Research Article

Does Generation Z Consume Artificial Meat? Türkiye Examination

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A B S T R A C T

The aim of this study is to examine the perceptions of young people between the ages of 18-22 in Türkiye, studying at universities and representing generation Z regarding the consumption of artificial meat and to determine whether there will be a consumer base for artificial meat in Türkiye in the coming years. For this purpose, face-to-face interviews were conducted with a total of 227 individuals, 95 (41.85%) female and 132 (58.15%) male participants. Both quantitative descriptive and qualitative descriptive analysis were used in the research. Qualitative analyses were evaluated using Maxqda 20 Package Program. 77 respondents (33.92%) stated that they could consume artificial meat. 29 (30.52%) female and 45 (34.09%) male participants stated that they could consume artificial meat. Participants stated that they would not consume artificial meat because they were concerned about artificial meat being unhealthy, unnatural, insufficient in terms of nutritional value, unsafe, negatively affecting animal husbandry, and posing a problem in terms of belief. As a result, contrary to expectations, generation Z living in Türkiye has a high potential to consume artificial meat. As long as the concerns of the participants are clarified, we foresee that there will be a more serious increase in the artificial meat consumption potential of the generation Z, which will represent the Turkish population in the future.

Keywords: *Artificial meat, Cultured meat, In vitro meat, Synthetic meat, Türkiye, Generation Z*

INTRODUCTION

Proteins are the largest basic building blocks of the human body after water. Proteins, which have many important functions in the physiology and metabolism of living things, are found in foods of plant and animal origin. In recent years, the rapid increase in the world population and changing consumer orientations have led to serious discussions on protein sources, which have a very important place in human nutrition (Yetim et al. 2020; Ebcim et al. 2021). In 2050, with the increasing human population, it is predicted that the need for meat consumption, which is one of the important protein sources, will double and animal production will reach its maximum production capacity (FAO 2011). It is estimated that meat, which is a source of animal protein, will not be able to meet the needs and the cost of production will increase further, and meat consumption will become a luxury consumption group (Çakmak et al. 2023). Therefore, it is observed that there is an increase in the search for alternative protein sources and biotechnological research (Aydemir et al. 2023). Nowadays, microbial proteins, alternative plants, insects, algae, fungi, in vitro or artificial meat are emphasized and recommended as alternative protein sources (Ünver Alçay et al. 2018).

It is the name given to the product obtained as a result of the development and differentiation of stem cells taken from some animals grown for artificial meat food purposes in a bioreactor with the necessary conditions (growth factors, nutrients, energy sources, etc.) and their transformation into mature muscle cells and subsequently into larger muscle tissues (Bhat et al. 2015; Sürek and Uzun 2020). Artificial meat is named with many different concepts (artificial meat, in vitro meat, animal-free meat, synthetic meat, cultured meat, lab grown meat, clean meat, tube meat) (Yetim et al. 2020). Two separate projects were first initiated in the early 2000s to produce artificial meat for food purposes. The first introduction of artificial meat to the societies of the world was with the news of a hamburger produced by a chef using artificial meat, which appeared in some London-based media organizations in August 2013 (Wosczyna and Rando 2018; Post et al. 2020). Many methods of artificial meat production have been tried or proposed. Among the main methods preferred for this purpose; There are cell culture-based techniques, tissue culture-based techniques and some other techniques (organ printing technique, biophotonic technique, nanotechnology technique).

It is said that there were many problems of concern before the production and commercialization of artificial meat (Ünver Alçay et al. 2018). The problems that may arise are reported to be largely non-applicable, excessively high cost of production, not accepted by consumers, and not considered natural (Fayaz Bhat et al. 2017; Ünver Alçay et al. 2018; Datar and Betti 2010).

In addition, many uncertainties in the production of artificial meat raise consumer concerns. This uncertainty involves doubts about whether there is negativity in terms of community health and food security, efficiency in terms of nutritive value (fatty acids, B12, iron, etc.), and guarantee of sensory admiration that natural meat provides (color, texture, smell, etc.), problem in terms belief and ethics (Sürek and Uzun 2020; Yetim et al. 2020).

Therefore, before starting production on a large scale, it is necessary to investigate consumer opinions, benefit-interest relationships, cost and economic dimensions, public health and food safety dimensions, belief dimensions, ethical and social issues regarding artificial meat (Schaefer and Savulescu 2014; Pakseresht et al. 2022).

Age is one of the main factors affecting people's food choices. Therefore, it is important to determine the food preferences of age groups (Grasso et al. 2019). Generation Z, which represents a specific age group, refers to people born in the digital age between the late 1990s and early 2000s. In 2020, approximately 30% of the world's population (2 billion) consists of generation Z (Zuo et al. 2022). It is predicted that Generation Z will play an important role in the economic, decision-making, political and social change of the future (Bogueva and Marinova 2020). Generation Z, the world's largest consumer group, influences a food's desirability, purchasing ability and food consumption (Su et al. 2019). Generation Z prefer foods that make a good impression, reliable and transparent food(s) sources, branded products that meet expected standards, and foods that are globally trending on social media (Su et al. 2019; Szakály et al. 2018; Kamenidou et al. 2018) Therefore, it is important to determine the food preferability of generation Z and to develop products according to the needs of this generation.

The aim of this study is to examine the perceptions of young people between the ages of 18-22 in Türkiye, studying at universities and representing generation Z regarding the consumption of artificial meat and to determine whether there will be a consumer base for artificial meat in Türkiye in the coming years.

MATERIAL AND METHODS

Working Group

The study group of this research consists of individuals between the ages of 18-22, representing Generation Z, studying at any university and participating in the Teknofest (technology festival where competitors participate in every region of the country) event held at Istanbul Atatürk Airport between 27 April 2023 and 1 May 2023. Before the questions were asked, the participants were informed about artificial meat as follows; Artificial meat, also known as cultured meat, in vitro meat, cultivated meat, lab meat, clean meat and synthetic meat, is a novel food produced in laboratories using animal muscle stem cells, but does not come directly from a living animal and which proliferate in culture. To be simple, cultured meat is the meat grown in vitro from cell reproduction. The cell is from an animal and the vitro contains required nutrients. Nutritional contents in the meat can be customized to meet different demands for nutrition.

Research Pattern

Our research consists of both open-ended and closed-ended survey questions. Our research consists of both open-ended and closed-ended survey questions. In the survey prepared for the participants within the scope of the research, two closed-ended questions were asked as "yes" and "no" about whether they would consume artificial meat. Following this, open-ended questions were asked to reveal the reasons according to the answers given by the participants to the closed-ended questions. Quantitative descriptive statistics were used for closed-ended questions and qualitative descriptive analysis was used for open-ended questions. Therefore, this research is a survey study in which different question patterns are used. Büyüköztürk and Demirel (2018) stated that open-ended survey studies are included in qualitative patterns.

Data Collection Tool

In our research, a questionnaire interview form consisting of two parts was used and the questions in these prepared parts were asked to the participants. The first part of the form we prepared consists of various demographic information and the other part consists of interview questions. In essence, our aim in the questions asked was to reveal the attitudes and perspectives of the participants towards the consumption of artificial meat.

Data Collection

The participants were first asked for permission for the study and the interviews were recorded accordingly. The preference for an interview in this way was aimed both to be prepared for the interview in line with the study plan and to ensure that the questions related to the study were answered in a sincere and natural way in a natural environment (Karasar, 2008). Since the age criterion we determined for our study is important, the participants suitable for the purpose of our study were selected from young people in the Z generation between the ages of 18-22. First of all, participants were asked the first part of our questions consisting of various demographic information. Then, the questions that will reveal the attitudes and perceptions of the participants, which will reveal the main purpose of our research, were started.

Data Analysis

Following the completion of the interviews with the students within the framework of the research, the data analysis process began. First, the audio recordings were transcribed. Afterwards, these interviews were transferred to the Maxqda 20 Package Program, and then the analysis steps were started. 124 participants out of 227 participants gave detailed explanations about whether they would consume artificial meat or not, and the data of these participants were included in the qualitative analysis. In qualitative research, it is possible to mention some steps that will guide the researcher (Pietkiewicz et al. 2014). Of course, these steps should not be perceived as definitive steps. Based on these, the data obtained were first read once to ensure the comprehensibility of the data. Then, coding was done with the second reading. Following the coding, sub-themes and themes were formed by bringing together the relevant codes.

Three ways are suggested in the analysis of qualitative data. The first way is to present the data with a descriptive approach without distorting the originality by taking the participant statements directly and adhering to the originality of the data obtained as much as possible. The second way is to present the data with a descriptive approach, and a number of themes are determined and relations between these themes are established. In the third way, the researcher analyzes the data by adding his/her own interpretations alongside the participants' statements. In the research, the data can be analyzed by using these three ways (Yıldırım and Simsek 1999).

RESULTS

Data were collected from a total of 227 individuals, 95 (41.85%) female and 132 (58.15%) male participants. It was observed that all individuals participating in the research were students. With the analysis of the data obtained from the participants, it is understood that the statements of the participants are shaped around two main themes. The first theme's reasons for preferring to consume artificial meat, the second theme's reasons for not consuming artificial meat. Our findings are presented below.

Artificial Meat Consumption Preferences
The question of whether or not they would consume artificial meat was asked to 227 individuals participating in the research, along with its justification. While 77 (33.92%) people who participated in the research reported that they would consume artificial meat, 150 (66.07%) stated that they would not (Figure 1). 29 (30.52%) female participants and 45 (34.09%) male participants stated that they can consume artificial meat (Figure 2). The findings regarding the reasons for both consumption and non-consumption of these people are presented below.
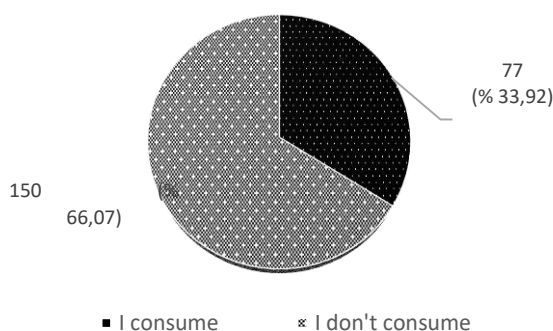

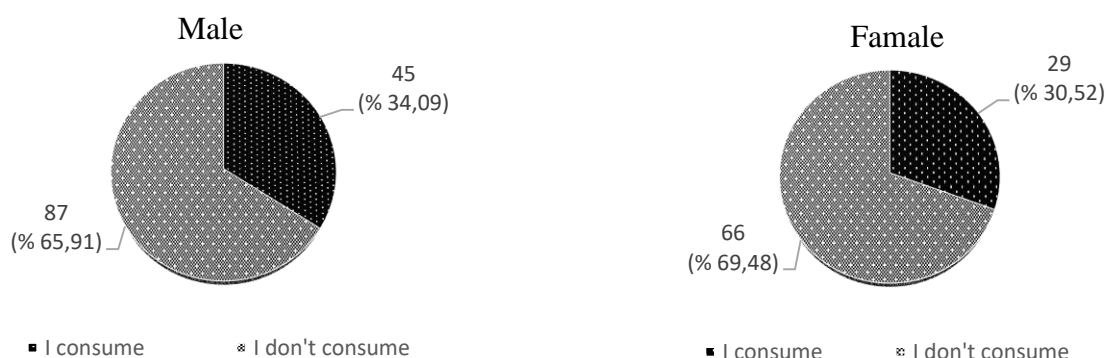*Figure 1. Artificial meat consumption preference rates of the participants*

Figure 2. Artificial meat consumption preference rates by gender

Reasons for Consuming Artificial Meat

In this section, the sub-themes of the emerging theme regarding the reasons for consuming artificial meat are presented.
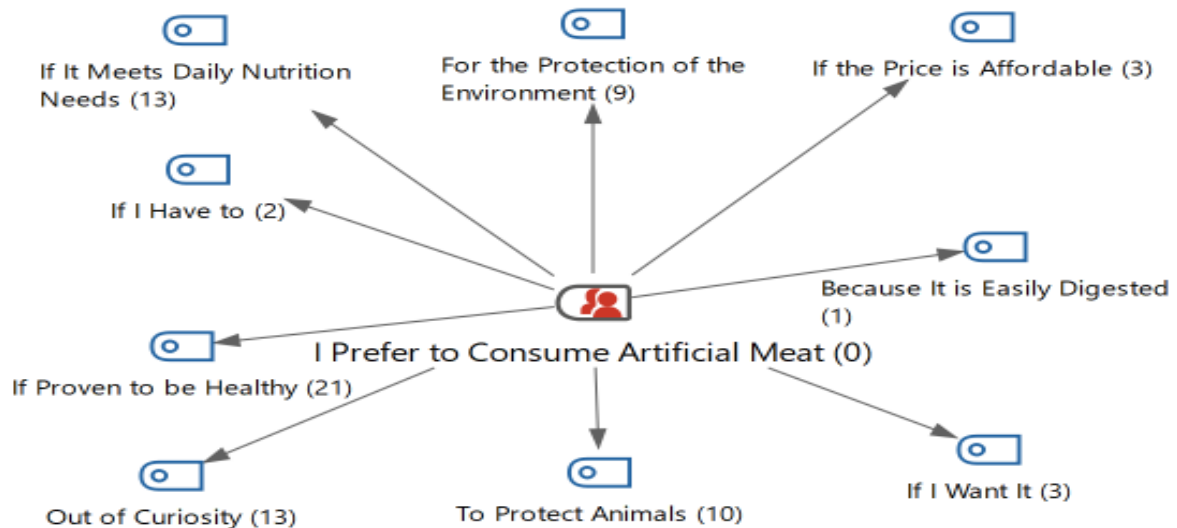

***Figure 3.** Sub-themes of the emerging theme about the reasons for consuming artificial meat*

When Figure 3 is examined, it is seen that the participants mentioned some themes related to consuming artificial meat. A few statements related to these themes are shown below.

- *I think it can be digested more easily, so I consume.* (K5)
- *I prefer to consume artificial meat as I am against killing animals.* (K21)
- *I consume to prevent global warming caused by cows* (K43)
- *I consume so that animals are not slaughtered for our sustenance* (K63)
- *I consume out of curiosity* (K80)
- *If it is proven to be healthy, I will consume it.* (K82)
- *I'd be curious and consume it. If I liked it, I'd consume it all the time.* (K95)
- *As long as the nutritional values are the same and there are no bad side effects, I consume it to protect the environment.* (K104)
- *I consume because it will ensure animal welfare and prevent cruelty to animals* (K110)
- *I will consume it if the price is affordable* (K127)
- *If it will prevent animal trade and have the same nutritional values, I will consume it.* (K153)
- *Although I am not a big meat eater, I may consume it out of curiosity. However, I would not prefer to consume artificial meat produced entirely in laboratories. My first preference would be animal production* (K185)
- *Although I am not sure, I consume it because I think there is such a need.* (K198)
- *Yes, to prevent the damage to nature and animals caused by the animal slaughter industry.* (K220)

In the question we posed to the participants regarding the consumption of artificial meat, it ranked first in the statements given by the participants with the statement "I would consume artificial meat if it is proven to be healthy" (21). In addition, when we look at the other reasons for consumption respectively, they stated that they would consume it if it meets my daily nutritional needs (13), out of curiosity (13), to protect animals (10), to protect the environment (9), if I feel like it (3), if the price is affordable (3), if I have to (2) and because it is easily digestible (1).

Reasons for Not Consuming Artificial Meat

In this section, the sub-themes of the emerging theme regarding the reasons for not consuming artificial meat are presented.
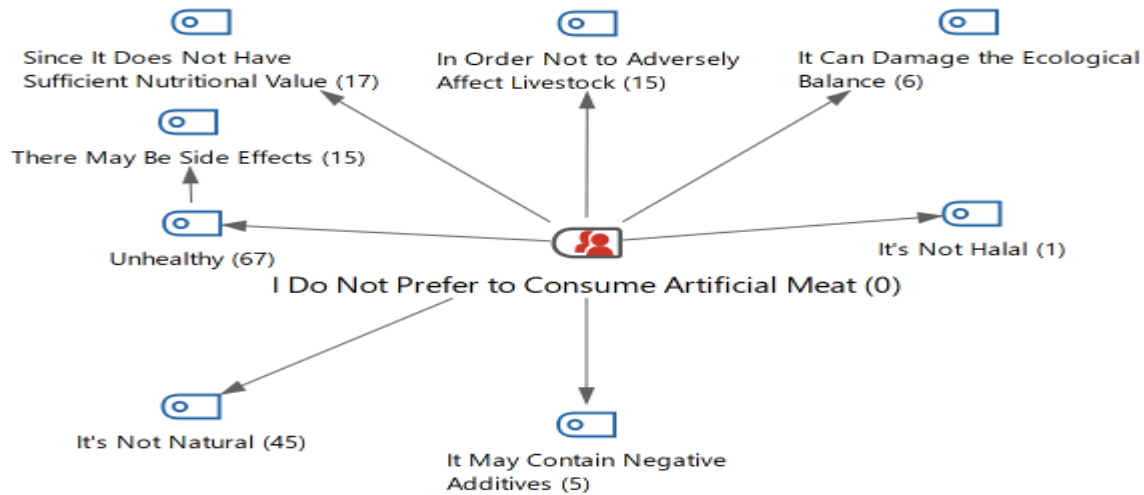

Figure 4. Sub-themes of the emerging theme about the reasons for not consuming artificial meat

Figure 4 shows the sub-themes obtained in the research based on the question asked to the participants regarding the reasons for not consuming artificial meat. Some statements regarding participant attitudes are presented below:

- *Because it will interfere with animal husbandry. I think the ecosystem will deteriorate even more with the decrease in animal husbandry.* (K1)
- *Because it is not known how it will affect the human body after years, I will not consume it.* (K12)
- *I do not consume it because I think it does not contain enough nutrients. I think it will be problematic in terms of health in the future.* (K54)
- *I think the natural balance should not be disturbed* (K121)
- *I think it will have very low nutritional value. I find it unhealthy because it will contain additives.* (K156)
- *I think it will have negative impacts on ecosystem and human health* (K166)
- *I don't think it's halal* (K184)
- *I think it may be harmful to health and cause ecological disturbance. If conditions prove favorable, I can consume.* (K186)
- *I do not trust products produced in a laboratory environment because I think that hormonal foods shorten human life and degrade quality.* (K199)
- *I prefer everything natural to live in a healthier way* (K204)

In the question we asked the participants regarding the reasons for not consuming artificial meat, it is seen that the participants stated that they do not prefer to consume artificial meat, with the highest answer because it is unhealthy (67) and may have side effects related to this theme (15). Considering the statements they gave respectively, they stated that they would not consume artificial meat for reasons such as it is not natural (45), it does not have sufficient nutritional value (17), in order not to negatively affect animal husbandry (15), it may harm the ecological environment (6), it may contain negative additives (5) and it is not halal (1).

DISCUSSION

Of the 227 individuals who participated in the study, 77 (33.92%) stated that they could consume artificial meat, while 150 (66.07%) stated that they would not. In a study on the artificial meat consumption preference of Generation Z living in Sydney, Australia, similar results were reported (72% of 227 participants would not consume artificial meat) (Bogueva and Marinova 2020). In studies on artificial meat consumption preference in many other countries, it is seen that the preferability of artificial meat varies between 30-50%. In the study conducted by Chriki et al. (2021) on the artificial meat consumption preference of the people of Brazil, 46.6%

of the 4471 participants who participated in the survey reported that artificial meat was promising and acceptable In a study conducted by Gousset et al. (2022) on the artificial meat consumption preference of the people of France, it was reported that while the majority of those surveyed were willing to try this product (80%), only 35.6% were willing to eat it regularly. In the study conducted by Faletar and Cerjak (2022) on the artificial meat consumption preference of the people of Croatia, it is reported that 40.9% of the 411 participants who participated in the survey are curious about and want to consume artificial meat. In a study conducted by Franceković et al. (2021) on the artificial meat consumption preference of the people of Croatia, Greece, and Spain, 43.5% of the 2007 participants who participated in the survey stated that they would try artificial meat. Even if a little variability of consumption choices according to the work results can be explained by the style of expressing the survey questions, the difference between the age and the maturity of the participants, and the unsteadiness of participant numbers.

Age and gender are major factors influencing people's food choices (Grasso et al. 2019). Studies show that younger participants have the highest willingness to consume artificial meat compared to older participants. In a study conducted in the USA, it is reported that especially young people are more inclined to try artificial meat, and 51% of individuals aged 18-29 are willing to try artificial meat (Johnson et al. 2018). A study conducted in Germany reports that children and adolescents are more willing to consume a burger made of artificial meat than insects (Dupont and Fiebelkorn 2020). In this study, it is thought that the fact that the preference for artificial meat consumption was at this rate (33.92%) may be due to the fact that the participants were young. Gender is also reported to affect concerns about ethical and environmental problems caused by the meat industry, views on meat consumption, and the perception of artificial meat in general (Wilks et al. 2019). When the results of this study are examined in terms of gender, 29 (30.52%) female participants and 45 (34.09%) male participants stated that they can consume artificial meat. In recent studies, it has been reported that women tend to consume less artificial meat than men (Wilks et al. 2019; Bryant et al. 2020; Bryant and Barnett 2018; Baum et al. 2022; Van Loo et al. 2020; Verbeke et al. 2021; Zhang et al. 2020). However, other studies have reported that female participants were more willing to consume artificial meat (Heidemann et al. 2020; Chriki et al. 2021). Such a discrepancy between studies can be explained by the interaction between age and gender (Hocquette et al. 2015) and the unequal number of men and women surveyed.

It is argued that young people's enthusiasm for artificial meat consumption is due to their greater concern for animal welfare issues and environmental issues (De Backer and Hudders 2015). Our results support this opinion. Of the participants who said they would consume artificial meat, 10 individuals stated that they would consume artificial meat for the protection of animals and 9 individuals for the protection of the environment. On the contrary, it is seen that 6 individuals who said that they do not consume artificial meat think that artificial meat harms the ecological environment. In addition, it is seen that 15 individuals who said they do not consume artificial meat answered that they do not consume it in order not to negatively affect animal husbandry. When the individuals who gave this answer were questioned, it was determined that their families were engaged in animal husbandry or received education related to agriculture and husbandry. Therefore, it was concluded that individuals interested in agriculture and animal husbandry were against artificial meat.

It is reported that young individuals in the generation Z prefer globally trending foods on social media (Su et al. 2019; Szakály et al. 2018; Kamenidou et al. 2018) In the study, it is seen that 13 individuals who say that they consume artificial meat give the answer that they consume artificial meat because they are curious about it. It is thought that the fact that artificial meat is a new food product and that this issue is constantly on the agenda on social media has triggered the participants' curiosity.

It is said that before the production and commercialization of artificial meat there were many problems of concern (Ünver Alçay et al. 2018). One of the most important concerns in the studies is that artificial meat is not natural, safe and healthy (Chriki et al. 2021; Bogueva and Marinova 2020; Bryant and Barnett 2018; Bryant et al. 2020; Liu et al. 2021; Gousset et al. 2022). In the current study, it is seen that the first (67 individuals) reason for not preferring artificial meat consumption is claimed to be unhealthy. In fact, it is seen that most of the participants who said that they would not consume artificial meat (21 individuals) answered that they would consume it if it was proven to be healthy. The perception that artificial meat is not natural and safe also emphasizes that it prevents the consumption of artificial meat (Siegrist and Hartmann 2020; Tomiyama et al. 2020; Verbeke et al. 2015; Wilks et al. 2021; Rosenfeld and Tomiyama 2022) In the current study, it is seen that it is suggested that it is not natural (45 individuals) among the reasons why artificial meat consumption is

not preferred. In addition, 5 individuals state that they do not find artificial meat safe as it may contain additives. Therefore, the findings of the study are quite consistent with the literature.

The nutritional quality of artificial meat can theoretically be controlled by adjusting the fat compositions used in the production environment. However, controlling the composition of animal-specific micronutrients (such as vitamin B12 and iron) of artificial meat is still unproven (Chriki et al. 2021) According to the results of the study, it is seen that 17 individuals who say they do not consume artificial meat think that artificial meat does not have sufficient nutritional value. In fact, it is seen that 13 individuals who say that they will consume artificial meat think that they will consume artificial meat if it meets their daily nutritional needs. Therefore, it is thought that artificial meat should be carefully controlled and documented in terms of nutritional value.

According to the results of the study, the price of artificial meat was also among the reasons for preference. It is seen that 3 individuals who say that they will consume artificial meat give the answer that if the price is appropriate, they will consume it. As a matter of fact, studies have also reported that low-income participants prefer artificial meat more. (Chriki et al. 2021; Liu et al. 2021). It is thought that the fact that the participants are young and students who are just starting to be economically independent affects their orientation towards alternative and cheap products.

Artificial meat, like any other new technology, raises numerous ethical, philosophical and religious questions. In fact, due to the uncertainties involved in the production of artificial meat, religious authorities are still debating these issues (Chriki et al. 2021). In the current study, even if it is at a low rate, an individual who says that he/she does not consume artificial meat states that he/she would not consume artificial meat because he/she thinks that it is not halal.

CONCLUSION

As a result, contrary to expectations, generation Z living in Türkiye has a high potential to consume artificial meat. It was determined that the fact that the consumption rate was not higher was due to the fact that the participants were concerned at many points. It was seen that the main concerns were that it was unhealthy, unnatural, insufficient in terms of nutritional value, unsafe, negatively affecting animal husbandry and posing a problem in terms of belief. Therefore, before starting the production and placing on the market of artificial meat on a large scale, efforts should be made to address these concerns and raise consumer awareness regarding artificial meat. As long as the concerns of the participants are clarified, we foresee that there will be a more serious increase in the artificial meat consumption potential of the generation Z, which will represent the Turkish population in the future.

Conflict of interest

The author declares that for this article they have no actual, potential, or perceived conflict of interest.

Author contribution

All authors contributed to the creation and design of the study. Mehmet Emin AYDEMİR and Kasım TAKIM conducted the literature review. Yusuf Taha OKAN designed the statistical plan, performed the analyzes and interpreted the data. Mehmet Emin AYDEMİR wrote the first draft. All authors critically reviewed this and previous versions of the document.

Ethical approval

Ethics committee certificate numbered 10.03.2023-213758 was obtained from Harran University Social and Human Sciences Ethics Committee for this study.

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