Applied Economic Perspectives and Policy

WILEY | AAEA Agricultural & Applied Economics Association

AAEA INVITED PAPER OPEN ACCESS

Consumer Valuation of Meat Alternatives and Labeling Policies: A Comparative Perspective

Daniele Asioli[1,2] | Wei Yang[3] | Jia Han[2] | Quoc Cuong Nguyen[4,5] | Massimiliano Petracci[6] | Rodolfo M. Nayga Jr.[3,7]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padua, Padua, Italy | [2]Department of Agri-Food Economics and Marketing, University of Reading, Reading, UK | [3]Department of Agricultural Economics, Texas A&M University, College Station, Texas, USA | [4]Department of Food Technology, Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam | [5]Vietnam National University Ho Chi Minh City, Ho Chi Minh City, Vietnam | [6]Department of Agricultural and Food Sciences, Alma Mater Studiorum University of Bologna, Cesena, Italy | [7]Korea University, Seoul, South Korea

Correspondence: Daniele Asioli (daniele.asioli@unipd.it)

Received: 18 August 2025 | **Revised:** 6 March 2026 | **Accepted:** 18 March 2026

Keywords: best–worst scaling | consumer valuation | information effect | labeling policies | meat alternatives | United States

ABSTRACT

This study investigates and compares US consumer perceptions and the impact of environmental, human health, and animal welfare information related to conventional meat on preferences for meat alternatives and labeling policies. Using the best–worst scaling method across 10 different burger alternatives, our results show that the meat burger is largely the most preferred option, while meat alternatives collectively account for nearly 40% of total consumer preferences. Information about the health effects of meat consumption and consumer characteristics influences preferences for meat alternatives. Consumers perceive the meat burger as tastier, more natural, more nutritious, and more expensive. In contrast, the plant burger is viewed as healthier and more environmentally friendly, while also being perceived as very distinct from the meat burger. Interestingly, most consumers oppose labeling meat alternatives as "meat." Our findings provide useful insights into the psychology of consumer acceptance, which can be useful in communicating the nature of meat alternatives to the public and shaping meat alternatives labeling policies.

JEL Classification: Q110 agriculture, Q130 agricultural markets and marketing, Q180 agricultural policy and agribusiness

1 | Introduction

Meat plays a key cultural, symbolic, nutritional, and traditional role in many diets (Leroy et al. 2023). The continued growth in world population, rising incomes, and urbanization has strongly increased the global meat demand (OECD/FAO 2024). However, conventional meat is currently at the center of many discussions among policy makers, governments, NGOs,[1] stakeholders, consumers and academics because of its negative effects in terms of environmental impact (Poore and Nemecek 2018), biodiversity loss (Machovina et al. 2015), human health and nutritional issues (Forouzanfar et al. 2015), and animal welfare concerns (Ammann et al. 2023). As a consequence of these concerns and challenges, many scientific bodies like the EAT–Lancet report (Willett et al. 2019), scientists (Parlasca and Qaim 2022), institutions like FAO[2] (FAO 2023), as well as international health authorities and organizations have emphasized the need to reduce meat production (WHO 2023). This has increased interest in meat alternatives (e.g., plant-based meat) (Apostolidis and McLeay 2016). Indeed, over the last few years, there have been substantial investments and new startup businesses emerging in the rapidly growing market for meat alternatives, especially in Western countries (see Caputo et al. 2024 for a market overview). A key feature of the meat alternatives market is the wide and growing range of products available (Jahn et al. 2024), shaped by their historical presence (e.g., first-generation[3] and

Wei Yang is the co-first author.

second-generation[4] meat alternatives), technology of production (e.g., cultured technology), use of different plant-based ingredients (e.g., legumes), animal-origin (e.g., cattle), and other sources (e.g., mushrooms) (Caputo et al. 2024). Those differences are reflected in different meat alternatives' characteristics in terms of nutritional content (Caputo et al. 2024), consumer familiarity (Etter et al. 2024), environmental impact (Caputo et al. 2024), animal-welfare (Asioli et al. 2023), cultural aspects (Hartmann et al. 2015), sensory characteristics (Caputo et al. 2023), technology of production (Caputo and Lusk 2020), and so forth. Since these product attributes are among the most important food values that drive consumers when purchasing food (Lusk and Briggeman 2009), possible perceived differences among meat alternatives may affect consumer choices.

Many studies have compared consumer preferences for meat alternatives (e.g., Asioli et al. 2023; Motoki et al. 2022; Van Loo et al. 2020), revealing some interesting observations. First, despite the large number of studies, there is limited empirical evidence on how consumers perceive the various existing meat alternatives (Jahn et al. 2024). Previous research generally shows an undifferentiated view of meat alternatives, often examining them together or comparing a few alternatives with their meat counterparts (Fischer et al. 2023). For example, Asioli et al. (2023) and Adhikari et al. (2025) compared consumer willingness to pay (WTP) for conventional, plant-based meat, and hybrid meat. Van Loo et al. (2020) compared consumer WTP for conventional meat, plant-based meat, and cultured meat, while Motoki et al. (2022) investigated consumer acceptance of cultured meat, insect food, and plant-based meat. However, the reality is that the number of meat alternatives that consumers can find on the market is typically larger than those products currently investigated (Caputo et al. 2024), while other types of alternatives (e.g., dairy) are emerging. Second, the investigation of consumer preferences for meat alternatives typically focuses on the same types of second- and emerging-generation alternatives like plant-based meat, cultured meat, and so forth, rather than including also important first-generation alternatives like seitan or tempeh or new emerging meat alternative products like dairy-based meat alternatives (Morning AgClips 2023). Third, these meat alternatives comparisons typically focus the investigation on a few specific characteristics like sensory liking (e.g., Sogari et al. 2023), preferences (e.g., Asioli et al. 2022), and attitudes (e.g., Mancini and Antonioli 2019) without a more systematic investigation and comparison of the key attributes affecting consumer purchasing food decisions, like taste, nutrition, and price, and overall perception of similarity and dissimilarity among them. Fourth, it is not clear how different information about the possible negative effects of meat production and consumption—in terms of environmental impact, animal welfare, or health—may affect and shift consumer preferences for a larger number of meat alternatives. Overall, the literature reveals a lack of studies that more broadly compare consumer preferences across various meat alternatives (Jahn et al. 2024).

Furthermore, labeling policies for meat alternatives are among the most currently debated topics, particularly concerning the use of the term "meat" on meat alternative labels (DeMuth et al. 2023). According to Caputo et al. (2024), the US Cattlemen's Association (USCA) made efforts to restrict the use of "meat" and "beef" terms on plant-based meat packaging to avoid misleading or confusing consumers about the products' ingredients on their labels or packaging (Gleckel 2020) and to protect the investments of traditional meat producers (DeMuth et al. 2023). Indeed, over the last few years, several US states mandated clear plant-based labeling on these new products (Food and Drug Law Institute 2022). Moreover, recently, the 118th US Congressional Legislature introduced the "Fair and Accurate Ingredient Representation on Labels Act of 2024" bill to ensure that consumers are correctly informed about whether foods marketed as meat or poultry are real or imitation (US Congress 2024). Since labeling can influence consumer trust, transparency, and choices for meat alternatives (Tobias-Mamina et al. 2025)—for example, labeling restrictions may make these products less appealing to consumers—understanding preferences for meat alternatives labeling is essential. It can also inform policymakers in designing effective labeling regulations and guide producers and sellers' marketing and communication practices, yet few studies have examined this topic. To illustrate, Van Loo et al. (2020) found that most US consumers oppose policies allowing the word "beef" on any meat alternatives. Demartini et al. (2022) showed that meat-sounding labels applied to plant-based foods influenced perceived Italian consumer healthiness, while vegan labeling negatively impacted perceptions of taste, healthiness, and purchase intent for plant-based foods. In addition, DeMuth et al. (2023) found that more than 30% of US consumers cannot accurately distinguish the nutritional content and ingredients in traditional versus non-traditional meat. Boldt et al. (2026) found that consumers have stronger preferences for plant-based meat alternatives (PBMAs) in an unregulated labeling environment rather than under a ban of meat-related terms or when label qualifiers are required. Feltz et al. (2025) discovered that, in the United States, both USDA and FDA proposals aimed at addressing presumed consumer confusion about plant-based products may be unnecessary and could even be harmful. Ji and Lee (2026) reviewed the recent research on how meat-alternative labeling affects consumer responses and found that meat-related labels influence consumer reactions, shape levels of confusion, and produce heterogeneous effects. However, these studies mainly focused on plant-based meat, leaving consumer preferences for labeling of other meat alternatives unexplored. Moreover, since the new meat alternatives are being produced and marketed by start-up businesses with a strong interest in promoting the benefits of their products, it is important to examine the impact of different types of information (Caputo and Lusk 2020).

Our study fills these voids by using the best–worst scaling (BWS) method to investigate the impact of environmental, human health, and animal welfare information related to conventional meat on the heterogeneous preferences and perceptions of US consumers on 10 different burger alternatives, namely meat, hybrid, plant, seitan, tempeh, Quorn, mushroom, cultured, dairy, and insect burgers. Furthermore, we examine consumer heterogeneity in preferences for using the term "meat" on labels for meat alternatives.

This study makes several important contributions to the literature. First, we aim to provide more realistic and richer information about consumer preferences for many emerging meat alternatives, as well as the impact of information about meat production and consumption on changing these preferences.

Second, we offer a comparative analysis of consumer perceptions across multiple meat alternatives, focusing on key purchasing drivers (i.e., taste, nutrition, price, naturalness, and health) that influence food purchasing decisions. Third, we aim to contribute to the ongoing policy debate around meat alternatives labeling regulations. With these contributions, we hope to contribute to the growing literature and debate around meat and meat alternatives, providing valuable insights for producers, marketers, and policymakers.

2 | Methodology

2.1 | Experimental Design

We employed the BWS method (Finn and Louviere 1992), which has been increasingly applied in many fields, including business, marketing, food, consumer science, and policy (e.g., Caputo and Lusk 2020; Lusk and Briggeman 2009). We chose the BWS method because, given the increasing number of meat alternatives available or being developed in the market, it allows us to examine consumer preferences for many items (burgers in our case) at the same time. In addition, BWS has several advantages over rating-based methods (where a consumer responds on a scale of 1–5, with 1 being *not important* and 5 being *very important*) (Lusk and Briggeman 2009). First, in the rating-based methods, respondents are not forced to make trade-offs between the relative importance of issues (e.g., goods). Second, in rating-based methods, different respondents use the scale differently, with a 4 for one person possibly representing a 3 for another (see Lusk and Briggeman 2009 for an overview). In BWS, respondents are forced to choose the best and worst options (i.e., burgers in our case), and unlike rating scales, there is only one way for people to respond to the question (with a choice). Also, the BWS method provides richer and more granular information compared to other methodologies (Hensher et al. 2015).

We included 10 different burgers in the BWS method: conventional meat, hybrid, plant, seitan, tempeh, Quorn, mushroom, cultured, dairy, and insect-based (see Table SA1). We chose beef burger as product of interest for five main reasons: (i) US consumers are among the largest beef consumers in the world (ERS-USDA 2024); (ii) much of the US beef is consumed in the form of ground beef (Caputo and Lusk 2020); (iii) the beef industry is one of the larger contributors of greenhouse gas (GHG) emissions especially as the majority of US cattle are raised in feedlots and grain-fed (Clune et al. 2017). Thus, even a partial substitution of beef with other meat alternatives (e.g., hybrid burgers) can potentially contribute to a reduction of the GHG emissions; (iv) ground meat (burger) is the form of meat easier to imitate for meat alternatives (He et al. 2020), and (v) a large number of meat businesses are investing in alternatives to beef burgers (e.g., JBS and Tyson Food) (Coyne 2024).

As meat alternatives, we chose both the first-generation (He et al. 2020) and second-generation PBMA (USDA 2021), as well as other meat alternatives currently available or under development in the US market. As first-generation PBMA, we included seitan[5] and tempeh.[6] These products typically fit vegetarian diets, which are rapidly increasing in the Western markets (Leahy et al. 2010). Indeed, seitan has an expected market growth of 5% CAGR[7] through 2032, led by Europe, followed by the Asian–Pacific region and North America (Future Market Insights 2022), while tempeh has an expected market growth of 6% through 2032 (Market 2021), led by North America (Mondor Intelligence 2022). As second-generation PBMA, we included both plant[8] and hybrid[9] burgers. Second-generation PBMA tend to imitate conventional meat, for example, in terms of sensory properties (He et al. 2020), and are preferred by flexitarians. Specifically, the plant-based meat market is expected to increase rapidly over the next decade, with an expected market growth (CAGR) for plant-based beef of 22% through 2032, led by North America (Choudhury et al. 2020). We also included other meat alternatives like Quorn,[10] mushroom,[11] cultured,[12] dairy,[13] and insect[14] burgers. Both Quorn and mushroom burgers are popular meat alternatives in the United States (Statista 2023). Cultured meat is expected to grow in the market, led by North America (Grand View Research 2021), after the recent USDA approvals of sale from the companies UPSIDE Foods and GOOD Meat. Dairy meat burger is another type of meat alternative under development in the United States (Progressive Dairy 2023). For example, the US startup Top Protein is developing meat products using bio-fermentation of dairy proteins. Insect meat burger is a kind of meat alternative under development in different countries (StudyFinds 2023). For example, company Divaks is developing a burger patty made with textured insect protein (Divaks 2025).

For the allocation of the different items (i.e., burgers) across the choice sets, we used a partially balanced incomplete block design (PBIBD) commonly used for BWS (Flynn and Marley 2014). The BIBD is one of the most common designs used in the BWS literature due to its desirable properties, as it is balanced and orthogonal. Specifically, each choice task includes the same number of items, each item occurs the same number of times across choice tasks, and each item appears equally often with every other item. However, sometimes it is difficult to generate a BIBD with a restricted number of choice sets and attributes per choice set. Therefore, several studies (e.g., Bazzani et al. 2018) have implemented BIBD designs where the orthogonality requirement is relaxed, like the partially BIBD (PBIDB) (Street and Street 1996). Our PBIBD consists of 10 choice sets, with each of the choice sets containing a subset of four different burgers. Each product was repeated four times across the 10 choice sets, and each burger was compared with each other 1.33 times, maximizing both the *D*-efficiency (0.99) and *A*-efficiency scores (0.99) to satisfy the orthogonality property (Kuhfeld 2005). To avoid ordering effects, the order of the BWS choice sets and the burger options within each choice set was randomized during the experiment. For each choice set, respondents were asked to select one burger as best (most preferred) and one burger as worst (least preferred) over all other burgers. Figure SB1 reports an example of one of the BWS questions (i.e., choice set) used in this study.

The BWS was introduced to the respondents with a clear explanation and description of the different burgers to evaluate, including the main ingredients and the technology of production (see Table SC1). In addition, we clearly explained to consumers that the burgers have all the same characteristics except for their main ingredients and the production technology. Before the choice sets, participants also received the instructions that they should imagine themselves to be shopping

in a grocery store or eating at a restaurant, and instructions were provided on how to complete the choice tasks. In addition, before presenting the series of choice sets, we included a cheap talk script to mitigate possible hypothetical bias (Cummings and Taylor 1999; Xhakollari et al. 2025). Upon completion of the choice tasks, the respondents were asked to complete a questionnaire to gather various types of information. Specifically, we included questions about consumer sociodemographics, religious preferences, political opinions, familiarity with and perceptions of meat and meat alternatives, perceived similarities and dissimilarities using a sorting task exercise (Abdi et al. 2007), and preferences regarding meat alternative labeling (adapted from Van Loo et al. 2020). In addition, we collected data on consumer pro-environmental attitudes using the new environmental paradigm (NEP) scale (Dunlap et al. 2000), fear about new foods using the food neophobia (FNS) scale (Pliner and Hobden 1992), pro-health attitudes using the HEALTH scale (Roininen et al. 1999), and pro-animal attitudes using the animal attitudes scale (AAS) (Herzog et al. 2015). The complete questionnaire is available in Appendix SD.

2.2 | Experimental Treatments

We implemented a between-subjects design based on the use of four BWS treatments. Hence, each respondent was randomly assigned to one of the treatments. The four treatments differed only in the information provided before the series of BWS choice tasks, specifically regarding the effects of meat production and consumption on the environment, human health, and animal welfare, as these are the main factors that have driven the development of meat alternatives (He et al. 2020). Specifically, in Treatment 1 "Control," 288 consumers were exposed to the BWS choice tasks without providing any additional information. In Treatment 2, "Environment," 293 consumers were exposed to the BWS choice questions after providing information about the effects of meat production on the environment (Gerber et al. 2013; Djekic 2015; Godfray et al. 2018; Xu et al. 2021). In Treatment 3, "Health," 292 consumers were provided the BWS choice tasks after being given information about the impact of meat consumption on human health (Wolk 2017; Godfray et al. 2018; Barone et al. 2021; Grosso et al. 2022). In Treatment 4, "Animal," 291 consumers were exposed to the BWS choice tasks after being provided with information about the effects of meat production on animal welfare (Lymbery and Oakeshott 2014; Nollkaemper 2023; del Campo et al. 2025). See Appendix SE for the information treatments.

2.3 | Data

The data[15] used in this manuscript are drawn from an online survey involving 1164 US consumers using the online platform Qualtrics LLC (Provo, USA) for creating the survey, while Dynata LLC (Shelton, USA) was used for data collection carried out in Spring 2024. Consumers were randomly recruited by Dynata using sampling quotas in terms of age, gender, and income based on official US statistics (United States Census Bureau 2022). Only consumers who were at least 18 years old were included in the study. A pretest involving 100 consumers was performed to test the survey.

To ensure data quality (Asioli and Jaeger 2025), we took several steps. First, as suggested by several authors (e.g., DeVylder et al. 2019), at the beginning of the questionnaire, we asked respondents if they would commit to providing their thoughtful and honest answers to the questions in the survey. Only those who declared "I will provide my best answers" continued with the survey; they were excluded from the study. Second, we implemented a trap question (Mariel et al. 2025) in the HEALTH scale. Specifically, we added one item by asking respondents to select a specific answer (i.e., "*Somewhat agree*"), and those who failed to select it were excluded from the study. Third, we included in the study only those respondents who took more than one-third of the median time duration to complete the survey.

Given the randomization to treatments, we checked if a balance for the observable characteristics across the treatments was achieved. The results are presented in Tables SF1 and SF2 and show that the hypotheses of equality of means between sociodemographic characteristics and types of diet across the four treatments failed to be rejected at the 0.05 level. Moreover, we can see that most respondents (~70%) are full-meat eaters, followed by flexitarians (~20%) and pollotarians (~3%).

3 | Econometric Analysis

We examined consumer familiarity with and perceptions of burger alternatives in relation to key attributes that influence consumer valuation of these products, using descriptive statistics. Moreover, to investigate consumers' perceived overall similarities/dissimilarities among the burgers (i.e., Sorting task), we used the Factorial Approach Sorting Task (FAST) (see Cadoret et al. 2009 for more details). The FAST approach is based on multiple correspondence analysis (MCA) (Lebart 1975) and complements it by directly incorporating a representation of consumers, while also providing elements of validation through confidence ellipses (Cadoret et al. 2009). The FAST approach was analyzed using the *SensoMine* package in R.

The BWS method assumes that respondents evaluate all possible pairs of items (i.e., burgers) in each choice set and then simultaneously select the best and the worst items, thereby maximizing the perceived difference among the items in the set (Finn and Louviere 1992). First, we estimated the model using the Random Parameters Logit (RPL), following previous studies (e.g., Lusk and Briggeman 2009), to analyze responses from the BWS questions. The RPL model accounts for heterogeneity in consumer preferences across the various burger alternatives. For a general perspective, we assumed that there were J items (i.e., burgers) in each choice set question t, and then there were $J(J-1)$ possible pairs of items (i.e., burgers). We used λ_j to describe the observable level of preference of the burger j, and then the unobservable level of preference could be defined as $I_{ij} = \lambda_j + s\varepsilon_{ij}$, where i represents respondent I, and ε_{ij} is idiosyncratic error term that is independent and identically distributed (i.i.d.) extreme value type 1. The

probability (P) of respondent i choosing item j as the most preferred burger and item k as the least preferred burger in the choice set t equals the probability that the difference in utility of the selected items (I_{ij} and I_{ik}) is greater than all the other $M = J(J-1)-1$ possible differences in the same choice set can be calculated using the following equation:

$$P_{jkt} = \frac{\exp\left(\lambda_{ijt} - \lambda_{ikt}\right)}{\sum_{m=1}^{J}\sum_{n=1}^{J}\exp\left(\lambda_{imt} - \lambda_{int}\right) - J} \quad (1)$$

The estimated λ_j represents the preference of the item j relative to some burgers, which is normalized to zero for identification purposes. The burger that was normalized to zero was insect.[16] We assumed that the estimated parameters followed a multivariate normal distribution with means and standard deviations (SDs) to be estimated. The parameters of the model are estimated by simulated maximum likelihood (ML) estimation technique using 1000 pseudo-random draws. The RPL models were estimated using the *gmnl* package in R (Sarrias and Daziano 2017).

Then, we conducted a post-estimation analysis to calculate the share of preferences (PS_j) for each burger, representing the probability that a given burger is preferred over another (Lusk and Briggeman 2009). Thus, PS_j represents the forecasted probability that each burger is chosen as the most preferred, and it was calculated using the following equation:

$$PS_j = \frac{e^{\hat{\lambda}_j}}{\sum_{k=1}^{j} e^{\hat{\lambda}_k}} \quad (2)$$

where $\hat{\lambda}$ is the mean of the estimated individual parameter. The share of preferences across the 10 burger alternatives sums to one. Specifically, Equation (2) reports the preference of the burger j on a ratio scale, meaning that if one burger has a share value twice that of another burger, we can interpret that the former burger is twice as preferred as the latter. It is important to note that the calculated share of preference for a burger will reflect both the true preference of the burger and the relative uncertainty in the preference respondents place on the burger. See Lusk and Briggeman (2009) for more details about the approach. Then, a bootstrap Poe test (Poe et al. 2005) was conducted to evaluate the significance of differences across treatments. All the models were estimated using R 3.4.1 software.

Next, we investigated consumer heterogeneity preferences through subsample analysis based on several consumer attributes using Equation (2). First, we examined sociodemographics (i.e., gender, age, and income) because previous research shows that gender (Zhang et al. 2020; Yuan et al. 2025), age (Slade 2018; Asioli et al. 2022), and income (Chen et al. 2023) affect consumer valuation for meat alternatives. Second, we investigated political preferences (i.e., liberals, moderates, and conservatives), since earlier research indicates that they affect consumer preferences for meat alternatives (Kershaw et al. 2023; Kovacs et al. 2024). Third, we examined attitudinal factors, namely FNS (Dupont and Fiebelkorn 2020; Yuan et al. 2025), Health (Vural et al. 2023), and AAS (Bryant and Barnett 2018) because they affect consumer valuation for meat alternatives. More details on how the subsamples were created are reported in Table SG1.

Finally, for the control group (Treatment 1), we examined consumer opinion (opposition or support) regarding a meat alternative labeling policy stating that any product labeled as "*meat*" should only come from animals born, raised, and harvested in the traditional animal agricultural manner rather than coming from alternative sources (i.e., plant-based). We used descriptive statistics and the logit regression model to investigate the potential sources of heterogeneity toward such a policy. Specifically, in the logit regression model, the dependent variable is the individual's opinion on the meat alternative labeling policy. The independent variables are age, gender, income, education, meat familiarity, pro-environmental attitude (NEP), pro-health attitude (HEALTH), pro-animal welfare attitude (AAS), religion, and political preferences. Accordingly, the logit model can be specified as follows:

$$\begin{aligned} LABELING_i = {} & \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \beta_3 INCOME_i \\ & + \beta_4 EDUCATION_i + \beta_5 FAMILIARITY_i \\ & + \beta_6 NEP_i + \beta_7 AAS_i + \beta_8 HEALTH_i \\ & + \beta_9 RELIGION_i + \beta_{10} MODERATE_i \\ & + \beta_{11} CONSERVATIVE_i + \varepsilon_i \end{aligned} \quad (3)$$

where labeling is the dependent variable taking the value of 0 if consumers oppose a policy where the "*meat*" name should apply only for products from traditional animal farming, and 1 if they support it, i indicates the respondent, β_0 is the intercept of the model, β_{1-11} are the regression coefficients of the explanatory variables. Specifically, AGE represents the age of the consumer, GENDER represents the gender of the consumer taking the value of 0 for female and 1 for male, INCOME is the annual household income before taxes taking the value of 0 for respondents have an income below $75,000 and 1 for those who have an income of $75,000 or more, EDUCATION represents the education level of consumer taking the value of 0 for respondents have an education lower than Associate degree and 1 for those who have an Associate degree level or more, FAMILIARITY is the consumer familiarity with conventional meat taking the value from 1 (*not familiar at all*) to 5 (*extremely familiar*), NEP represents the consumer pro-environmental attitude taking the value from 1 (*strongly disagree*) to 5 (*strongly agree*), AAS indicates the consumer pro-animal welfare attitude taking the value from 1 (*strongly disagree*) to 5 (*strongly agree*), HEALTH represents the consumer health attitude taking the value from 1 (*strongly disagree*) to 7 (*strongly agree*), RELIGION represents if consumers are religious taking the value of 0 if they are not religious, and 1 if they are religious, POLITICS represents the respondents political preferences taking the value from 1 (*extremely liberal*) to 5 (*extremely conservative*). Furthermore, we examined consumer preferences for a labeling policy to name the two most relevant meat alternatives (i.e., hybrid and cultured) as "*meat*." Thus, following Equation (3), we employed two separate logit regression models, each with a dependent variable representing consumer support or opposition for a specific labeling policy that allows the term "*meat*" to be used for hybrid and cultured alternatives. Each dependent variable was coded as 1 if the respondent supported labeling the respective meat alternative as "*meat*," and 0 otherwise. The independent variables

were AGE, GENDER, INCOME, EDUCATION, FAMILIARITY, NEP, AAS, HEALTH, RELIGION, and POLITICS, as described above. The LOGIT regression models were estimated using the module *logit* in Stata 19.5.

4 | Results

4.1 | Consumer Familiarity, Perceptions, and Perceived Similarities/Dissimilarities Among Burger Alternatives

Table SH1 shows the results of consumer familiarity and perceptions of burger alternatives. First, we can see that consumers are most familiar with meat burgers, followed by plant-based and mushroom burgers. Second, we discovered that most respondents perceive meat as the tastiest burger, followed by plant and mushroom. Next, we found that nearly half of the participants consider plant burgers the healthiest, followed by meat and mushrooms. Furthermore, more than one-third of consumers perceive meat as the most nutritious burger, followed by plant and mushroom. Moreover, almost half of the respondents consider meat to be the most natural burger, followed by plant and mushroom. In addition, we notice that over one-third of respondents view plant burgers as the most environmentally friendly burger, followed by mushroom and meat. Also, less than one-third of respondents perceive meat as the most expensive burger, followed by cultured and hybrid.

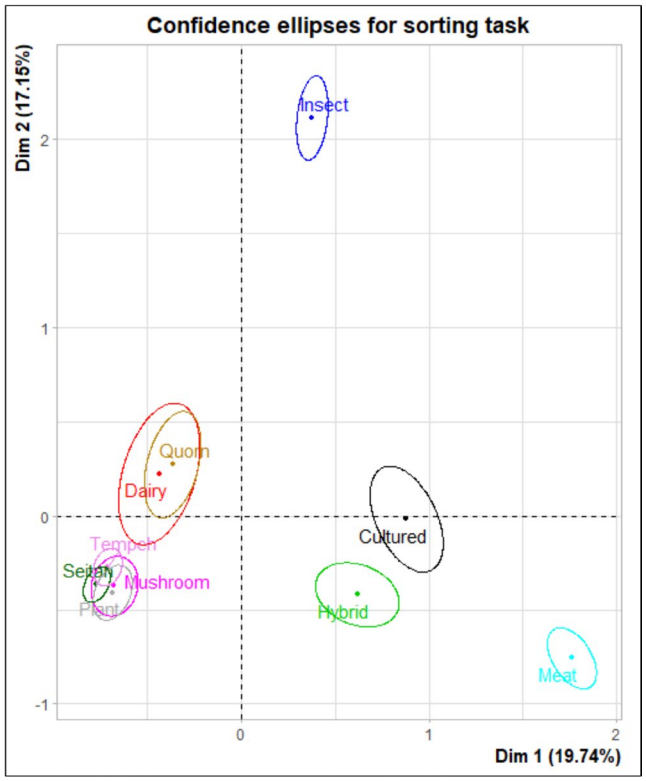

FIGURE 1 | Representation of the burger alternatives in terms of their similarities/dissimilarities and their respective confidence ellipses (*p* value: 5%) in the plane defined by dimensions 1 and 2 of MCA.

Next, we investigated consumer perceived similarities/dissimilarities among the 10 burger alternatives (Figure 1). The first dimension (Dim. 1: 19.74%) opposes meat, cultured, hybrid, and insect burgers to all the other burger alternatives (Figure 1 and Figure SI1), while the second dimension (Dim. 2: 17.15%) opposes insect to all the other burgers. The relative distances between burger alternatives relate to the number of times that these products were put in a group alone. Thus, we can identify three main groups of burger alternatives: (i) meat, cultured, and hybrid in one group; (ii) dairy and Quorn in a second group; and (iii) plant, mushroom, seitan, and tempeh in a third group. Specifically, Figure 1 illustrates the representation of the burger alternatives and their respective confidence ellipses (*p* value: 5%) in the plane defined by Dimensions 1 and 2 of MCA. We can see that while burgers obtained from animal tissues (i.e., meat, cultured, hybrid, and insect) are well differentiated—and relatively similar, except for insect burger—by consumers, the burgers derived from dairy proteins and nonanimal-based alternatives (i.e., Quorn, seitan, mushroom, plant, and tempeh) are grouped closely together, indicating that they are perceived as very similar by consumers. Interestingly, consumers tend to perceive an insect burger as very dissimilar from all the other burgers.

4.2 | RPL Model Estimates

Table 1 reports both the mean estimates and SDs from the RPL models for each treatment. The mean estimates reflect the preferences for each of the nine burger alternatives relative to the insect burger, which was normalized to zero for identification purposes. Results indicate that across all treatments, the meat burger is largely the most preferred, followed by hybrid, mushroom, and plant burgers, while the insect burger is the least preferred product. Interestingly, the second-generation burger alternatives (i.e., hybrid, mushroom, and plant) were more preferred than the first-generation (i.e., seitan and tempeh) and Quorn burger alternatives. The SDs of each burger are large and highly significant, indicating that consumer heterogeneity is a pattern when analyzing burger preferences.

4.3 | Shares of Preferences of Meat and Meat Alternative Burgers

To provide a more intuitive interpretation of the RPL results, Table 2 reports the share of preferences for the different burger alternatives. Outcomes reveal that across all treatments, around 60% of the respondents prefer a meat burger, followed by hybrid (~14%), while mushroom, plant, and cultured burgers are the most preferred options in only 5%–9% of cases. In addition, the first-generation burger alternatives (i.e., seitan and tempeh), dairy, and insect burgers are the least preferred options. Regarding the treatment's effects on consumer preferences for burger alternatives, we found that neither the environmental nor the animal welfare information of meat production was effective in changing consumer preference shares, while health information had an effect for some alternatives. Specifically, when consumers are informed about the impact of meat consumption on human health, they have a stronger preference for a mushroom burger, but a higher consistent preference for a dairy burger. In addition, when

TABLE 1 | Random parameter logit (RPL) model estimates.

	Treatment 1, Control ($N=288$)		Treatment 2, Environment ($N=293$)		Treatment 3, Health ($N=292$)		Treatment 4, Animal ($N=291$)	
Product	**Mean (SE)**	**SD (SE)**	**Mean (SE)**	**SD (SE)**	**Mean (SE)**	**SD (SE)**	**Mean (SE)**	**SD (SE)**
Meat	11.19*** (0.39)	8.90*** (0.39)	9.78*** (0.35)	8.13*** (0.35)	11.25*** (0.44)	9.53*** (0.43)	11.30*** (0.40)	8.33*** (0.38)
Hybrid	6.98*** (0.25)	5.09*** (0.24)	5.78*** (0.20)	4.99*** (0.23)	7.10*** (0.27)	5.90*** (0.28)	6.50*** (0.22)	4.73*** (0.21)
Mushroom	6.32*** (0.24)	4.82*** (0.23)	5.38*** (0.20)	4.31*** (0.19)	5.64*** (0.25)	4.72*** (0.25)	6.10*** (0.22)	4.37*** (0.20)
Plant	6.05*** (0.23)	3.85*** (0.19)	5.17*** (0.19)	4.10*** (0.18)	6.23*** (0.25)	5.08*** (0.27)	5.89*** (0.20)	3.70*** (0.17)
Cultured	5.03*** (0.22)	4.76*** (0.23)	4.32*** (0.17)	4.39*** (0.19)	5.33*** (0.24)	5.47*** (0.27)	4.82*** (0.20)	4.45*** (0.19)
Tempeh	4.38*** (0.20)	3.00*** (0.18)	3.66*** (0.17)	2.91*** (0.16)	4.44*** (0.23)	4.17*** (0.26)	4.01*** (0.19)	2.86*** (0.18)
Seitan	4.18*** (0.21)	3.03*** (0.20)	3.12*** (0.15)	2.90*** (0.16)	4.26*** (0.22)	4.20*** (0.26)	3.81*** (0.18)	2.73*** (0.17)
Dairy	3.80*** (0.20)	3.19*** (0.21)	2.86*** (0.15)	3.02*** (0.17)	3.78*** (0.22)	4.45*** (0.27)	3.60*** (0.18)	3.24*** (0.19)
Quorn	3.16*** (0.19)	2.87*** (0.19)	2.13*** (0.15)	2.33*** (0.16)	3.23*** (0.21)	3.40*** (0.25)	2.76*** (0.18)	2.38*** (0.16)
Insect	Baseline							
Model statistics								
LLF	−3855.25		−4072.95		−3987.07		−3968.24	
N	2880		2930		2920		2910	
AIC/N	7818.52		8253.92		8082.16		8044.49	

Abbreviations: AIC/N, Akaike information criterion per observation; LLF, log-likelihood function; N, number of observations; SD, standard deviation; SE, standard error.
*$p<0.1$.
**$p<0.05$.
***$p<0.01$.

TABLE 2 | Shares of preferences for burger alternatives.

Treatment/ product	Meat % shares (SD)	Hybrid % shares (SD)	Mushroom % shares (SD)	Plant % shares (SD)	Cultured % shares (SD)	Tempeh % shares (SD)	Seitan % shares (SD)	Dairy % shares (SD)	Quorn % shares (SD)	Insect % shares (SD)
Control	63.240% (0.026)	14.140% (0.017)	9.118% (0.013)	5.400% (0.009)	5.377% (0.009)	0.933% (0.00)	0.801% (0.002)	0.692% (0.002)	0.96% (0.001)	0.002% (0.00001)
Environment	62.867% (0.025)	14.549% (0.017)	7.232% (0.011)	6.669% (0.011)	6.133% (0.011)	1.059% (0.003)	0.694% (0.002)	0.631% (0.002)	0.159% (0.001)	0.005% (0.00001)
Health	59.217% (0.025)	15.729% (0.017)	5.653% (0.009)	7.880% (0.011)	6.725% (0.011)	1.632% (0.004)	1.449% (0.004)	1.436% (0.004)	0.317% (0.001)	0.002% (0.00001)
Animal welfare	64.241% (0.025)	13.033% (0.015)	8.342% (0.012)	5.900% (0.009)	5.906% (0.010)	0.867% (0.003)	0.695% (0.002)	0.842% (0.002)	0.170% (0.001)	0.003% (0.00001)
Comparison among treatments										
Environment vs. control	−0.373	0.409	−1.886	1.269	0.756	0.26	−0.107	−0.061	−0.137	0.003**
Health vs. control	−4.064	1.590	−3.465**	2.480*	1.348	0.699*	0.648*	0.742**	0.021	0.003
Animal welfare vs. control	1.001	−1.107	−0.776	0.500	0.529	−0.066	−0.106	0.150	−0.126	0.003
Health vs. environment	−3.691	1.181	−1.579	1.211	0.592	0.573	0.755**	0.805**	0.158	−0.003***
Animal welfare vs. the environment	1.374	−1.516	1.110	−0.769	−0.227	−0.192	0.001	0.211	0.011	−0.002*
Animal welfare vs. health	5.065*	−2.697	2.689**	−1.980	−0.819	−0.765*	−0.754**	−0.594	−0.147	0.001**

Abbreviation: SD, standard deviation.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

consumers are informed about the impact of meat production on the environment, they have a slight preference for an insect burger. Interestingly, when compared to respondents in the animal welfare information treatment, consumers in the health treatment have a significantly higher preference for mushroom burgers and smaller preferences for insect burgers, but a lower preference for seitan burgers. Furthermore, when compared to respondents in the environmental information treatment, respondents in the health treatment increased their preferences consistently both for seitan and dairy burgers, while we found an opposite, lower pattern for the insect burger.

4.4 | Consumer Heterogeneity: Subsample Analysis

Next, we performed the subsample analysis to compare the preference shares in different consumer groups based on sociodemographics, political preferences, and attitude variables.

Table 3 reports the share of preferences for the different burger alternatives for the subsamples based on gender, age, and income. Results indicate that males slightly prefer meat burgers more than females, while the opposite is evident for mushroom burgers when informed about the environmental (Treatment 2) and animal welfare (Treatment 4) effects of meat production. Moreover, males have a slightly higher preference for cultured burgers than females in Treatment 1 (control), while females have a slightly higher preference for plant burgers than males, both without any information (Treatment 1) and with information about the effects on animal welfare of meat production (Treatment 4). Indeed, males have a slightly higher preference for insect burgers when informed about the environmental, health, and animal welfare effects of meat production and consumption. Younger consumers—compared to older—consistently prefer meat burgers less, both without any information (Treatment 1) and with information about the effects on animal welfare (Treatment 4) of meat production. Interestingly, younger consumers have a higher preference for seitan, dairy, Quorn, tempeh, cultured, insect, and plant burgers than older people when informed about the effect of meat production on animal welfare (Treatment 4). Also, the younger group has a larger preference for cultured, insect, and plant burgers in the control group, and slightly less for mushroom burgers and more for insect burgers when informed about the environmental effects of meat production. In addition, younger people have slightly larger preferences for insect burgers when informed about the health effects of meat consumption. Moreover, low-income people have a slightly higher preference for mushroom burgers when informed about the environmental effects of meat production (Treatment 2) and for dairy and cultured burgers when informed about the health effects of meat consumption on human health. Moreover, the younger group has slightly larger preferences for insect burgers when informed about the health effects of meat consumption.

Table 4 reports the share of preferences for the different burger alternatives for the subsamples based on political preferences. Outcomes show that meat burgers are less preferred by liberals than conservatives when informed about the environmental, human health, and animal welfare effects (Treatments 2–4) of meat production and consumption. In contrast, liberals—compared to conservatives—generally preferred alternative burgers (i.e., dairy, Quorn, tempeh, cultured, and plant) mainly when provided with information about the effects of meat consumption on human health. In addition, liberals—compared to moderates—slightly prefer more cultured and insect burgers when informed about the health effects of meat consumption, but less insect burgers when informed about the animal welfare effects of meat production. Also, liberals—compared to conservatives—slightly prefer more cultured burgers without providing any information about the effects of meat production and consumption on the environment, health, and animal welfare, and more hybrid burgers when supplied with information about the environmental effects of meat production. Furthermore, moderate people—compared to conservatives—prefer fewer meat burgers when provided with information about the health and animal welfare effects of meat production and consumption, and more mushroom burgers when health information is provided. In addition, when environmental and animal welfare information is provided, moderate people—compared to conservatives—slightly prefer more insect burgers.

Table 5 reports the share of preferences for the different burger alternatives for the subsamples based on consumer attitudes. Respondents with a low degree of neophobia toward new foods in the control group prefer more mushroom, insect, and plant burgers than those with a high degree of neophobia; while when people are informed about the human health effects of meat consumption (Treatment 3), they prefer slightly less hybrid burgers than those with a lower degree of neophobia and less insect burgers when informed about the environmental effects of meat production. Moreover, less healthy consumers prefer meat burgers across all treatments—except for animal welfare information—while high healthy people prefer plant burgers across all treatments and mushroom burgers both without any information (Treatment 1) and with information about the environmental effects of meat production (Treatment 2), as well as they prefer tempeh and seitan burgers in the control group compared to low-health consumers. Tempeh burgers are also less preferred by less healthy people when informed about the health effects of meat consumption. Similarly, insect burgers are less preferred by less healthy consumers without and with information about the animal welfare effects of meat production. Compared to consumers with high pro-animal welfare attitudes, low pro-animal welfare consumers prefer meat burgers more when informed about health (Treatment 3) and animal welfare effects (Treatment 4) of meat production. In addition, consumers with high pro-animal welfare attitudes in Treatment 3 (health) prefer more seitan, tempeh, mushrooms, and plant burgers, while those in Treatment 4 (animal) have higher preferences for tempeh and mushroom burgers. In addition, insect burgers are slightly preferred by people with low pro-animal welfare attitudes.

4.5 | Consumer Preferences for Meat Alternatives Labeling Policies

Finally, we examined consumers' preferences for meat alternatives labeling policies (Table 6). Results show that most

TABLE 3 | Subsample analysis: Shares of preferences for burger alternatives across consumer sociodemographics.

	Gender, ΔPS (female–male)				Age, ΔPS (young–old)				Income, ΔPS (low income–high income)			
Product	Treatment 1, Control ($N=288$) % shares	Treatment 2, Environment ($N=293$) % shares	Treatment 3, Health ($N=292$) % shares	Treatment 4, Animal ($N=291$) % shares	Treatment 1, Control ($N=288$) % shares	Treatment 2, Environment ($N=293$) % shares	Treatment 3, Health ($N=292$) % shares	Treatment 4, Animal ($N=291$) % shares	Treatment 1, Control ($N=288$) % shares	Treatment 2, Environment ($N=293$) % shares	Treatment 3, Health ($N=292$) % shares	Treatment 4, Animal ($N=291$) % shares
Meat	−0.065	−0.097**	−0.014	−0.09**	−0.11**	−0.014	−0.026	−0.214***	0.04	−0.079*	−0.076*	−0.002
Seitan	0.005	0.000	0.008	−0.001	0.007	0.013**	0.004	0.009**	−0.002	0.000	0.008	0.002
Dairy	0.000	0.000	−0.002	−0.009*	−0.002	0.008	0.002	0.018***	−0.003	0.008	0.022**	−0.001
Quorn	0.002	0.000	0.000	0.000	0.003	0.002	0.002	0.008***	0.000	−0.001	0.000	0.001
Hybrid	0.029	0.021	−0.039	0.004	0.04	0.034	−0.039	0.05*	−0.024	0.025	−0.026	−0.045*
Tempeh	0.01*	0.002	0.011	0.003	0.004	0.012	0.003	0.01**	−0.010	−0.011	−0.001	−0.003
Mushroom	0.035*	0.044**	0.029	0.047**	−0.024	−0.043**	−0.008	0.01	−0.004	0.049**	0.031	0.003
Cultured	−0.048***	−0.001	−0.005	0.003	0.042**	−0.015	0.025	0.069***	0.019	0.035	0.043**	0.042*
Plant	0.033**	0.031*	0.012	0.044**	0.04**	0.003	0.037*	0.041**	−0.016	−0.026	0.001	0.003
Insect	−0.00002*	−0.00007***	−0.00005***	−0.00003***	0.00011***	0.00009***	0.00009***	0.00006***	0.000	0.000	0.00003***	0.00002

Abbreviation: PS, preference share.
*$p<0.1$.
**$p<0.05$.
***$p<0.01$.

TABLE 4 | Subsample analysis: Shares of preferences for burger alternatives across consumer political preferences.

	Politics ΔPS (liberals–moderate)				Politics ΔPS (liberals–conservative)				Politics ΔPS (moderate–conservatives)			
Product	Treatment 1, Control ($N=288$) % shares	Treatment 2, Environment ($N=293$) % shares	Treatment 3, Health ($N=292$) % shares	Treatment 4, Animal ($N=291$) % shares	Treatment 1, Control ($N=288$) % shares	Treatment 2, Environment ($N=293$) % shares	Treatment 3, Health ($N=292$) % shares	Treatment 4, Animal ($N=291$) % shares	Treatment 1, Control ($N=288$) % shares	Treatment 2, Environment ($N=293$) % shares	Treatment 3, Health ($N=292$) % shares	Treatment 4, Animal ($N=291$) % shares
Meat	−0.014	−0.107*	−0.104*	−0.007	−0.097*	−0.138**	−0.267***	−0.149**	−0.082	−0.032	−0.163***	−0.142**
Seitan	0.001	0.001	0.005	−0.002	0.005	−0.001	0.014*	−0.003	0.004	−0.001	0.009	−0.001
Dairy	0.003	0.000	0.011	−0.002	0.004	−0.006	0.016**	0.01	0.001	−0.007	0.005	0.012*
Quorn	0.002	0.000	0.003	0.001	0.004	−0.001	0.005**	0.003	0.001	−0.001	0.002*	0.001
Hybrid	−0.009	0.059	0.022	0.041	0.033	0.085**	0.049	0.074*	0.042	0.026	0.027	0.033
Tempeh	−0.006	0.009	0.005	0.001	0.005	0.002	0.019**	0.004	0.011*	−0.007	0.014*	0.003
Mushroom	0.012	0.047*	−0.032	0.007	−0.028	0.035	0.029*	0.034	−0.04	−0.012	0.061***	0.027
Cultured	0.019	−0.045*	0.053**	−0.037	0.047**	−0.013	0.058**	−0.008	0.028	0.033	0.005	0.029
Plant	−0.008	0.037	0.038	−0.002	0.025	0.037	0.077***	0.036	0.033*	0.0001	0.04*	0.038*
Insect	0.00000	−0.00004*	0.00002**	−0.00006***	0.000	0.00001*	0.00002*	0.0000	0.0000	0.00005***	0.0000	0.00006***

Abbreviation: PS, preference share.
*$p<0.1$.
**$p<0.05$.
***$p<0.01$.

TABLE 5 | Subsample analysis: Shares of preferences for burger alternatives across consumer attitudes.

	Food neophobia attitude ΔPS (low FNS–high FNS)				Health attitude ΔPS (low health–high health)				Animal attitude ΔPS (low AAS–high AAS)			
Product	**Treatment 1, Control (*N* = 288), % shares**	**Treatment 2, Environment (*N* = 293), % shares**	**Treatment 3, Health (*N* = 292), % shares**	**Treatment 4, Animal (*N* = 291), % shares**	**Treatment 1, Control (*N* = 288) % shares**	**Treatment 2, Environment (*N* = 293), % shares**	**Treatment 3, Health (*N* = 292), % shares**	**Treatment 4, Animal (*N* = 291), % shares**	**Treatment 1, Control (*N* = 288), % shares**	**Treatment 2, Environment (*N* = 293), % shares**	**Treatment 3, Health (*N* = 292), % shares**	**Treatment 4, Animal (*N* = 291), % shares**
Meat	−0.073*	−0.076*	0.076*	0.000	0.207***	0.127***	0.099**	0.069*	0.003	0.012	0.16***	0.115**
Seitan	0.004	0.006	−0.004	−0.005	−0.013**	0.002	−0.012	0.004	0.002	0.001	−0.019**	−0.008*
Dairy	−0.001	0.005	−0.003	0.002	−0.005	0.000	0.003	0.009	0.001	0.007*	−0.005	−0.004
Quorn	0.001	0.002	0.003*	0.002	−0.002	0.001	−0.002	0.003	−0.002	0.000	−0.002	−0.002
Hybrid	−0.031	0.001	−0.085***	−0.020	−0.043*	0.000	−0.011	−0.002	−0.005	0.023	−0.045*	0.009
Tempeh	0.01*	0.009	−0.004	0.001	−0.024***	−0.005	−0.018**	−0.005	−0.006	−0.003	−0.016**	−0.01**
Mushroom	0.049**	0.027	0.025	0.036*	−0.04**	−0.064***	−0.03*	−0.015	−0.009	−0.007	−0.038**	−0.045**
Cultured	0.004	0.008	0.007	−0.02	−0.011	0.013	0.022	−0.021	0.021	0.003	0.027*	−0.025
Plant	0.037**	0.018	−0.015	0.004	−0.07***	−0.074***	−0.051**	−0.042**	−0.005	−0.036*	−0.064***	−0.03*
Insect	0.00003***	−0.00005***	0.00001	0.00002*	−0.00002**	0.00001	0.0000	−0.0001***	0.00001*	0.00007***	0.00007***	0.00001

Abbreviations: AAS, animal attitude scale; FNS, food neophobia scale.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

TABLE 6 | Consumer support or opposition for meat alternatives labeling policies.

Policy	Meat alternative labeling ($N = 288$)
SUPPORT a policy that only meat coming from traditional animal agriculture should be labeled as "meat."	86.81%
OPPOSE a policy that only meat coming from traditional animal agriculture should be labeled as "meat."	13.19%

consumers (86.80%) support a policy that only meat coming from traditional animal agriculture (i.e., animals born, raised, and harvested in the traditional animal agricultural manner) rather than coming from alternative sources (e.g., culturing meat, plant-based sources, fermentation of soybeans, and dairy sources) should be labeled as "meat."

Next, we found that consumers who prefer a meat alternative labeling policy that allows only meat coming from traditional animal agriculture should be labeled as "meat" tend to be conservative (Table 7).

Furthermore, we discovered that cultured and hybrid burgers are the meat alternatives that respondents mostly prefer to be labeled as "meat" (Figure SL1). This suggests that consumers tend to prefer products labeled as "meat" when the meat alternatives contain animal tissue protein (i.e., cultured and hybrid). We also found that consumers who mostly prefer cultured meat to be labeled as "meat" are highly educated and liberals, while those who mostly prefer hybrid meat to be labeled as "meat" tend to be younger and liberals (Table SM1).

5 | Discussion

With many meat alternatives that are entering the market, it is important to better understand consumer valuation for these new products. There are several important outcomes highlighted in this study. First, unsurprisingly, we discovered that consumers perceive meat burgers as the most familiar, tastiest, most nutritious, and most natural product, while plant burgers are perceived as the healthiest and most environmentally friendly product.

Second, our results suggest that the meat burger is largely and consistently the most preferred burger, capturing more than 60% of the preference shares across all treatments and subsamples investigated. This finding corroborates previous research (e.g., Jahn et al. 2024; Tonsor et al. 2022; Van Loo et al. 2020), which indicates that conventional meat remains the most consumed product among meat and meat alternatives in the United States. This preference may be driven by greater consumer familiarity with meat, as well as perceptions of it being tastier, more natural, and more nutritious, compared to meat alternatives, which are the attributes that consumers consider most important when buying meat (Tonsor and Lusk 2022).

Third, we found that around 40% of the consumer preference shares are for meat alternatives. This finding is in line with Tonsor et al. (2022), who found that in a binary choice between traditional meat and plant-based alternatives, consumers selected the latter option in 25% of the cases, and Jahn et al. (2024), who found that with three meat alternatives plus conventional meat, the latter held 75% of the market share. Our

TABLE 7 | Effect of consumer characteristics on preference for meat alternatives labeling.

	Meat labeling ($N = 272$)	
Variable	Coefficient (SE)	p
Intercept	2.88 (2.30)	0.21
Age: older	0.01 (0.01)	0.48
Gender: male	−0.48 (0.41)	0.24
Income: higher income	0.09 (0.42)	0.83
Education: higher education	−0.43 (0.43)	0.31
Meat familiarity: higher meat familiarity	−0.25 (0.30)	0.41
NEP: higher pro-environmental attitude	−0.15 (0.37)	0.68
AAS: higher pro-animal attitude	0.03 (0.42)	0.94
Health: higher pro-health attitude	−0.06 (0.17)	0.71
Religion: Religious	−0.08 (0.41)	0.84
Politics: Conservative	0.41 (0.19)	0.03
Model statistics		
No. of obs.	272	
ll(model)	−95.10	
df	11	
Prob > X^2	0.37	
LR $X^2(10)$	10.83	
Pseudo-R^2	0.05	
AIC	212.20	
BIC	251.87	

Abbreviations: AAS, pro-animal welfare attitude; AIC, Akaike information criterion; BIC, Bayesian information criterion; df, degree of freedom; Health, pro-health attitude; ll, log-likelihood; LR $X^2(10)$, likelihood ratio (LR) chi-squared statistic; No. of obs, number of observations; NEP, pro-environmental attitude; Pseudo-R^2, McFadden's pseudo-R^2; SE, standard error.

finding is plausible as we have offered a larger number (nine) of meat alternatives to consumers to select compared to Tonsor et al. (2022) and Jahn et al. (2024). Specifically, we found that mushroom, plant, and hybrid burgers have the most relevant preference shares after meat burgers. This finding is corroborated by Onwezen et al. (2021) and may be explained by the fact that these second-generation meat alternatives are perceived as healthier and more environmentally friendly than meat and tend to mimic conventional meat burgers in terms of sensory properties (Banovic et al. 2022; Caputo et al. 2024). In addition, we found that consumers perceive hybrid and cultured burgers as more similar to meat compared to all other burger alternatives. In contrast, plant burgers are perceived as very different from meat, suggesting that plant alternatives (along with all other non-animal-derived options and dairy) may not serve as direct substitutes for conventional meat. This outcome is consistent with real US market data (Neuhofer and Lusk 2022).

Fourth, overall, we found that information has little impact on changing consumer preferences, which aligns with the findings from Van Loo et al. (2020) when consumers are informed about the human health impacts of meat consumption on their preferences for certain burger alternatives.

Fifth, we found that females and younger consumers tend to prefer more meat alternatives, especially when informed about the animal welfare effects of meat production, as corroborated by McKendree et al. (2014). Indeed, it has been demonstrated that strong cross-cultural associations exist between meat and masculinity. Especially across Western societies, women are twice as likely as men to be vegan or vegetarian (Love and Sulikowski 2018). Furthermore, we found that liberals prefer more meat alternatives compared to conventional meat when informed about the human health effects of meat consumption. Also, respondents with high pro-health attitudes prefer more burger alternatives, which may be explained by the fact that consumers perceive plant-based burgers as healthier than meat burgers, as also highlighted by Van Loo et al. (2020).

Sixth, we noted that first-generation meat alternatives (i.e., seitan and tempeh) tend to be preferred by younger consumers when informed about the animal welfare effects of meat production and by liberals when informed about the human health effects of meat consumption.

Seventh, we found that the large majority of consumers think that the word *"meat"* should be used only to label traditional meat, as corroborated by Van Loo et al. (2020) but contrasted with Ingredient Communications (2019). In addition, cultured and hybrid burgers are the meat alternatives that consumers mostly prefer to be labeled as "meat" the most. This might be explained by the perceived animal tissue content in meat alternatives (i.e., both cultured and hybrid meat contain animal tissues), which may drive preferences for labeling them as "meat." Interestingly, younger consumers and liberals are more likely to prefer that hybrid meat be labeled as "meat," while those who prefer cultured meat to be labeled as "meat" tend to be highly educated and liberal.

These findings have important implications for the meat alternatives market. First, since the second-generation meat alternatives have larger preferences among consumers, producers could introduce or expand the market availability of these products by, among others, setting up alliances with retailers and food service businesses. Second, meat alternatives businesses could also benefit from marketing plant- and mushroom-alternatives to consumers with higher pro-health attitudes and lower levels of neophobia toward new foods. Furthermore, emphasizing the animal welfare benefits of plant and mushroom meat alternatives to females and younger people and highlighting human health benefits to liberals could appeal to these groups as potential early adopters of meat alternatives. Third, producers should emphasize to younger consumers, males, individuals with pro-health attitudes, and liberals the similarities between meat alternatives and meat. Fourth, first-generation meat alternative producers should target their products to younger people by informing them about the animal welfare impacts of meat production and appeal to liberals by highlighting the health benefits of these products.

Further research is needed to test the robustness of our findings with other types of muscle foods (i.e., chicken, pork, and seafood) and investigate the potential substitution and complementarity effects across meat and meat alternatives. Similar studies should also be conducted in other countries, given the expected increase in demand for meat alternatives in many parts of the world. Given the growing debate around food labeling regulations for plant-based alternatives, future research could explore consumer labeling preferences in other product categories where plant-based options are becoming increasingly popular, such as milk and seafood.

6 | Policy Implications and Conclusions

Several policy implications can be derived from this study. First, the large meat alternatives preference shares indicate that consumption of these products can have significant potential to impact sustainability, animal welfare, and health policy goals. Thus, if the policy goals are related to improving these factors, policymakers could provide greater support to producers of hybrid and cultured meat alternatives, as these products—at least in the short run—are more likely to replace meat compared to other alternatives. Specifically, policymakers should work together with producers to reduce the market prices of hybrid and cultured meat as well as provide R&D funding aimed at improving their taste and nutritional properties, as these key attributes affect food purchases (Lusk and Briggeman 2009).

Second, the potential to promote more sustainable and healthy diets through the introduction of meat alternatives in the US market depends on both the type of information provided and differences across consumer segments. Research and innovation policies should emphasize the role of consumer-driven product development and market strategies to enhance the appeal of meat alternatives (Jahn et al. 2024). These policies should also target specific consumer segments that are more receptive to meat alternatives while encouraging greater product variety to gradually reduce the market dominance of conventional meat.

Third, we found that consumers strongly prefer the term "meat" to be reserved exclusively for products derived from traditional

animal sources. This aligns with the position of the USCA (2018), which advocates for restricting the use of the word "meat" on labels for meat alternatives. Such preferences may justify the establishment of clear labeling regulations that both reflect consumer expectations and safeguard the investments of conventional meat producers (DeMuth et al. 2023). However, a significant challenge lies in the fragmented regulatory landscape, where federal and state-level labeling laws often overlap or even conflict (Tarko and Farrant 2019). This regulatory inconsistency can undermine the effectiveness of labeling policies and create logistical and distributional burdens for producers, marketers, food service providers, and retailers. These burdens include navigating varying compliance requirements, redesigning product labels, and managing inconsistent claims, each of which can increase operational costs and may limit the efficient distribution of meat alternatives across state lines (Staples et al. 2022; Mendez et al. 2025). As protein supply chains are increasingly subject to complex regulatory constraints (Staples et al. 2022), there is a clear need for policymakers and regulators to harmonize labeling standards. Doing so would reduce unnecessary barriers and facilitate the broader adoption and distribution of meat alternatives within the marketplace.

In conclusion, our findings suggest that consumer preferences for meat alternatives are generally consistent across different information treatments and demographic traits. However, factors such as age, political orientation, health attitudes, and exposure to information about the health impacts of meat production can influence preferences for certain products. Notably, most consumers prefer that the term "meat" not be used for products that do not contain animal proteins. These insights into consumer perceptions and attitudes can guide the development of targeted communication strategies that highlight the benefits of meat alternatives, thereby enhancing their market acceptance and supporting broader policy objectives related to sustainability, animal welfare, and public health.

Acknowledgments

During the preparation of this work, the authors used ChatGPT-4 to correct the grammar. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the content of the published article. This study was supported by funding from the "Institute for Advancing Health through Agriculture, Texas A&M AgriLife." Open access publishing facilitated by Universita degli Studi di Padova, as part of the Wiley - CRUI-CARE agreement.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available in the Supporting Information of this article.

Endnotes

[1] Non-governmental organizations.

[2] Food and Agriculture Organization.

[3] First-generation are protein-rich plant foods such as tempeh and seitan originated in Asia (see for more details, Caputo et al. 2024).

[4] Second-generation are protein-based products, such as plant-based meat alternatives, produced to mimic sensory properties of conventional beef, pork, chicken, and fish products (see for more details, Caputo et al. 2024).

[5] Seitan burger is made of gluten derived from wheat.

[6] Tempeh burger is made of fermented soybeans.

[7] Compound Annual Growth Rate.

[8] Plant burger is made of plant proteins (e.g., soybean and pea).

[9] Hybrid burger is made of a mix conventional meat (e.g., beef and chicken), and plant proteins (e.g., soybean and pea).

[10] Quorn burger is made of mycoproteins.

[11] Mushroom burger is made of mushroom (e.g., portobello).

[12] Cultured burger is made of cultivated meat (e.g., beef).

[13] Dairy burger is made of fermented milk proteins.

[14] Insect burger is made of proteins obtained by edible insects (e.g., mealworm and house cricket).

[15] We obtained informed consent from all the participants in the study. Our study was approved by an institutional review ethical committee.

[16] Insect burger was the least preferred burger, based on the calculation of the per cent of times each burger was selected best or worst.

References

Abdi, H., D. Valentin, S. Chollet, and C. Chrea. 2007. "Analyzing Assessors and Products in Sorting Tasks: DISTATIS, Theory and Applications." *Food Quality and Preference* 18, no. 4: 627–640. https://doi.org/10.1016/j.foodqual.2006.09.003.

Adhikari, S., S. Adhikari, B. R. McFadden, T. Malone, and J. L. Lusk. 2025. "Plant-Based Versus Animal-Based Proteins: Does It Have to be Either/or?" *Journal of Agricultural and Resource Economics* 50: 1–20. https://doi.org/10.22004/ag.econ.344678.

Ammann, J., G. Mack, J. Irek, R. Finger, and N. el Benni. 2023. "Consumers' Meat Commitment and the Importance of Animal Welfare as Agricultural Policy Goal." *Food Quality and Preference* 112: 105010. https://doi.org/10.1016/j.foodqual.2023.105010.

Apostolidis, C., and F. McLeay. 2016. "Should We Stop Meating Like This? Reducing Meat Consumption Through Substitution." *Food Policy* 65: 74–89. https://doi.org/10.1016/j.foodpol.2016.11.002.

Asioli, D., M. Banovic, A. M. Barone, S. Grasso, and R. M. Nayga Jr. 2023. "European Consumers' Valuation for Hybrid Meat: Does Information Matter?" *Applied Economic Perspectives and Policy* 45, no. 1: 44–62. https://doi.org/10.1002/aepp.13283.

Asioli, D., J. Fuentes-Pila, S. Alarcón, et al. 2022. "'Consumers' Valuation of Cultured Beef Burger: A Multi-Country Investigation Using Choice Experiments." *Food Policy* 112: 102376. https://doi.org/10.1016/j.foodpol.2022.102376.

Asioli, D., and S. R. Jaeger. 2025. "Online Consumer Research: More Attention Needs to Be Given to Data Quality." *Current Opinion in Food Science* 63: 101307. https://doi.org/10.1016/j.cofs.2025.101307.

Banovic, M., A. M. Barone, D. Asioli, and S. Grasso. 2022. "Enabling Sustainable Plant-Forward Transition: European Consumer Attitudes and Intention to Buy Hybrid Products." *Food Quality and Preference* 96: 104440. https://doi.org/10.1016/j.foodqual.2021.104440.

Barone, A. M., M. Banovic, D. Asioli, E. Wallace, C. Ruiz-Capillas, and S. Grasso. 2021. "The Usual Suspect: How to Co-Create Healthier Meat Products." *Food Research International* 143: 110304. https://doi.org/10.1016/j.foodres.2021.110304.

Bazzani, C., G. W. Gustavsen, R. M. Nayga Jr., and K. Rickertsen. 2018. "A Comparative Study of Food Values Between the United States and Norway." *European Review of Agricultural Economics* 45, no. 2: 239–272. https://doi.org/10.1093/erae/jbx033.

Boldt, L. J. S., J. E. Hobbs, P. Lloyd-Smith, and Y. Yang. 2026. "Beyond Labels: Exploring Consumer Preferences for Plant-Based Meat Labeling Policies." *Applied Economic Perspectives and Policy* 48, no. 1: 123–136. https://doi.org/10.1002/aepp.70013.

Bryant, C., and J. Barnett. 2018. "Consumer Acceptance of Cultured Meat: A Systematic Review." *Meat Science* 143: 8–17. https://doi.org/10.1016/j.meatsci.2018.04.008.

Cadoret, M., S. Lê, and J. Pagès. 2009. "A Factorial Approach for Sorting Task Data (FAST)." *Food Quality and Preference* 20, no. 6: 410–417. https://doi.org/10.1016/j.foodqual.2009.02.010.

Caputo, V., and J. L. Lusk. 2020. "What Agricultural and Food Policies Do U.S. Consumers Prefer? A Best–Worst Scaling Approach." *Agricultural Economics* 51, no. 1: 75–93. https://doi.org/10.1111/agec.12542.

Caputo, V., G. Sogari, and E. J. Van Loo. 2023. "Do Plant-Based and Blend Meat Alternatives Taste Like Meat? A Combined Sensory and Choice Experiment Study." *Applied Economic Perspectives and Policy* 45, no. 1: 86–105. https://doi.org/10.1002/aepp.13247.

Caputo, V., J. Sun, A. J. Staples, and H. Taylor. 2024. "Market Outlook for Meat Alternatives: Challenges, Opportunities, and New Developments." *Trends in Food Science & Technology* 148: 104474. https://doi.org/10.1016/j.tifs.2024.104474.

Chen, B., G. Zhou, and Y. Hu. 2023. "'Estimating Consumers' Willingness to Pay for Plant-Based Meat and Cultured Meat in China." *Food Quality and Preference* 111: 104962. https://doi.org/10.1016/j.foodqual.2023.104962.

Choudhury, D., S. Singh, J. S. H. Seah, D. C. L. Yeo, and L. P. Tan. 2020. "Commercialization of Plant-Based Meat Alternatives." *Trends in Plant Science* 25, no. 11: 1055–1058. https://doi.org/10.1016/j.tplants.2020.08.006.

Clune, S., E. Crossin, and K. Verghese. 2017. "Systematic Review of Greenhouse Gas Emissions for Different Fresh Food Categories." *Journal of Cleaner Production* 140: 766–783. https://doi.org/10.1016/j.jclepro.2016.04.082.

Coyne, A. 2024. "Eyeing Alternatives—Meat Companies With Stakes in Meat-Free and Cell-Based Meat, Just-Food." *Just Food*. https://www.just-food.com/features/eyeing-alternatives-meat-companies-with-stakes-in-meat-free-and-cell-based-meat/?cf-view.

Cummings, R. G., and L. O. Taylor. 1999. "Unbiased Value Estimates for Environmental Goods: A Cheap Talk Design for the Contingent Valuation Method." *American Economic Review* 89, no. 3: 649–665.

del Campo, M., F. Montossi, J. M. Soares de Lima, and G. Brito. 2025. "Future Cattle Production: Animal Welfare as a Critical Component of Sustainability and Beef Quality, a South American Perspective." *Meat Science* 219: 109672. https://doi.org/10.1016/j.meatsci.2024.109672.

Demartini, E., D. Vecchiato, L. Finos, S. Mattavelli, and A. Gaviglio. 2022. "Would You Buy Vegan Meatballs? The Policy Issues Around Vegan and Meat-Sounding Labelling of Plant-Based Meat Alternatives." *Food Policy* 111: 102310. https://doi.org/10.1016/j.foodpol.2022.102310.

DeMuth, B., T. Malone, B. R. McFadden, and C. A. Wolf. 2023. "Choice Effects Associated With Banning the Word "Meat" on Alternative Protein Labels." *Applied Economic Perspectives and Policy* 45, no. 1: 128–144. https://doi.org/10.1002/aepp.13319.

DeVylder, J., M. Lalane, and L. Fedina. 2019. "The Association Between Abusive Policing and PTSD Symptoms Among U.S. Police Officers." *Journal of the Society for Social Work and Research* 10, no. 2: 261–273. https://doi.org/10.1086/703356.

Divaks. 2025. "The Beetles Burgers." https://divaks.com/products/the-beetles-burger-patty/.

Djekic, I. 2015. "Environmental Impact of Meat Industry—Current Status and Future Perspectives." *Procedia Food Science* 5: 61–64. https://doi.org/10.1016/j.profoo.2015.09.025.

Dunlap, R. E., K. D. Van Liere, A. G. Mertig, and R. E. Jones. 2000. "Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale." *Journal of Social Issues* 56, no. 3: 425–442.

Dupont, J., and F. Fiebelkorn. 2020. "Attitudes and Acceptance of Young People Toward the Consumption of Insects and Cultured Meat in Germany." *Food Quality and Preference* 85: 103983. https://doi.org/10.1016/j.foodqual.2020.103983.

ERS-USDA. 2024. "Livestock & Meat Domestic Data." https://www.ers.usda.gov/data-products/livestock-and-meat-domestic-data.

Etter, B., F. Michel, and M. Siegrist. 2024. "Which Are the Most Promising Protein Sources for Meat Alternatives?" *Food Quality and Preference* 119: 105226. https://doi.org/10.1016/j.foodqual.2024.105226.

FAO. 2023. "Achieving SDG 2 Without Breaching the 1.5°C Threshold: A Global Roadmap—How Agrifood Systems Transformation Through Accelerated Climate Actions Will Help Achieving Food Security and Nutrition, Today and Tomorrow." https://openknowledge.fao.org/server/api/core/bitstreams/61c1ab4e-32f7-47c4-b267-d6410bb1dac3/content.

Feltz, A., S. Feltz, U. Hoang, and J. Holt. 2025. "The Myth of Misleading Labels: Examining Consumer Understanding of Plant-Based Meat and Milk Analogues." *Journal of Consumer Policy* 48, no. 4: 539–562. https://doi.org/10.1007/s10603-025-09601-5.

Finn, A., and J. J. Louviere. 1992. "Determining the Appropriate Response to Evidence of Public Concern: The Case of Food Safety." *Journal of Public Policy & Marketing* 11, no. 2: 12–25. https://doi.org/10.1177/074391569201100202.

Fischer, A. R. H., M. C. Onwezen, and M. van der Meer. 2023. "Consumer Perceptions of Different Protein Alternatives." In *Meat and Meat Replacements: An Interdisciplinary Assessment of Current Status and Future Directions*, edited by H. L. Meiselman and J. M. Lorenzo, 333–362. Woodhead Publishing.

Flynn, T., and T. Marley. 2014. "Best Worst Scaling: Theory and Methods." In *Handbook of Choice Modelling*, edited by S. Hess and A. Daly, 178–201. Edward Elgar.

Food & Drug Law Institute. 2022. "Alternative Proteins: Navigating the Maze of U.S. Federal and State Meat Labeling Requirements." https://www.fdli.org/2023/05/alternative-proteins-navigating-the-maze-of-u-s-federal-and-state-meat-labeling-requirements/#_edn25.

Forouzanfar, M. H., A. Cohen, K. Delwiche, et al. 2015. "Global, Regional, and National Comparative Risk Assessment of 79 Behavioural, Environmental and Occupational, and Metabolic Risks or Clusters of Risks in 188 Countries, 1990–2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *Lancet* 386, no. 10010: 2287–2323. https://doi.org/10.1016/S0140-6736(15)00128-2.

Future Market Insights. 2022. "Seitan Market." https://www.futuremarketinsights.com/reports/seitan-market.

Gerber, P. J., H. Steinfeld, B. Henderson, et al. 2013. *Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*. FAO.

Gleckel, J. A. 2020. "Are Consumers Really Confused by Plant-Based Food Labels? An Empirical Study." *Journal of Animal and Environmental Law* 12: 1–27.

Godfray, H. C. J., P. Aveyard, T. Garnett, et al. 2018. "Meat Consumption, Health, and the Environment." *Science* 361, no. 6399: eaam5324. https://doi.org/10.1126/science.aam5324.

Grand View Research. 2021. *Cultured Meat Market (2023–2030)*. Grand Review Research.

Grosso, G., S. La Vignera, R. A. Condorelli, et al. 2022. "Total, Red and Processed Meat Consumption and Human Health: An Umbrella Review of Observational Studies." *International Journal of Food Sciences and Nutrition* 73, no. 6: 726–737. https://doi.org/10.1080/09637486.2022.2050996.

Hartmann, C., J. Shi, A. Giusto, and M. Siegrist. 2015. "The Psychology of Eating Insects: A Cross-Cultural Comparison Between Germany and China." *Food Quality and Preference* 44: 148–156. https://doi.org/10.1016/j.foodqual.2015.04.013.

He, J., N. M. Evans, H. Liu, and S. Shao. 2020. "A Review of Research on Plant-Based Meat Alternatives: Driving Forces, History, Manufacturing, and Consumer Attitudes." *Comprehensive Reviews in Food Science and Food Safety* 19, no. 5: 2639–2656. https://doi.org/10.1111/1541-4337.12610.

Hensher, D. A., J. M. Rose, and W. H. Greene. 2015. *Applied Choice Analysis: A Primer*. 2nd ed. Cambridge University Press.

Herzog, H., S. Grayson, and D. McCord. 2015. "Brief Measures of the Animal Attitude Scale." *Anthrozoös* 28, no. 1: 145–152. https://doi.org/10.2752/089279315X14129350721894.

Ingredient Communications. 2019. "One in Four Consumers Supports a Ban on Meat-Related Names for Vegetarian Products." https://www.datasmoothie.com/%40surveygoo/food-followup/.

Jahn, S., D. Guhl, and A. Erhard. 2024. "Substitution Patterns and Price Response for Plant-Based Meat Alternatives." *Proceedings of the National Academy of Sciences of the United States of America* 121, no. 50: e2319016121. https://doi.org/10.1073/pnas.2319016121.

Ji, J.-H., and S. H. Lee. 2026. "A Systematic Review of Consumer Responses to Meat Alternative Labeling." *Appetite* 218: 108375. https://doi.org/10.1016/j.appet.2025.108375.

Kershaw, J. C., A. A. Nolden, A. R. Brown, T. Hites, and L. K. Jefferies. 2023. "Tastiness of Meat and Plant Protein Foods Are Associated With Political Partisanship and May Be Influenced by Partisan Messaging." *Food Quality and Preference* 112: 105039. https://doi.org/10.1016/j.foodqual.2023.105039.

Kovacs, K. F., N. Kemper, R. M. Nayga Jr., W. Yang, and A. Blumenberg. 2024. "Positive and Negative Information Effects on Consumer Preferences for Lab Grown Meat." *Q Open* 4, no. 1: qoad030. https://doi.org/10.1093/qopen/qoad030.

Kuhfeld, W. F. 2005. "Experimental Design: Efficiency, Coding, and Choice Designs." In *Marketing Research Methods in SAS: Experimental Design, Choice, Conjoint, and Graphical Techniques*, 47–97. SAS Institute Inc.

Leahy, E., S. Lyons, and R. Tol. 2010. "An Estimate of the Number of Vegetarians in the World." Working Paper No. 340. The Economic and Social Research Institute.

Lebart, L. 1975. "L'orientation du dépouillement de certaines enquêtes par l'analyse des correspondances multiples." *Consommation* 2: 73–96.

Leroy, F., N. W. Smith, A. T. Adesogan, et al. 2023. "The Role of Meat in the Human Diet: Evolutionary Aspects and Nutritional Value." *Animal Frontiers* 13, no. 2: 11–18. https://doi.org/10.1093/af/vfac093.

Love, H. J., and D. Sulikowski. 2018. "Of Meat and Men: Sex Differences in Implicit and Explicit Attitudes Toward Meat." *Frontiers in Psychology* 9: 559.

Lusk, J., and B. C. Briggeman. 2009. "Food Values." *American Journal of Agricultural Economics* 91, no. 1: 184–196. https://doi.org/10.1111/j.1467-8276.2008.01175.x.

Lymbery, P., and I. Oakeshott. 2014. *Farmageddon: The True Cost of Cheap Meat*. Bloomsbury Publishing.

Machovina, B., K. J. Feeley, and W. J. Ripple. 2015. "Biodiversity Conservation: The Key Is Reducing Meat Consumption." *Science of the Total Environment* 536: 419–431. https://doi.org/10.1016/j.scitotenv.2015.07.022.

Mancini, M. C., and F. Antonioli. 2019. "'Exploring Consumers' Attitude Towards Cultured Meat in Italy." *Meat Science* 150: 101–110. https://doi.org/10.1016/j.meatsci.2018.12.014.

Mariel, P., D. Campbell, E. D. Sandorf, J. Meyerhoff, A. Vega-Bayo, and R. Blevins. 2025. *Steps of a Discrete Choice Experiment BT—Environmental Valuation With Discrete Choice Experiments in R: A Guide on Design, Implementation, and Data Analysis*, edited by P. Mariel, 9–75. Springer. https://doi.org/10.1007/978-3-031-89338-4_2.

McKendree, M. G. S., C. C. Croney, and N. J. O. Widmar. 2014. "Effects of Demographic Factors and Information Sources on United States Consumer Perceptions of Animal Welfare." *Journal of Animal Science* 92, no. 7: 3161–3173. https://doi.org/10.2527/jas.2014-6874.

Mendez, S., W. McAuliffe, and B. Stevenson. 2025. *Effects of Restrictive Animal Product Alternative Labeling Laws on Supply-Chain Costs*. Rethink Priorities.

Mondor Intelligence. 2022. "Tempeh Market Size & Share Analysis—Growth Trends & Forecasts (2024–2029)."

Morning AgClips. 2023. "Move Over Plant-Based, Here Comes the First "Dairy-Based" Alternative Meats." https://www.morningagclips.com/move-over-plant-based-here-comes-the-first-dairy-based-alternative-meats/.

Motoki, K., J. Park, C. Spence, and C. Velasco. 2022. "Contextual Acceptance of Novel and Unfamiliar Foods: Insects, Cultured Meat, Plant-Based Meat Alternatives, and 3D Printed Foods." *Food Quality and Preference* 96: 104368. https://doi.org/10.1016/j.foodqual.2021.104368.

Neuhofer, Z. T., and J. L. Lusk. 2022. "Most Plant-Based Meat Alternative Buyers Also Buy Meat: An Analysis of Household Demographics, Habit Formation, and Buying Behavior Among Meat Alternative Buyers." *Scientific Reports* 12, no. 1: 13062. https://doi.org/10.1038/s41598-022-16996-5.

Nollkaemper, A. 2023. "International Law and the Agony of Animals in Industrial Meat Production." *European Journal of International Law* 34, no. 4: 939–972. https://doi.org/10.1093/ejil/chad049.

OECD/FAO. 2024. *OECD-FAO Agricultural Outlook 2024–2033*. OECD Publishing/FAO.

Onwezen, M. C., E. P. Bouwman, M. J. Reinders, and H. Dagevos. 2021. "A Systematic Review on Consumer Acceptance of Alternative Proteins: Pulses, Algae, Insects, Plant-Based Meat Alternatives, and Cultured Meat." *Appetite* 159: 105058. https://doi.org/10.1016/j.appet.2020.105058.

Parlasca, M. C., and M. Qaim. 2022. "Meat Consumption and Sustainability." *Annual Review of Resource Economics* 14: 17–41. https://doi.org/10.1146/annurev-resource-111820-032340.

Pliner, P., and K. Hobden. 1992. "Development of a Scale to Measure the Trait of Food Neophobia in Humans." *Appetite* 19, no. 2: 105–120. https://doi.org/10.1016/0195-6663(92)90014-W.

Poe, G. L., K. L. Giraud, and J. B. Loomis. 2005. "Computational Methods for Measuring the Difference of Empirical Distributions." *American Journal of Agricultural Economics* 87, no. 2: 353–365.

Poore, J., and T. Nemecek. 2018. "Reducing Food's Environmental Impacts Through Producers and Consumers." *Science* 360, no. 6392: 987–992. https://doi.org/10.1126/science.aaq0216.

Progressive Dairy. 2023. "Futurizing Milk Into Dairy-Based Meat." *Progressive Dairy*. https://www.agproud.com/articles/57091-futurizing-milk-into-dairy-based-meat.

Reasearch and Markets. 2021. "Tempeh—Global Market Trajectory & Analytics." https://www.researchandmarkets.com/reports/5030386/tempeh-global-strategic-business-report.

Roininen, K., L. Lähteenmäki, and H. Tuorila. 1999. "Quantification of Consumer Attitudes to Health and Hedonic Characteristics of Foods." *Appetite* 33: 71–88. https://doi.org/10.1006/appe.1999.0232.

Sarrias, M., and R. Daziano. 2017. "Multinomial Logit Models With Continuous and Discrete Individual Heterogeneity in R: The Gmnl Package." *Journal of Statistical Software* 79: 1–46. https://doi.org/10.18637/jss.v079.i02.

Slade, P. 2018. "If You Build It, Will They Eat It? Consumer Preferences for Plant-Based and Cultured Meat Burgers." *Appetite* 125: 428–437. https://doi.org/10.1016/j.appet.2018.02.030.

Sogari, G., V. Caputo, A. Joshua Petterson, C. Mora, and F. Boukid. 2023. "A Sensory Study on Consumer Valuation for Plant-Based Meat Alternatives: What Is Liked and Disliked the Most?" *Food Research International* 169: 112813. https://doi.org/10.1016/j.foodres.2023.112813.

Staples, A. J., D. Chambers, R. T. Melstrom, and T. Malone. 2022. "Regulatory Restrictions Across U.S. Protein Supply Chains." *Journal of Agricultural and Applied Economics* 54, no. 1: 1–27. https://doi.org/10.1017/aae.2021.28.

Statista. 2023. "Quorn Brand Awareness, Usage, Popularity, Loyalty, and Buzz Among Meat Substitutes Users in the United States in 2022."

Street, D. J., and A. P. Street. 1996. "Partially Balanced Incomplete Block Design." In *Encyclopedia of Biostatistics*, edited by C. J. Colbourn and J. H. Dinitz. CRC Press.

StudyFinds. 2023. "Beetleburgers Could Soon Reach Mass Production—Helping to Feed the World." https://studyfinds.org/beetleburgers-feed-the-world/?utm_source=chatgpt.com.

Tarko, V., and A. Farrant. 2019. "The Efficiency of Regulatory Arbitrage." *Public Choice* 181, no. 1: 141–166. https://doi.org/10.1007/s11127-018-00630-y.

Tobias-Mamina, R., Y. Jordaan, L. Lin, and D. L. Ortega. 2025. "The Effects of Information and Naming Restriction on South African Consumer Preferences for Farm-Raised Meat and Meat Alternatives." *Future Foods* 12: 100685. https://doi.org/10.1016/j.fufo.2025.100685.

Tonsor, G. T., and J. L. Lusk. 2022. "U.S. Perspective: Meat Demand Outdoes Meat Avoidance." *Meat Science* 190: 108843. https://doi.org/10.1016/j.meatsci.2022.108843.

Tonsor, G. T., J. L. Lusk, and T. C. Schroeder. 2022. "Market Potential of New Plant-Based Protein Alternatives: Insights From Four US Consumer Experiments." *Applied Economic Perspectives and Policy* 45, no. 1: 164–181. https://doi.org/10.1002/aepp.13253.

United States Census Bureau. 2022. "Census.gov." https://www.census.gov/.

US Congress. 2024. "FAIR Labels Act of 2024." https://www.congress.gov/bill/118th-congress/house-bill/7130/text.

USCA. 2018. "Petition for the Imposition of Beef and Meat Labeling Requirements: To Exclude Products Not Derived Directly From Animals Raised and Slaughtered From Definition of "Beef" and "Meat."" https://www.uscattlemen.org/Templates/pdfs_USCA/2018-PDFs/2-9-18USCA-AMS-Petition-re-definition-of-beef-and-meat.pdf.

USDA. 2021. "Market Overview of Plant-Based Meat Alternative Products in China." https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Market%20Overview%20of%20Plant-Based%20Meat%20Alternative%20Products%20in%20China_Beijing_China%20-%20Peoples%20Republic%20of_01-07-2021.

Van Loo, E. J., V. Caputo, and J. L. Lusk. 2020. "Consumer Preferences for Farm-Raised Meat, Lab-Grown Meat, and Plant-Based Meat Alternatives: Does Information or Brand Matter?" *Food Policy* 95: 101931. https://doi.org/10.1016/j.foodpol.2020.101931.

Vural, Y., D. Ferriday, and P. J. Rogers. 2023. "'Consumers' Attitudes Towards Alternatives to Conventional Meat Products: Expectations About Taste and Satisfaction, and the Role of Disgust." *Appetite* 181: 106394. https://doi.org/10.1016/j.appet.2022.106394.

WHO. 2023. "Red and Processed Meat in the Context of Health and the Environment: Information Brief Many Shades of Red and Green." https://iris.who.int/bitstream/handle/10665/370775/9789240074828-eng.pdf?sequence=1.

Willett, W., J. Rockström, B. Loken, et al. 2019. "Food in the Anthropocene: EAT–Lancet Commission on Healthy Diets From Sustainable Food Systems." *Lancet* 393, no. 10170: 447–492. https://doi.org/10.1016/S0140-6736(18)31788-4.

Wolk, A. 2017. "Potential Health Hazards of Eating Red Meat." *Journal of Internal Medicine* 281, no. 2: 106–122. https://doi.org/10.1111/joim.12543.

Xhakollari, V., D. Asioli, and R. M. Nayga. 2025. "Mitigating Hypothetical Bias in Choice Experiments: An In-Depth Review on the Use of Cheap Talk." *Journal of Choice Modelling* 56: 100561. https://doi.org/10.1016/j.jocm.2025.100561.

Xu, X., P. Sharma, S. Shu, et al. 2021. "Global Greenhouse Gas Emissions From Animal-Based Foods Are Twice Those of Plant-Based Foods." *Nature Food* 2, no. 9: 724–732. https://doi.org/10.1038/s43016-021-00358-x.

Yuan, R., D. Asioli, S. Jin, and R. M. Nayga Jr. 2025. "Consumers' Valuation for Cultured Meat: A Multi-City Choice Experiment in China." *Journal of Agricultural and Applied Economics Association*: 1–15. https://doi.org/10.1002/jaa2.70028.

Zhang, M., L. Li, and J. Bai. 2020. "Consumer Acceptance of Cultured Meat in Urban Areas of Three Cities in China." *Food Control* 118: 107390. https://doi.org/10.1016/j.foodcont.2020.107390.

Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Appendix S1:** Supporting Information.