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Food technology neophobia and animal ethics orientation: Influences on cultured meat acceptance in Croatia

Neofobija prema prehrambenoj tehnologiji i etička orijentacija prema životinjama: Utjecaji na prihvaćanje kultiviranog mesa u Hrvatskoj

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ABSTRACT

Although cultured meat is not yet widely available on the market, numerous scientific studies have already looked at consumers in relation to the purchase and consumption of this type of meat. However, many aspects of the consumer perspective on this meat are still unknown in many national markets. The aim of this study was to investigate the influence of attitudes towards novel food technologies and animal ethics orientation on the willingness to consume (WTC) cultured meat among Croatian consumers and to determine whether respondents differ in these attitudes. The results showed that attitudes measured with the food technology neophobia scale have a significant influence on WTC. The more positive the attitude towards the benefits of novel food technologies, the greater the willingness to consume cultured meat. In contrast, the more pronounced the attitude towards the risks and dangers of new food technologies, the less willing consumers are to consume cultured meat. The consumers for whom the positive aspects of new food technologies predominate tend to be those who have a more liberal world view than others. The animal ethics orientation had no significant influence on the WTC. The results obtained contribute to the extensive literature on the acceptance of cultured meat and can be used to develop a communication policy to promote cultured meat in the market studied.

Keywords: cultured meat, food technology neophobia scale, animal ethics orientation, willingness to consume

SAŽETAK

Iako kultivirano meso još nije široko dostupno na tržištu, brojne znanstvene studije već su se bavile potrošačima u kontekstu kupnje i konzumacije ove vrste mesa. Međutim, mnogi aspekti vezani uz perspektivu potrošača prema ovom mesu još uvijek su nepoznati na mnogim nacionalnim tržištima. Cilj ovog istraživanja bio je istražiti utjecaj stavova prema novim prehrambenim tehnologijama i etičke orijentacije prema životinjama na spremnost konzumacije kultiviranog mesa među hrvatskim potrošačima i ispitati razlikuju li se ispitanici u ovim stavovima. Rezultati su pokazali da stavovi mjereni skalom neofobije prehrambene tehnologije imaju značajan utjecaj na spremnost konzumacije. Što je pozitivniji stav prema dobrobitima novih prehrambenih tehnologija, veća je voljnost konzumacije kultiviranog mesa. Nasuprot tome, što je stav prema rizicima i opasnostima novih prehrambenih tehnologija izraženiji, potrošači su manje spremni na konzumaciju kultiviranog mesa. Potrošači kod kojih prevladavaju pozitivni aspekti novih prehrambenih tehnologija uglavnom su oni koji imaju liberalniji svjetonazor od ostalih. Etička orijentacija prema životinjama nije imala značajan utjecaj na spremnost konzumacije kultiviranog mesa. Dobiveni rezultati doprinose bogatoj literaturi o prihvaćanju kultiviranog mesa te se mogu koristiti za razvoj komunikacijske politike za promicanje kultiviranog mesa na tržištu obuhvaćenom ovim istraživanjem.

Ključne riječi: kultivirano meso, skala neofobije prehrambene tehnologije, etička orijentacija prema životinjama, spremnost konzumiranja

INTRODUCTION

Animal welfare and the impact on the environment are currently two unavoidable issues when it comes to livestock farming. Animal welfare is a complex issue that encompasses ethical, scientific, economic and political dimensions (Lund et al., 2006). Scientists with different backgrounds offer various definitions for this concept, but the most appropriate definition should refer to the state of the animal organism, which takes into account body and mind, but also everything that connects them (Carenzi and Verga, 2009). Regarding the relationship between livestock farming and the environment, it is clear that livestock farming has a negative impact on the environment in several ways due to the struggle for resources such as land or water (de Vries and de Boer, 2010). Given the environmental threats posed by livestock production, scientists are working with the industry to offer new solutions for protein production that will help reduce the negative impact on the environment while addressing important issues related to public health, sustainability and animal welfare (Post et al., 2020). One of the solutions to simultaneously address the aforementioned challenges is lab-grown meat production (Zhang et al., 2020). With the help of scientific innovations and technological achievements, animal-free production is achieved by cultivating stem cells taken from animals (Mengistie, 2020). This is a way to produce meat in a way that benefits animal welfare and the environment (Siegrist and Hartmann, 2020a). At the same time, cultured meat is also an alternative for consumers who do not want to change their dietary habits in terms of protein intake, but want to consume more responsibly (Chriki and Hocquette, 2020).

Although the mass production of cultured meat has not yet become established, numerous studies have been carried out on consumer attitudes towards this type of meat. The results of these studies have shown that consumers perceive cultured meat as unnatural (e.g. Verbeke et al., 2015; Lupton and Turner, 2018; Shaw and Mac Con Iomaire, 2019; Franceković et al., 2021) and in this context as less safe (e.g. Lupton and Tuerner, 2018; Shaw and Mac Con Iomaire, 2019; Mancini and Antonioli, 2019) and less healthy than conventional (e.g. Verbeke et al., 2015; Laestadius and Caldwell, 2015). They also believe that production will have a negative impact on traditional agriculture (e.g. Verbeke et al., 2015; Wilks and Phillips, 2017; Shaw and Mac Con Iomaire, 2019). Nevertheless, consumers see certain benefits in the production of cultured meat. They believe that cultured meat production is good for the environment (e.g. Mancini and Antonioli, 2019; Liu et al., 2023; Gousset et al., 2022) and animal welfare (e.g. Mancini and Antonioli, 2019; Gousset et al., 2022). A large proportion of consumers are not very familiar with cultured meat. For example, a study by Bryant et al. (2019) found that 57% of respondents in the USA, more than 35% of respondents in China and more than 25% of respondents in India were not at all familiar with cultured meat. In the context of insufficient information and knowledge about this type of meat, studies conducted have shown that a considerable higher percentage of consumers are willing to try cultured meat than to buy it, especially not on a regular basis (e.g. Mancini and Antonioli, 2019; Bryant and Dillard, 2019; Weinrich et al., 2020; Muiruri and Rickertsen, 2024).

Pakseresht et al. (2022), reviewing the literature, found that factors such as public awareness, perceived naturalness, perceived food-related risks, food neophobia, perceived uncertainty about safety and health, price and sensory appearance, and some socio-demographic characteristics of respondents influenced the acceptance of cultured meat. In addition, Rombach et al. (2022) found that the presence of allergies, concern about food technologies, curiosity about food, importance of meat and perception of cultured meat influence the willingness to consume cultured meat.

To our knowledge, only two studies on potential consumers of cultured meat have been conducted in Croatia. Franceković et al. (2021) conducted a study in Croatia, Greece and Spain to investigate how consumers perceive cultured meat and whether meat consumption is related to the intention to buy and try cultured meat. They identified four segments in terms of meat consumption

and variety: a. Non-Meat Eaters, b. Medium Frequency, Low Processed, c. High Frequency, Medium Processed, d. Very High Frequency, High Processed. The High Frequency, Medium Processed segment is most likely to consume cultured meat. It was also found that 47% of respondents had never heard the term "cultured meat", but 43.5% of them were willing to try this type of meat. The same study found that 60% of respondents think that cultured meat is good for animals, more than half think it is unnatural, and 45% think cultured meat is healthy and environmentally friendly. Faletar and Cerjak (2022) published a study whose main objective was to segment potential consumers based on their perceptions of cultured meat and describe the resulting segments based on socio-demographic characteristics. They discovered four segments: Concerned, Rationally Concerned, Acceptors and Apathetic. The segments differed from the reference segment (Concerned) in terms of support for public research and funding of cultured meat, willingness to consume cultured meat, and religiosity. Although 53.2% of respondents stated that they had heard of cultured meat, 36.5% of them chose the correct definition for this type of meat. 42.9% of respondents are not sure whether they support public research and funding of cultured meat.

Previous Croatian studies have addressed willingness to consume cultured meat to some extent; however, in these studies, willingness to consume was not a variable of key interest. Furthermore, only a limited number of constructs that can be considered as determinants of willingness to try or consume cultured meat were considered. Therefore, this study aims to gain additional insights into the acceptance of cultured meat in this market by examining the influence of attitudes towards novel food technologies and orientation towards animal ethics. Meat consumption is not only questioned for environmental reasons, but also ethical reasons (Peschel et al., 2024). It is assumed that neophobia towards food technologies is a direct obstacle to innovation in the field of food production (Siegrist and Hartmann, 2020b). For this reason, it is scientifically justified to investigate the role of these aspects in the acceptance of meat alternatives such as cultured meat. Investigating the acceptance of cultured meat at the national market level is important given the cultural differences of potential consumers. A study conducted by Siegrist and Hartmann (2020a) in ten countries, including countries from Europe, Africa, Asia, the America and Australia, showed large cultural differences in the acceptance of cultured meat.

The present study pursued two objectives: (1) to investigate the influence of attitudes towards novel food technologies and animal ethics orientation on the willingness to consume cultured meat (2) and if these attitudes have an influence, whether consumers differ in their attitudes towards novel food technologies and animal ethics orientation.

MATERIAL AND METHODS

An online survey was conducted in Croatia in summer 2021. With the help of social networks and personal contacts, 480 surveys were collected. For this study, 402 surveys were included because they were answered in full. The questionnaire relevant for this study included the Food Technology Neophobia Scale (Cox and Evans, 2008) (FTNS) to measure attitudes towards novel food technologies, the Animal Ethics Orientation Scale (Lund et al., 2019) (AEOS) to measure attitudes towards animal ethics, a question on willingness to consume cultured meat (WTC) and socio-economic characteristics of the respondents. FTNS, AEOS and WTC were measured on a 5-point Likert scale (1- totally disagree/no, in no case willing to consume; 5- totally agree/definitely willing to consume). Respondents were given the exact definition of cultured meat before being asked to rate their level of agreement with the statements about attitudes towards new food technologies, ethical orientation towards animals and willingness to consume cultured meat. SPSS software was used to analyse the data. A univariate data analysis was carried out to describe the sample. Several methods were used to achieve the research objectives. First, two separate exploratory factor analyses were conducted to reduce the FTNS statements and AEOS statements to a smaller number of factors. The factors obtained were then used as independent variables in a

multiple regression analysis to examine their influence on willingness to consume cultured meat. A two-step cluster analysis was then performed with the previously identified factors for those variables that were found to be statistically significant determinants of willingness to consume cultured meat. The resulting clusters were described using binary logistic regression analysis with the socio-demographic characteristics of the respondents.

RESULTS

Sample description

Around two-thirds of respondents were women, and the same number grew up in the city. The most represented age group was respondents between the ages of 18 and 24, and the highest percentage of respondents (47.7%) had a bachelor's or master's degree. More than half of the respondents rated their household's financial situation as good. The largest percentage of respondents (38%) tended to be religious, and the largest percentage of them (42.6%) belonged to the political center. Most of them (45.3%) consume meat frequently, and 97% described themselves as omnivores (Table 1).

Willingness to consume cultured meat

The mean value shows that the willingness to consume cultured meat is uncertain among the consumers surveyed ($\bar{x}$=3.12; SD=1.129). However, the answers on a 5-point scale show a large polarisation. The results show that 8.5% of respondents are definitely not willing to consume cultured meat, while 21.6% are probably not willing to do so. 29.4% of respondents are not sure about this. Almost the same percentage of respondents (29.6%) are probably willing to consume cultured meat, while 10.9% of them are definitely willing to do so.

Exploratory factor analyses

The result of the exploratory factor analysis with statements on the neophobia of food technology was four factors. The statement „The media usually provides a balanced and unbiased view of new food technologies“ formed one factor, and since a factor with only one statement is not considered a suitable solution, this statement/factor was omitted from further procedure, and the factor analysis was repeated. The repeated factor analysis resulted in three stable factors and can be considered statistically appropriate as the values for KMO (0.900), Bartlett's test (0.000) and MSA (0.819 - 0.947) values satisfactory. These three factors explain 64.503% of the variance. The first factor consists of aspects that are critical of new food technologies and new foods, so this factor is called "Critical view of food technology neophobia". The second factor can be called "Positive view of new food technologies for nutrition", as it is composed of statements related to the benefits that foods from new technologies can have for a balanced diet and food choices in general. The third factor consists of aspects related to caution in the use of foods from new technologies in relation to the environment and the solution of food sufficiency. Therefore, this factor is referred to as "Restraint towards new food technologies". Table 2 contains a detailed presentation of the factors with the corresponding statements and their mean values.

The exploratory factor analysis with statements on animal ethics orientation with a satisfactory KMO value (0.858), a statistically significant Bartlett's test (0.000) and MSA range (0.772–0.939) revealed three reliable factors explaining 64.992% of the variance. The first factor consists of items related to the approval of the use of animals and the infliction of pain on animals if it achieves certain social goals. Therefore, this factor is referred to as "Favouring the use of animals for social purposes at the expense of suffering". The second factor is referred to as "Approval of the use of animals for social purposes on the condition that they do not suffer", as it consists of statements that advocate animal experimentation, but on the condition that the animals are not subjected to unnecessary stress or suffering and that they have previously had a high-quality life. The third factor consists of aspects that exclude the use of animals by humans, as animals are living beings that can feel happiness and pain, and their use should be prohibited by law. This factor is referred to as "Unacceptable use of animals by humans". All factors with statements and their mean values are shown in Table 3.

Table 1. Description of the sample

Variable	Categories	n	%
Gender	female	266	66.2
	male	136	33.8
Age		Mean = 34.9 (SD = 14.535)	
Place of growing up	countryside	136	33.8
	town/city	266	66.2
Place of current living	countryside	95	23.6
	town/city	307	76.4
Education	primary school	3	0.7
	middle school	159	39.6
	bachelor/master	191	47.5
	Mr.sc./Dr.sc.	49	12.2
Perceived financial status of the household	very bad	3	0.7
	bad	6	1.5
	neither bad nor good	127	31.6
	good	266	56.2
	very good	40	10.0
Religiosity	not religious at all	75	18.7
	not really religious	74	18.4
	unsure	79	19.7
	somewhat religious	153	38.1
	very religious	21	5.2
Political affiliation	left	64	15.9
	center-left	82	20.4
	center	171	42.5
	center-right	45	11.2
	right	40	10.0
Eating habits	omnivore	390	97.0
	vegetarian	5	1.2
	Something else	7	1.7
Meat consumption frequency	very often	129	32.1
	often	182	45.3
	neither often nor rarely	72	17.9
	rarely	17	4.2
	very rarely	2	0.5

Table 2. Exploratory factor analysis on FTNS

Factors	Factor loading	Mean	SD
FTNS 1 (Cronbach alpha = 0.872)			
There is no sense trying out high-tech food products because the ones I eat are already good enough	0.788	2.49	0.999
New food technologies are something I am uncertain about	0.817	2.77	1.046
New foods are not healthier than traditional foods	0.733	3.23	0.937
The benefits of new food technologies are often grossly overstated	0.714	3.22	0.905
There are plenty of tasty foods around, so we do not need to use new food technologies to produce more	0.902	2.74	1.036
New food technologies decrease the natural quality of food	0.491	3.23	0.942
FTNS 2 (Cronbach alpha = 0.758)			
New products produced using new food technologies can help people have a balanced diet	0.847	3.21	0.955
New food technologies are unlikely to have long-term negative health effects	0.669	2.96	0.824
New food technologies give people more control over their food choices	0.870	3.31	0.888
FTNS 3 (Cronbach alpha = 0.704)			
New food technologies may have long-term negative environmental effects	0.741	3.11	0.780
It can be risky to switch to new food technologies too quickly	0.930	3.50	0.809
Society should not depend heavily on technologies to solve its food problems	0.550	3.42	1.030

Note: the extraction method was Principal Component Analysis; the rotation method was Promax with Kaiser Normalization.

Table 3. Exploratory factor analysis on AEOS

Factors	Factor loading	Mean	SD
AEOS 1 (Cronbach alpha = 0.886)			
Inflicting serious pain on the animal is acceptable if it is necessary in order to achieve a vital human goal, e.g. in medical research	0.880	2.63	1.087
We have the right to use animals because humans are intellectually superior to animals	0.716	2.12	0.975
Inflicting considerable pain on animals is justified if the purpose is sufficiently important, e.g. medical research	0.909	2.56	1.053
We must prioritize humans over animals	0.699	3.14	1.059
Human interests are more important than those of animals	0.666	3.03	1.042
Exposing animals to stress and reducing their welfare is justified if the purpose is sufficiently important	0.825	2.68	1.037
AEOS 2 (Cronbach alpha = 0.746)			
Using animals for important human purposes (e.g. medical research) is acceptable if it is done so that the animals do not experience unnecessary stress	0.822	3.60	0.942
Using animals for important human purposes is acceptable if it is done so that the animals do not experience unnecessary pain	0.743	3.53	0.984
It is acceptable for humans to put animals down if it is done painlessly	0.658	3.60	0.892
Using animals for important human purposes is acceptable if the animals have a decent quality of life	0.763	3.54	0.890
AEOS 3 (Cronbach alpha = 0.833)			
The use of animals by humans should be prohibited by law	0.865	2.95	1.105
In principle, the use of animals by humans is unacceptable because animals can feel pain, happiness, etc	0.840	3.32	0.976
In principle, the use of animals by humans is unacceptable because animals are sentient beings	0.845	3.01	1.018

Note: the extraction method was Principal Component Analysis; the rotation method was Promax with Kaiser Normalization.

Multiple regression analysis

The results of the multiple regression analysis show a significant influence of all three variables of neophobia towards food technology on the willingness to consume cultured meat (WTC). In contrast, none of the three animal ethics orientation variables significantly influenced WTC (Table 4). The independent variables explained 52% of the variance in the willingness to consume cultured meat. The more critical the respondents were of new food technologies, the less willing they were to consume cultured meat (β=-0.450; P<0.001). The more positively respondents rated new food technologies in relation to human nutrition, the greater their willingness to consume cultured meat (β=0.262; P<0.001). The more reluctant the respondents are towards the introduction of new food technologies, the less willing they are to consume cultured meat (β=-0.128; P<0.01) (Table 4).

Table 4. Results of multiple regression analysis

Independent variable	β	t	p
FTNS 1	-0.450	-9.766	0.000
FTNS 2	0.262	5.849	0.000
FTNS 3	-0.128	-3.074	0.002
AEOS 1	0.018	0.410	0.682
AEOS 2	-0.002	-0.039	0.969
AEOS 3	0.026	0.607	0.544

Note: the dependent variable is willingness to consume cultured meat

Cluster analysis

The two-step cluster analysis with three variables on neophobia in food technology led to two clusters. Based on the silhouette measure for cohesion and separation, which is around 0.5, a good quality of the clustering procedure can be determined (see Figure 1).

Based on the BIC change (-217.104) and the distance measure (2.563), it is obvious that the optimal number of clusters is two (Table 5).

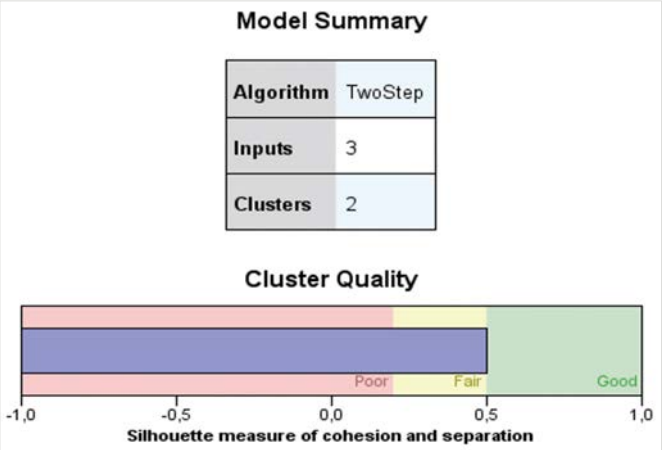
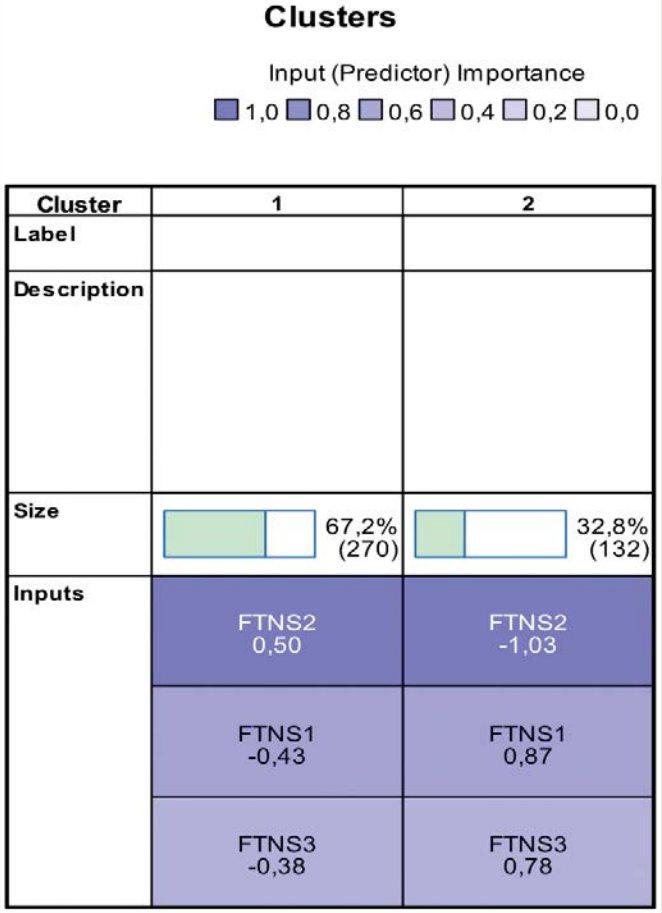


Figure 1. Model summary and cluster quality

The two clusters differ in size. Around 67% of all respondents belong to the first cluster (Figure 2).



Note: FTNS1 - Critical view of food technology neophobia; FTNS2 - Positive view of new food technologies for nutrition; FTNS3 - Restraint towards new food technologies

Figure 2. Cluster solution

Table 5. Auto-clustering

Number of Clusters	Schwarz's Bayesian Criterion (BIC)	BIC Change[a]	Ratio of BIC Changes[b]	Ratio of Distance Measures[c]
1	870.413			
2	653.309	-217.104	1.000	2.563
3	590.525	-62.784	0.289	1.471
4	559.382	-31.143	0.143	1.774
5	557.520	-1.862	0.009	1.016
6	556.242	-1.277	0.006	1.438
7	566.318	10.075	-0.046	1.105
8	578.859	12.541	-0.058	1.078
9	593.101	14.242	-0.066	1.220
10	611.263	18.162	-0.084	1.091
11	630.912	19.649	-0.091	1.288
12	654.208	23.296	-0.107	1.095
13	678.604	24.396	-0.112	1.067
14	703.728	25.124	-0.116	1.246
15	730.999	27.271	-0.126	1.036

Note:
[a] The changes are from the previous number of clusters in the table
[b] The ratios of changes are relative to the change for the two-cluster solution
[c] The ratios of distance measures are based on the current number of clusters against the previous number of clusters

The most important variable predicting membership of one of the two clusters is the variable Positive view of new food technologies for nutrition (FTNS2), followed by the variables Critical view of food technology neophobia (FTNS1) and Restraint towards new food technologies (FTNS3). Looking at the mean values of the individual variables for the clusters, it can be seen that the first cluster comprises respondents who prioritize the positive aspects associated with nutrition ($\bar{x}$=0.50) over the negative aspects associated with new food technologies ($\bar{x}$=-0.43 and $\bar{x}$=-0.38). The second group, on the other hand, includes consumers who are critical ($\bar{x}$=0.87) and cautious ($\bar{x}$=0.78) about new food technologies compared to positive aspects ($\bar{x}$=-1.03) (Figure 2).

Binary logistic regression

A statistically significant regression model (x^2=60.877; df=19; *P*=0.000) and a non-significant Hosmer and Lemeshow test (x^2=4.948; df=8; *P*=0.763) confirm a good model fit. The results show (Table 6) that current place of residence, level of religiosity and political affiliation are predictors of cluster membership. Respondents who live in rural areas, are less religious, and whose political affiliation is between center-left and center-right seem to be more open to new food technologies. The odds ratio of 0.520 shows that people living in urban areas are 48% less likely to reject new food technologies than people living in rural areas. Respondents who described their political affiliation as center-left and center were 59% less likely to reject new food technologies than respondents

who described their political affiliation as right-wing. The odds ratio of 0.330 shows that people who belong to the center-right are 67% less likely to reject new food technologies than people who belong to the right. The odds ratio of 0.086 shows that respondents who are not at all religious are 91% less likely to reject new food technologies than respondents who are very religious. People who are not really religious are also 74% less likely to reject new food technologies than those who are very religious (Table 6).

Table 6. Results of binary logistic regression

Independent variables[a, b]	B	S.E.	Wald	p	Exp (B)	95% C.I.for Exp(B)	
						Lower	Upper
Frequency of meat consumption (reference category: rarely/very rarely[c])							
Often/very often[c]	0.656	0.743	0.778	0.378	1.927	0.449	8.270
Neither often nor rarely	0.327	0.768	0.181	0.671	1.386	0.307	6.250
Eating habits (0 - omnivore; 1- vegetarian/something else[c])	-0.592	0.924	0.411	0.521	0.553	0.090	3.380
Gender (0 - female; 1- male)	-0.246	0.257	0.917	0.338	0.782	0.472	1.294
Place of growing up (0 - countryside; 1 - town/city)	-0.104	0.293	0.127	0.721	0.901	0.507	1.599
Place of living (0 - countryside; 1 - city/town)	-0.654	0.325	4.041	0.044	0.520	0.275	0.984
Age	0.012	0.008	2.074	0.150	1.012	0.996	1.028
Perceived financial status of the household (reference category: good/very good[c])							
Bad/very bad[c]	0.244	0.776	0.099	0.754	1.276	0.279	5.838
Neither good nor bad	-0.016	0.258	0.004	0.950	0.984	0.593	1.632
Education (reference category: Mr.sc./Dr.sc.)							
Primary school/middle school	-0.058	0.396	0.022	0.883	0.943	0.434	2.050
Bachelor/master	0.218	0.388	0.314	0.575	1.243	0.581	2.661
Political affiliation (reference category: right)							
Left	-0.701	0.486	2.081	0.149	0.496	0.191	1.286
Center-left	-0.912	0.452	4.059	0.044	0.402	0.166	0.975
Center	-0.898	0.387	5.383	0.020	0.407	0.191	0.870
Center-right	-1.108	0.477	5.393	0.020	0.330	0.130	0.841
Religiosity (reference category: very religious)							
Not religious at all	-2.455	0.647	14.45	0.000	0.086	0.024	0.305
Not really religious	-1.364	0.564	5.855	0.016	0.256	0.085	0.772
Unsure	-0.920	0.545	2.851	0.091	0.398	0.137	1.159
Somewhat religious	-0.527	0.509	1.074	0.300	0.590	0.218	1.600

Note:
[a] Dependent variable is cluster membership (0 - Acceptors; 1 - Non-aceptors)
[b] The reference cluater is cluster Acceptors
[c] Due to a low number of responses, answer options were merged

DISCUSSION

The aim of this was to investigate the influence of attitudes towards new food technologies and animal ethics on the willingness to consume cultured meat and whether the respondents differ in these attitudes. The results showed that around 40% of respondents were more or less willing to consume cultured meat. This result is in line with the results of studies conducted in other countries. Valente et al. (2019), for example, found that 39% of Brazilian respondents were willing to consume cultured meat. Bryant and Dillard (2019) found that 48.5% of respondents in the US were probably or definitely willing to consume this type of meat. However, among the consumers in this study, there is also a significant percentage of people who are less willing to consume this type of meat. Due to this inhomogeneity, it was important to investigate the influence of scales with multiple aspects, including both positive and negative aspects, such as novel food technology and animal ethics orientation. The literature review revealed that neophobia towards novel food technology was a significant predictor of cultured meat acceptance. To our knowledge, animal ethics orientation has not yet been investigated in this context, but its inclusion is warranted as modern consumers are faced with ethical issues when it comes to the way their food is produced. Taking into account the fact that they are not yet familiar with this product, there is a significant proportion of respondents who tend to be open to meat from novel food technologies and who can be considered a potential market niche for this type of meat. The results confirmed a significant correlation between willingness to eat cultured meat and neophobia towards food technologies. All three factors of neophobia towards food technologies were decisive for the willingness to eat. The greater the perceived benefits of new food technologies, the more willing consumers are to eat cultured meat. On the other hand, the more cautious and critical they are of new food technologies, the less willing they are to consume this type of meat. Boereboom et al. (2022) and Dupont et al. (2022) also found that the greater the neophobia towards food technologies, the lower the willingness to consume cultured meat. Respondents also differed in their attitudes towards new food technologies. Respondents who live in cities, are less religious and see their political orientation as between left and right of center, are more likely to have a positive attitude towards new food technologies. It stands to reason that consumers with these demographic characteristics who have a more positive attitude towards new food technologies are also more likely to be consumers of cultured meat. Some previous studies have also confirmed that worldviews play a role in the acceptance of cultured meat. Wilks et al. (2019) found that politically conservative individuals are less likely to accept cultured meat. Faletar and Cerjak (2022) previously found that Croatian respondents who were more accepting of cultured meat were less likely to be religious. As far as we are aware, there are no other studies examining the variable of religiosity in relation to cultured meat acceptance. Therefore, addressing religiosity in this context can be seen as an additional scientific contribution of this study to the understanding of cultured meat acceptance. Animal ethics orientation had no significant influence on the willingness to consume cultured meat, and therefore differences between consumers regarding these attitudes were not investigated. The fact that attitudes towards animal ethics have no significant influence on the willingness to consume cultured meat can be interpreted to mean that consumers are not able to evaluate or position cultured meat in comparison to meat from conventional animal husbandry.

CONCLUSION

These research findings are a valuable contribution to the already rich literature on the acceptance and willingness to consume cultured meat, as they are findings from the still under-researched national market. First and foremost, these results can be useful for business practices to improve the image of this type of meat and ultimately increase its acceptance as one of the alternatives to conventional meat when it appears on the market. The significant positive correlation between the attitude towards new food technologies and the willingness to consume cultured meat can be used to strengthen the

image not only of cultured meat but also of new food technologies, so that ultimately the positive aspects of this technology determine the choice of products made with it. On the other hand, work must be done to educate and inform consumers about the existing benefits of new food technologies in order to develop additional acceptance for them and to reduce reservations, criticism and skepticism towards them. Considering that aversion to sensory attributes, fear of the consequences of food consumption and aversion to food origin are the three main barriers to food acceptance (Vidigal et al., 2015) and that cultured meat is not yet available in the market studied, the only aspect that marketers can focus on when it comes to cultured meat acceptance in the context of new food technologies is to create a positive image of the "technological" origin of cultured meat. Since this study has shown that consumers who live in cities are less religious and belong to the political centre, they are obviously more likely to be consumers of cultured meat, it is recommended to focus on these consumers in order to create a stable market niche. They should be targeted with the message that the technologically modern way of food production does not have a negative impact on health, but also brings more control over food choices and contributes to a balanced diet. In order to gain a broader perspective on the potential consumers of cultured meat in Croatia, future research on this topic should include additional constructs that have been shown to be relevant in studies conducted in other markets. It is also recommended to conduct experimental research in which participants are given certain information about new food technologies and have the opportunity to see cultured meat and then test their willingness to consume it.

REFERENCES

Boereboom, A., Mongondry, P., de Aguiar, L. K., Urbano, B., Jiang, Z., De Koning, W., Vriesekoop, F. (2022) Identifying consumer groups and their characteristics based on their willingness to engage with cultured meat: A comparison of four European countries. Foods, 11 (2), 197. DOI: https://doi.org/10.3390/foods11020197

Bryant, C., Szejda, K., Parekh, N., Deshpande, V., Tse, B. (2019) A survey of consumer perceptions of plant-based and clean meat in the USA, India, and China. Frontiers in Sustainable Food Systems, 3, 432863. DOI: https://doi.org/10.3389/fsufs.2019.00011

Bryant, C., Dillard, C. (2019) The Impact of Framing on Acceptance of Cultured Meat. Frontiers in Nutrition, 6, 103. DOI: https://doi.org/10.3389/fnut.2019.00103

Carenzi, C., Verga, M. (2009) Animal welfare: review of the scientific concept and definition. Italian Journal of Animal Science, 8 (suppl. 1), 21-30. DOI: https://doi.org/10.4081/ijas.2009.s1.21

Chriki, S., Hocquette, J. F. (2020) The myth of cultured meat: a review. Frontiers in Nutrition, 7, 507645. DOI: https://doi.org/10.3389/fnut.2020.00007

Cox, D.N., Evans, G. (2008) Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: The food technology neophobia scale. Food Quality and Preferences, 19(8), 704-710. DOI: https://doi.org/10.1016/j.foodqual.2008.04.005

De Vries, M., de Boer, I. J. (2010) Comparing environmental impacts for livestock products: A review of life cycle assessments. Livestock Science, 128 (1-3), 1-11. DOI: https://doi.org/10.1016/j.livsci.2009.11.007

Dupont, J., Harms, T., Fiebelkorn, F. (2022) Acceptance of cultured meat in Germany—Application of an extended theory of planned behaviour. Foods, 11 (3), 424. DOI: https://doi.org/10.3390/foods11030424

Faletar, I., Cerjak, M. (2022) Perception of cultured meat as a basis for market segmentation: empirical findings from Croatian study. Sustainability, 14(12), 6956. DOI: https://doi.org/10.3390/su14126956

Franceković, P., García-Torralba, L., Sakoulogeorga, E., Vučković, T., Perez-Cueto, F. J. (2021) How do consumers perceive cultured meat in Croatia, Greece, and Spain?. Nutrients, 13 (4), 1284. DOI: https://doi.org/10.3390/nu13041284

Gousset, C., Gregorio, E., Marais, B., Rusalen, A., Chriki, S., Hocquette, J. F., Ellies-Oury, M. P. (2022) Perception of cultured "meat" by French consumers according to their diet. Livestock Science, 260, 104909. DOI: https://doi.org/10.1016/j.livsci.2022.104909

Laestadius, L. I., Caldwell, M. A. (2015) Is the future of meat palatable? Perceptions of in vitro meat as evidenced by online news comments. Public Health Nutrition, 18 (13), 2457- 2467.

Liu, J., Almeida, J. M., Rampado, N., Panea, B., Hocquette, É., Chriki, S., Ellies-Oury, M.P., Hocquette, J.F. (2023) Perception of cultured "meat" by Italian, Portuguese and Spanish consumers. Frontiers in Nutrition, 10, 1043618. DOI: https://doi.org/10.3389/fnut.2023.1043618

Lund, V., Coleman, G., Gunnarsson, S., Appleby, M.C., Karkinen, K. (2006) Animal welfare science-Working at the interface between the natural and social sciences. Applied Animal Behaviour Science, 97, 37-49. DOI: https://doi.org/10.1016/j.applanim.2005.11.017

Lund, T.B., Kondrup, S.V., Sandoe, P. (2019) A multidimensional measure of animal ethics orientation- Developed and applied to a representative sample of the Danish public. PloS One, 14 (2), e0211656. DOI: https://doi.org/10.1371/

Lupton, D., Turner, B. (2018) Food of the Future? Consumer Responses to the Idea of 3D-Printed Meat and Insect-Based Foods. Food and Foodways, 26, 269–289. DOI: https://doi.org/10.1080/07409710.2018.1531213

Mancini, M.C.; Antonioli, F. (2019) Exploring consumers' attitude towards cultured meat in Italy. Meat Science, 150, 101–110. DOI: https://doi.org/10.1016/j.meatsci.2018.12.014

Mengistie, D. (2020) Lab-growing meat production from stem cell. Journal of Nutrition & Food Sciences, 3 (1), 100015.

Muiruri, S. W., Rickertsen, K. (2024) Norwegian consumers' willingness to try cultured meat. Future Foods, 10, 100409. DOI: https://doi.org/10.1016/j.fufo.2024.100409

Pakseresht, A., Kaliji, S. A., Canavari, M. (2022) Review of factors affecting consumer acceptance of cultured meat. Appetite, 170, 105829. DOI: https://doi.org/10.1016/j.appet.2021.105829

Peschel, A. O., Thomsen, K., Tsalis, G., Grunert, K. G. (2024) The role of ethical orientation in animal welfare choice behaviour: A segmentation study. Food Quality and Preference, 105334. DOI: https://doi.org/10.1016/j.foodqual.2024.105334

Post, M. J., Levenberg, S., Kaplan, D. L., Genovese, N., Fu, J., Bryant, C. J., Nogowetti, N., Verzijden, K., Moutsatsou, P. (2020) Scientific, sustainability and regulatory challenges of cultured meat. Nature Food, 1 (7), 403-415. DOI: https://doi.org/10.1038/s43016-020-0112-z

Rombach, M., Dean, D., Vriesekoop, F., de Koning, W., Aguiar, L. K., Anderson, M., Mongondry, P., Oppong-Gyamfi, M., Urbano, B., Gomez Luciano, C.A, Hao, W., Eastwick, E., Jiang, Z.V., Boereboom, A. (2022) Is cultured meat a promising consumer alternative? Exploring key factors determining consumer's willingness to try, buy and pay a premium for cultured meat. Appetite, 179, 106307. DOI: https://doi.org/10.1016/j.appet.2022.106307

Shaw, E., Iomaire, M.M.C. (2019) A comparative analysis of the attitudes of rural and urban consumers towards cultured meat. British Food Journal, 121, 1782–1800. DOI: https://doi.org/10.1108/BFJ-07-2018-0433

Siegrist, M., Hartmann, C. (2020a) Perceived naturalness, disgust, trust and food neophobia as predictors of cultured meat acceptance in ten countries. Appetite, 155, 104814. DOI: https://doi.org/10.1016/j.appet.2020.104814

Siegrist, M., Hartmann, C. (2020b) Consumer acceptance of novel food technologies. Nature Food, 1 (6), 343-350. DOI: https://doi.org/10.1038/s43016-020-0094-x

Valente, J. D. P. S., Fiedler, R. A., Sucha Heidemann, M., Molento, C. F. M. (2019) First glimpse on attitudes of highly educated consumers towards cell-based meat and related issues in Brazil. PloS one, 14 (8), e0221129.

Verbeke, W., Marcu, A., Rutsaert, P., Gaspar, R., Seibt, B., Fletcher, D., Barnett, J. (2015) 'Would you eat cultured meat?': Consumers' reactions and attitude formation in Belgium, Portugal and the United Kingdom. Meat Science, 102, 49-58. DOI: https://doi.org/10.1016/j.meatsci.2014.11.013

Vidigal, M. C., Minim, V. P., Simiqueli, A. A., Souza, P. H., Balbino, D. F., Minim, L. A. (2015) Food technology neophobia and consumer attitudes toward foods produced by new and conventional technologies: A case study in Brazil. LWT-Food Science and Technology, 60 (2), 832-840. DOI: https://doi.org/10.1016/j.lwt.2014.10.058

Weinrich, R., Strack, M., Neugebauer, F. (2020) Consumer acceptance of cultured meat in Germany. Meat Science, 162, 107924. DOI: https://doi.org/10.1016/j.meatsci.2019.107924

Wilks, M., Phillips, C.J. (2017) Attitudes to in vitro meat: A survey of potential consumers in the United States. PloS one, 12 (2), e0171904. DOI: https://doi.org/10.1371/journal.pone.0171904

Wilks, M., Phillips, C. J., Fielding, K., Hornsey, M. J. (2019) Testing potential psychological predictors of attitudes towards cultured meat. Appetite, 136, 137-145. DOI: https://doi.org/10.1016/j.appet.2019.01.027

Zhang, G., Zhao, X., Li, X., Du, G., Zhou, J., Chen, J. (2020) Challenges and possibilities for bio-manufacturing cultured meat. Trends in Food Science and Technology, 97, 443-450. DOI: https://doi.org/10.1016/j.tifs.2020.01.026