future perspectives. Meat Sci. 2018 Sep;145:447-54.

Dalle Zotte A. Rabbit farming for meat purposes. Anim Frontiers. 2014 Oct;4:62-7.

Dalle Zotte A, Szendro Zs. The role of rabbit meat as functional food. Meat Sci. 2011 Jul;88(3);319-31.

De Backer CJ, Hudders L. Meat morals: Relationship between meat consumption consumer attitudes towards human and animal welfare and moral behavior. Meat Sci. 2015 Jan;99:68-74.

Escriba-Perez C, Baviera-Puig A, Buitrago-Vera J, Montero-Vicente L. Consumer profile analysis for different types of meat in Spain. Meat Sci. 2017 Jul;129:120-6.

Escriba-Perez C, Baviera-Puig A, Montero-Vicente L, Buitrago-Vera J. Children's consumption of rabbit meat. World Rabbit Sci. 2019;27:113-22.

European Commission. Commercial rabbit farming inthe European Union. Luxembourg: Publications Office of the European Union; 2017: 39 p.

FAO. Contribution of terrestrial animal source food to healthy diets for improved nutrition and health outcomes – An evidence and policy overview on the state of knowledge and gaps. Food and Agriculture Organization of the United Nations; Rome, Italy: 2023a.

FAO. Our World in Data. Per capita consumption of beef – FAO [dataset]. Food and Agriculture Organization of the United Nations. 2023b. Available at https://ourworldindata.org/grapher/per-capita-meat-consumption-by-type-kilograms-per-year

Gao Y, Zheng ZH. Consumer demand for rabbit meat in urban China: 2011-2015. In: Proceedings 11th World Rabbit Congress; Jun 15-18, 2016; Qingdao, China: 937-40.

Garcaa-Lopez JC, Pro-Martinez A, Becerril-Perez CM, Suarez-Oporta ME, Pinos-Rodriguez JM. Technical note: Rabbit meat production under a small scale production system as a source of animal protein in a rural area of Mexico. World Rabbit Sci. 2006;14:259-63.

Gonzalez-Redondo P, Contreras-Chacon GM. Perceptions among university students in Seville (Spain) of the rabbit as livestock and as companion animal. World Rabbit Sci. 2012;20:155-62.

Gonzalez-Redondo P, Mena Y, Fernandez-Cabanas VM. Factors affecting rabbit meat consumption among Spanish university students. Ecol Food Nutr. 2010 Apr;49:298-315.

Gonzalez-Redondo P, Rodriguez-Serrano TM. Promotion of rabbit meat consumption in Spain. In: Proceedings 10th World Rabbit Congress; Sept 3-6, 2012; Sharm El-Sheikh, Egypt: 955-9.

Goodman LA. Snowball sampling. Ann Math Statist. 1961;32:148-70.

Kildal CL, Syse KL. Meat and masculinity in the Norwegian Armed Forces. Appetite. 2017;112:69-77.

Li S, Zeng W, Li R, Hoffman LC, He Z, Sun Q, Li H. Rabbit meat production and processing in China. Meat Sci. 2018 Nov;145:320-8.

Love HJ, Sulikowski D. Of meat and men: Sex differences in implicit and explicit attitudes toward meat. Front Psychol. 2018 Apr 20;9:559.

Lukefahr SD, Cheeke PR, McNitt JI, Patton NM. Limitations of intensive meat rabbit production in North America: A review. Can J Anim Sci. 2004;84:349-60.

Lukefahr SD. Developing sustainable rabbit projects. 2nd ed. Little Rock, AR, USA: Heifer International; 2010: 167 p.

Montero-Vicente L, Escriba-Perez C, Baviera-Puig A, Buitrago-Vera J. Analysis of the commercial value of rabbit meat based on positioning of the different types of fresh meat. Span J Agric Res. 2018 Dec 19;16(3):e0110.

Murray et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: A systematic analysis for the global burden of disease Study 2019. Lancet. 2020 Oct 17;396(10258):1223-49.

Olivares R, Soriano R, Lopez M, Rivera J, Losada H. Consumption patterns of rabbit meat in the metropolitan area of Mexico City. In: Proceedings of the 8th World Rabbit Congress. Sep 7-10, 2004; Puebla, Mexico: 1152-6.

Petracci M, Soglia F, Leroy F. Rabbit meat in need of a hattrick: From tradition to innovation (and back). Meat Sci. 2018 Dec;146:93-100.

Richardson NJ, MacFie HJH, Shepherd R. Consumer attitudes to meat eating. Meat Sci. 1994;36(1-2):57-65.

Ruby MB. Vegetarianism: A blossoming field of study. Appetite. 2012;58:141-50.

Sanah I, Becila S, Djeghim F, Boudjellal A. Rabbit meat in the East of Algeria: Motivation and obstacles to composition. World Rabbit Sci. 2020 Dec;28(4):221-37.

Simpson EJ, Clark M, Razak AA, Salter A. The impact of reduced red and processed meat consumption on cardiovascular risk factors; An intervention trial in healthy volunteers. Food Funct. 2019;10:6690-8.

Stanton AV, Leroy F, Elliott C, Mann N, Wall P, De Smet S. 36-fold higher estimate of deaths attributable to red meat intake in GBD 2019: Is this reliable? Lancet. 2022 Apr 2; 399(10332):e23-6.

Stoll-Kleemann S, Schmidt UJ. Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors. Reg Environ Change. 2017;17:1261-77.

Sugiyama N, Azua RV, Galicia BR. Faunal acquisition, maintenance, and consumption: How the Teotihuacanos got their meat. Archaeol Anthropol Sci. 2017;9:61-81.

https://doi.org/10.17221/123/2024-CJAS

Szakaly Z, Szigeti O, Szente V. Analysis of consumer habits and attitudes on the Hungarian beef and rabbit market. Apstract. 2009b;3:67-70.

Szakaly Z, Szigeti O, Szente V, Polereczki Zs. Consumer habits on the market of Hungarian beef and rabbit meat. In: Proceedings of the Fourth Aspects and Visions of Applied Economics and Informatics Conference; 2009a; Debrecen, Hungary: 461-7.

Szczepaniak B, Gorecka D, Flaczyk E. Nutritional habits relating to meat and meat products consumption among young people from selected regions of Poland. Pol J Food Nutr Sci. 2004;54(4):421-6.

Szendro K, Szabo-Szentgroti E, Szigeti O. Consumers' attitude to consumption of rabbit meat in eight countries depending on the production method and its purchase form. Foods. 2020 May 19;9(5):654.

Szendro K. Consumer perceptions, concerns, and purchasing practices of rabbit meat in Hungary. J Food Prod Mark. 2016;22:683-93.

Trocino A, Cotozzolo E, Zomeno C, Petracci M, Xiccato G, Castellini C. Rabbit production and science: The world and Italian scenarios from 1998 to 2018. Ital J Anim Sci. 2019 Sep 25;18:1361-71.

Vanhonacker F, Van Loo EJ, Gellynck X, Verbeke W. Flemish consumer attitudes towards more sustainable food choices. Appetite. 2013 Mar;62:7-16.

Villanueva JLJ, Lopez SV, Rodriguez JDG. Behavior of consumers and willingness to pay for quality attributes of organic rabbit meat. Rev Mex Cienc Pecuarias. 2015 Jan; 6(1):221-32.

Wardle J, Haase AM, Steptoe A, Nillapun M, Jonwutiwes K, Bellisle F. Gender differences in food choice: The contribution of health beliefs and dieting. Ann Behav Med. 2004 Apr;27(2):107-16.

Wilson RT, Yilmaz O. The domestic livestock resources of Turkey: Notes on rabbits and a review of the literature. Arch Anim Breed. 2013;56:18-27.

Wongnaa CA, Afful-Kwadam K, Asempah MK, Hagan MAS, Awunyo-Vitor D. Is it profitable and viable to invest in commercialization of rabbit production? Implication on rural enterprise development. Sustain Technol Entrepreneurship. 2023 Sep;2(3):100048.

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