Improving Understanding of Consumer Attitudes toward Cultured Meat through the Lens of Online Media Framing

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Article

Improving Understanding of Consumer Attitudes toward Cultured Meat through the Lens of Online Media Framing

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Abstract: Wide-scale commercialization of cultured meat, produced from in vitro-grown animal stem cells, is still a long way off because of technical, regulatory and, above all, social acceptability constraints. As a result, despite the advancement of knowledge, it is difficult to predict whether this innovation will be commonly accepted. The concept of media framing is key to better understanding individuals' decision-making and mental interpretative patterns in relation to cultured meat adoption. This research therefore analyzes the role of media framing (namely the social media platform Twitter) on the components of consumer attitudes (cognitive, affective, and conative) in relation to cultured meat. A total of 23 020 publications and 38 531 comments were analyzed qualitatively (content analysis) and quantitatively (MANOVA). This study showed that media-framed posts influenced consumer attitudes more than did non-media-framed posts. Although the results indicate that the different types of media framing (ethical, intrinsic, informational, and belief) do not exert the same influence on each attitude component, they suggest that posts combining the ethical, intrinsic, and informational media frames have a greater impact on the acceptability of cultured meat and that the belief frame is equally important, particularly for the behavioral component. Relevant implications can be drawn for authorities and businesses on the use of differentiated education and marketing strategies.

Keywords: cultured meat; artificial meat; media framing; attitude; social acceptability; consumer acceptance; consumer behavior

1. Introduction

Most scholarly studies identify meat substitutes, including cultured meat, as a solution to the impacts of conventional meat production and farming (Onwezen et al. 2021; Fernandes et al. 2022), which raise a number of major concerns. First, there is concern about food security in light of a rapidly growing world population (9.8 billion people by 2050, UN, 2022) and increase in meat consumption (65% for pork and 80% for beef by 2050) (Choudhury et al. 2020b). Second, we face the challenge of environmental protection (high CO2 emissions generated by the livestock sector, overuse of agricultural land and water) and the fight against climate change (Alvaro, 2019). Additionally, the issue of human welfare (nutritional intake and health) and animal welfare (improving the condition of animals) (Michel et al., 2021) is also raised. Indeed, public debates around conventional meat highlight negative externalities such as water depletion, climate change, disruption of nutrient cycles and harmful effects on biodiversity (Michel et al., 2021, Ortega, Sun and Lin, 2022; Rombach et al., 2022). Moreover, several authors consider that the meat and livestock industry must be at the heart of the solutions to climate change (Nobre, 2022; Cornelissen and Piqueras-Fiszman, 2023).

Other studies have shown that consumers are increasingly concerned about animal welfare and sustainable meat production. (Pakseresht, Kaliji and Canavari, 2022; Holmes et al, 2022). Therefore, the desire to combat animal cruelty and environmental externalities is often cited as an example of prosocial consumer motivation for lifestyle changes that reduce meat consumption (Onwezen et al., 2021, Dupont, Harms and Fiebelkorn, 2022). According to the results of research carried out by Onwezen et al. (2021), Siddiqui et al. (2022b), and Lin-Hi et al. (2023), meat lovers are more likely to

try cultured meat due to the sustainability claims attached to it (Siddiqui et al 2022b and Lin -Hi et al 2023).

Recent literature shows that consumers are well-informed on sustainability issues (climate change, environmental protection), animal cruelty, and animal welfare issues (Stephens et al., 2018, Pakseresht, Kaliji, and Canavari, 2022) and that they perceive factory farming and slaughter as unethical and unjustified (Siddiqui et al 2022b, Rombach et al, 2022). Compared to conventional meat, cultured meat offers environmental benefits as its production uses less water and generates fewer greenhouse gas emissions. (Rosenfeld and Tomiyama, 2022).

Finally, in the context of COP27, held in November 2022, the UN warned against maintaining a highly animal-based diet to prevent future pandemics.

The range of alternatives to conventional meat, namely plant-based, soy, fish, and insect-based meat substitutes, as well as cultured meat, emerges as a sound promise in the face of these societal challenges (security, environment, climate, health/wellbeing) (Hoquette, 2016; Alexander et al., 2017). However, to date, Singapore is the only state to have put lab-grown meat on the shelves. In November 2022, the Food and Drug Administration (FDA) approved the sale of cultured chicken produced by the Californian start-up Upside Foods. While more than 30 companies in Europe are working on cultured meat, no pre-market approval has yet been requested. Consequently, many obstacles remain before cultured meat can be widely commercialized, including technical and regulatory barriers and, above all, acceptance by consumers and various opposition groups (Siddiqui et al. 2022; Kouarfaté et Durif, 2023).

Despite the advancement of knowledge, it is difficult to predict whether this innovation will find general acceptance. To date, research has primarily focused on expected consumer behavior (behavioral component of attitude). This includes studies of factors that positively or negatively influence consumer intentions, i.e., future acceptance or rejection of cultured meat (Verbeke, 2015; Verbeke et al. 2015b; Hwang et al., 2020; Weinrich et al., 2020; Arora et al., 2020), perceptions, likelihood of trying, purchasing or consuming (Wilks and Phillips, 2017; Bekker et al., 2017; Wilks et al., 2019), and comparative purchase intentions across cultures (Bryant et al., 2019b).

However, several important questions related to the acceptability of meat grown by consumers on social media remain. For example, how can we improve the acceptability of cultured meat to online consumers? What are the best communication techniques (media framing) that have the most influence on each of the components of online consumer attitudes (Twitter)? Which line of online communication for which specific objective? To answer these different questions, this study will be approached through theoretical foundations based on media framing.

Indeed, in 1993, Entman (p. 52) asserted the importance of understanding new or challenging phenomena through the process of media framing: "To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described." To our knowledge, aside from the research conducted by Goodwin and Shoulders (2013), Dilworth and McGregor (2015), and Bryant and Dillard (2019a), who investigated the issues of traditional media coverage and framing in relation to the acceptance of cultured meat, and a study by Pilařová et al. (2022) addressing sociological framing on Twitter, the phenomenon has not been analyzed through the lens of psychological framing on social media. Nonetheless, a number of studies investigating media framing from a psychological perspective have demonstrated its influence on decision-making, as well as on individuals' mental interpretive patterns (Lemarier-Saulnier, 2016): changes in belief, attitude, and behavior (e.g., Kahneman and Tversky, 1984; Price et al., 1997).

Hence, the purpose of this paper is to grasp the influence of media framing (social media platform Twitter) on the components (cognitive, affective and conative) of consumer attitude towards cultured meat. We explore whether each media frame of cultured meat on Twitter generates a different consumer attitude, and whether these differences impact each attitude component, and purchase and consumption behavior.

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2. Theoretical foundations and conceptual framework

2.1. The influence of media framing

The strength of media framing research lies in its multidisciplinary nature (Valkenburg, Semetko and de Vreese, 1999; Lemarier-Saulnier, 2016).

There are two main approaches to framing (Lemarier-Saulnier, 2016): 1) *the sociological approach*, which views frames as schemata of interpretation that individuals use to make sense of occurrences around them, and seeks to identify dominant frames/power struggles in the media (e.g., Entman, 1993; Reese, 2003); 2) *the psychological approach*, which posits that by orienting the message, seeking to elicit emotion and engaging certain values (and occulting others), framing influences individuals' train of thought; studies adopting this approach look to identify the role of framing in the perception and interpretation of reality (e.g., Cappella and Jamieson, 1997; Shah et al., 2007).

In this research, we take this psychological perspective of media framing, which has been used by a number of authors (Kahneman and Tversky, 1984; Nelson et al., 1997; Price et al., 1997; Shah et al., 2007, Tang et al., 2021), in order to gain an understanding of the impact of framing on consumer attitudes and behaviors toward a product, a service or a company, to the extent that "the framing of cultured meat has a significant effect on many attitudes and beliefs about the product, as well as behavioral intentions toward it" (e.g., Bryant and Dillard, 2019a, p. 6).

By using keywords, phrases and images in a newspaper (Entman, 1993) or social media (Bryant and Dillard, 2019a), communication experts can reinforce a particular representation of reality and a particular emotional response associated with that reality (Entman, 1993). For example, by purposefully omitting certain elements in a newspaper or broadcast, their message can suggest a specific perspective to the readers or listeners or trigger a specific feeling in them that are different from general reality (Tang et al., 2021).

In relation to cultured meat, the authors of Twitter posts may choose to talk about the intrinsic characteristics of cultured meat (taste, appearance, tenderness, and so on), ethical attributes (benefits to animals and the environment), or the informational or belief aspects with the aim of orienting and/or eliciting specific emotional responses to the exclusion of others. This study therefore aims to understand whether each publication about cultured meat on Twitter generates a different attitude among consumers depending on the media frame and whether these differences have an impact on each component of the attitude as well as on the purchasing and consumption behavior.

2.2. Determinants of the adoption of cultured meat

Meat consumption is associated with a few attributes and with sociocultural behaviors. It can meet nutritional needs, but it can also relate to cultural dogmas and religious laws (Stora-Lamarre, 1992). The influence of this range of determinants on consumer choice is rooted in microeconomic foundations based on the principle of utility maximization and/or random utility theory (McFadden, 1974). Consumers will therefore accept a meat alternative if and only if this alternative speaks to the determinants representing an individual or collective advantage or benefit.

The literature shows that cultured meat has both advantages and disadvantages, which can trigger ambivalent attitudes on the part of consumers. Its consumption therefore generates contradictory emotional responses. This dichotomous reaction has already been addressed in several studies (e.g., Berndsen and Van der Pligt, 2004; and Hwang et al., 2020; Kouarfaté et Durif, 2023). Defined as a conflict between determinant-generated positive and negative attitudes (benefit/risk) in the individual at the time of decision-making (Kaplan, 1972), consumption ambivalence can be viewed as a psychological state reflecting the concept of the meat paradox.

This concept of ambivalence is pertinent insofar as it makes it possible to identify and understand benefit determinants, which will contribute to the acceptability of cultured meat and risk determinants, which will lead to its rejection. Based on the tripartite theory developed by Rosenberg (1960), the influence of each ambivalent determinant will be examined for each of the components of online consumer attitudes. The tripartite theory holds that attitude is comprised of a cognitive component (measures consumers' level of knowledge about the object of study), an affective

component (measures the level of attachment to or affection for the product or brand) and a conative component (provides an understanding of intentions to purchase, pay and consume).

Although a number of studies have addressed media coverage of cultured meat, research on media frames and their influence on cultured meat consumption behavior is lacking. Bryant and Dillard (2019a) have examined mainstream media by considering three media frames: "societal benefits," "high tech" and "same meat." Like Bryant and Dillard (2019a), we consider each ambivalent determinant group identified in the literature as a media frame in the context of Twitter. We therefore conduct an a priori analysis of four media frames identified in the literature and propose the following research hypotheses.

– Ethical media frame of cultured meat: this ambivalent frame is defined by the benefit associated with the idea of sustainability, on the one hand, and the risk associated with unnaturalness on the other. While the notion of cultured meat's sustainability is connected to its capacity to protect the environment (Dilworth and McGregor, 2015; Bekker et al., 2017; Mancini and Antonioli, 2019), its unnaturalness is defined as a reaction of disgust and fear of unknown risks associated with new technology (Laestadius and Caldwell, 2015; Tuorila and Hartmann, 2020).

Hypothesis (H1). The ethical media frame (sustainability and unnaturalness) of cultured meat will influence each of the components of consumer attitude toward cultured meat.

– Intrinsic media frame of cultured meat: this frame is related to nutritional content, flavor (benefit), and consumer health concerns (risk), including the absence of drugs and chemicals (benefit) and distrust of biotechnology (risk). Researchers define nutrients as the total energy content, from fat and protein, of cultured meat, and they define flavor as the taste quality that cultured meat offers (Mancini and Antonioli, 2019; Weinrich et al., 2019). Health concerns associated with cultured meat are described by different authors as food safety considerations in relation to production methods and materials. Conversely, the absence of drugs and chemicals is a positive factor insofar as cultured meat production does not involve growth hormones, synthetic pesticides, or antibiotics (Verbeke et al., 2015a; Hwang et al., 2020). Distrust of biotechnology (risk) is associated with a negative perception of the bioengineering and nanotechnology techniques used in its manufacturing (Hwang et al., 2020).

Hypothesis (H2). The intrinsic media frame (nutritional content, flavor, absence of chemicals, health concerns, and distrust of biotechnology) of cultured meat influences each component of consumer attitude.

– Informational media frame or frame of initial information received by the consumer or of initial consumer reactions. Examples are food curiosity (benefit), food neophobia (risk), regulation (benefit), and conspiracy theories (risk). In the literature, food neophobia (as opposed to food curiosity) is defined as the reluctance to consume, avoidance, or distrust of new foods (Hwang et al., 2020; Tuorila and Hartmann, 2020). As regards the regulation of the cultured meat industry, some authors suggest that it is viewed as a guarantee by consumers (Choudhury, 2018; Choudhury et al., 2020a), whereas conspiratorial ideation refers to consumers' "general predisposition to believe" that cultured meat is the result of a plot by profit-driven individuals (Wilks et al., 2019).

Hypothesis (H3). The informational media frame (food curiosity, neophobia, regulation and conspiratorial ideation) of cultured meat has an effect on each component of consumer attitude.

– Belief media frame, where risks are associated with conservative values and benefits with good-deed morality (doing good for others, making sacrifices to protect the environment and so on). Morality is perceived as a community's set of rules and decisions that appeal to common sense, intended to ensure that the actions and behaviors adopted are "good or positive" for the collective (Stora-Lamarre, 1992); conservatism, on the other hand, is associated with favoring older or traditional values (Scheid, 2008) and opposing changes such as the novel manufacturing of cultured meat.

Hypothesis (H4). The belief media frame (consumer morality and religious and cultural conservatism) of cultured meat has an effect on each component of attitude.

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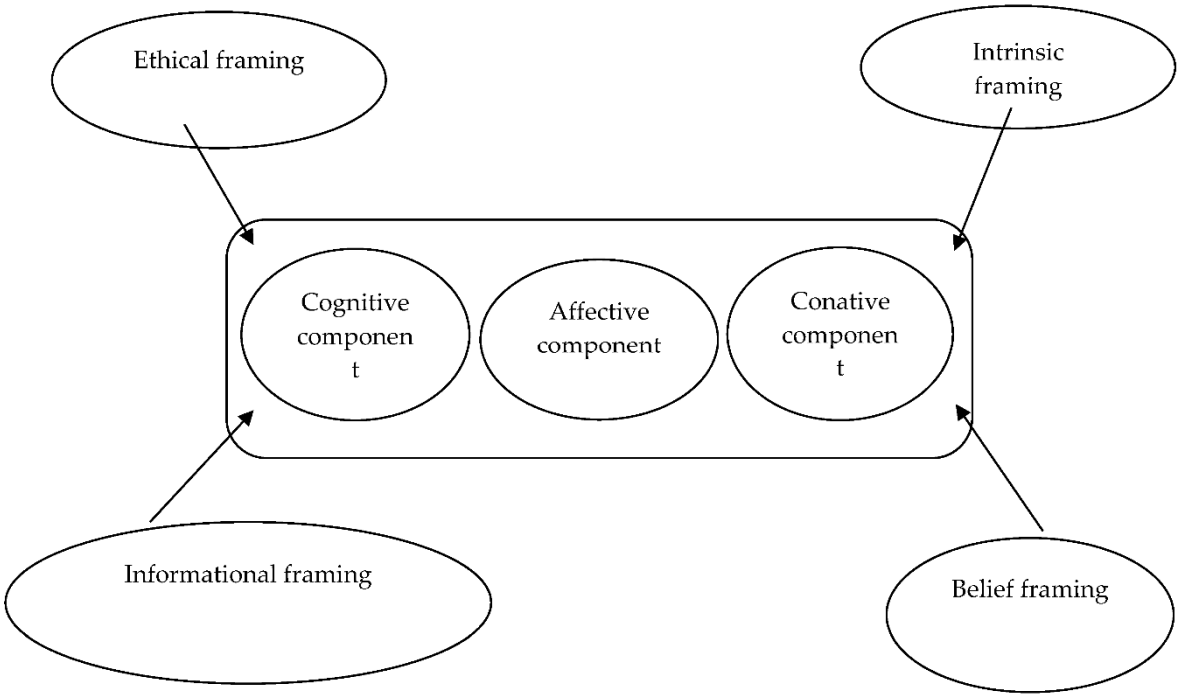

Figure 1. Conceptual framework: Impact of cultured meat media framing on attitude component.

3. Material and methods

The methodology based on "text mining" involved three main steps: 1) extraction and cleaning of the Twitter data, followed by transformation of the variables using a dictionary of keywords (identified during the literature review based on items used to measure the variables), 2) qualitative analysis of tweet content; 3) multivariate analysis of variance (MANOVA) based on the keywords in order to determine the influence of media framing on each component of the attitude toward cultured meat.

3.1. Identification of keywords

A number of keywords were drawn from the literature review. Their popularity on Twitter was then tested by counting the number of posts and comments associated with these keywords. We identified and selected the following keywords: Cultured meat, In vitro meat, Artificial meat, Lab-grown meat, Animal-free meat, Clean meat, Synthetic meat, Test tube meat, Meat substitute. Using the keywords in English and French, we extracted a total of 165 750 tweets (posts and comments) over a nine-month period (from January 1st to September 30, 2022), of which 153 727 were in English and 12 023 in French. The nine-month span was chosen to counter one of the major limitations of psychological approach research, which tends to focus on short-term effects to illustrate the process activated by framing (Lemarier-Saulnier, 2016).

3.2. Data collection and processing

A scientific research project was submitted to Twitter to request access for data extraction. After ensuring that our project met scientific importance, research, and confidentiality conditions, we were granted developer access, which allowed us to obtain posts and/or replies on cultured meat specifically in Canada.

Using the get_all_tweets() function of the academictwitterR library of the R software, the French- and English-language data were extracted, then processed separately and combined in the end using the R rbind() function.

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The database was then cleaned by automatically eliminating duplicate posts and comments. Subsequently, the posts were categorized using the R software by media frame, and replies or comments were categorized by attitude component based on the "keyword dictionary" made up of the items (shown in Table 2) that measure each variable.

The data used in this study is exclusively public data from anonymous and non-identifiable sources. This is consistent with similar studies that have used publicly available social media content (e.g., Griffith et al., 2021; Chicoine et al., 2021; Tang et al., 2021).

3.3. Identifying posts and comments

From the data extracted, we identified four types of tweets: "replied_to," "retweeted," "quoted" and "main tweets." These tweets were grouped into two categories: (1) posts and (2) comments (replies to Twitter posts). We applied the following process in order to precisely identify "posts" and "comments": (i) all main tweets were classified as "posts"; (ii) for "quoted" tweets, two groups emerged: one consisting of quotes from existing posts and a second group of quotes that were not associated with any post. The quoted tweets of the second group were therefore considered as "posts" because they generated replies or comments. The main tweets associated with this second group of "quoted" tweets were not found in our extracted data, because they were published before January 1, 2022, but were cited by other Twitter users during the data extraction period (from January 1, 2022, to 30 September 2022). For this reason, they were counted as posts.

3.4. Data analysis

A preliminary analysis was carried out to ensure that Twitter posts dealt with the topic of cultured meat. As recommended by Kozinets (2002), only terms and verbatim extracts related to the object of study were used. The qualitative analysis was carried out using R and QDA Miner software. We used the SPSS software platform for the quantitative analysis (MANOVA) on a final sample of **23 020 posts** and **38 531 comments**.

3.4.1. Qualitative analyses:

Following content analysis of posts and comments, the research team (composed of 2 researchers) coded a priori the data. Unlike a posteriori coding, a priori coding assumes that themes and sub-themes are identified in the literature and known to researchers, which has facilitated this process and reduced differences in the researchers' coding process (Kozinets, 2002).

The posts and comments were grouped by media frame and according to the tripartite theory of attitude (intrinsic, ethical, belief, informational frame; cognitive, conative, affective components). This made it possible to determine whether the type of media frame expressed through a post had an influence on the comments made by the consumers.

3.4.2. Quantitative analyses:

The quantitative analyses, namely descriptive analysis and multivariate analysis of variance (MANOVA), were carried out simultaneously. This methodology has been used by several authors in social media content analysis (e.g., Chicoine et al., 2021). A causal analysis was finally performed between each media frame and each attitude component.

The dependent variables are the three components (cognitive, affective and conative) of consumer attitudes toward cultured meat. The dictionary keywords derived from measurement items and their level of reliability and validity in relation to these variables are summarized in Table 2. Each of these attitude components was converted into a continuous binary variable (0,1). For example, if a dictionary keyword defining the cognitive component was identified in a Twitter user's comment, then this component was attributed to the comment, which was therefore given the value "1" for the "cognitive component of attitude" variable; if not the value was "0." The process was repeated for the other attitude components. To effectively capture the variables, we supplemented the dictionary of measurement items identified in the literature with analogous words whose

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occurrence was frequent in the tweets. These frequently encountered analogous words were identified after a preliminary analysis of the tweets. They are listed in column 3 of Table 2.

Independent variables: These refer to media framing and include all four media frames (ethical, intrinsic, informational and belief). The process used to convert the attitude components into a binary variable was also applied to media frames. As a result, each media frame is a categorical variable (0= post having no media framing and 1= post having a media framing).

4. Results

4.1. Qualitative analysis

Analysis of the tweets (Table 3, Figures 2 and 3) confirmed that a large number of posts on cultured meat were framed according to the four media themes (ethical, intrinsic, informational and belief). Each theme was found to encompass sub-themes, which is consistent with Bryant and Dillard (2019a) and Tang et al. (2020). The results also reveal the presence of ambivalent comments and responses on Twitter. The following are descriptions of each theme or media frame.

4.1.1. Ethical media frame

The ethical media frame was very prominent in Twitter posts. Consumers reacted in several different ways to posts that emphasized the issue of sustainability and the unnaturalness of cultured meat. Analysis of these reactions shows that each of the attitude components was affected either positively or negatively. For example, to the post, "***Lab-grown meat and insects 'good for planet and health'#LabGrownMeat #Insects #ClimateChange #Environment #Food https://t.co/7h3Dwmu63l***," one user had the following "cognitive" reaction: "***It's sometimes used as a meat substitute because the texture is similar, you make it by washing flour, which as a concept is hilarious***."

4.1.2. Intrinsic media frame

The most common media framing on Twitter is the one relating to the intrinsic qualities of cultured meat. Posts referring thereto, in particular to nutritional content, flavor, absence of chemicals, distrust of biotechnology and health concerns, have generated ambivalent cognitive, affective, and sometimes conative user reactions. The following example of a cognitive response illustrates this finding: "***Perhaps meat from animals. I bet lab-grown meat from animal cells that are sourced without significant harm to the animal will eventually be the norm***"; it was tweeted as a reply to a post highlighting the nutritional quality of cultured meat: "***Sia Invests in Pet Food Made from Cultured Meat https://t.co/hwhX6ez8HJ***."

4.1.3. Informational media frame

The information associated with initial reactions has an influence on each of the components of the Twitter users' attitude. This finding is consistent with research conducted by Mancini and Antonioli (2019) and Hwang et al. (2020). Indeed, tweets emphasizing curiosity, regulation, neophobia, and conspiracy in relation to cultured meat generate cognitive, affective, and conative reactions. A number of posts representative of the informational media frame and the comments (cognitive, affective, and conative) they elicited are summarized in Table 3.

4.1.4. Belief media frame

Our results suggest that there is a relationship between posts expressing beliefs and the cognitive, affective and conative reactions of the platform's users. A number of belief-framed posts and the responses they triggered are summarized in Table 3. Conservative philosophy, whether religious or cultural, favors traditional or outdated values (Scheid, 2008). Therefore, as a new food technology product, cultured meat stands at odds with conservative values.

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Table 3. Quotations of comments on cultured meat-related posts based on a cross-analysis of the four themes and each attitude component.

Framing	Sub-themes	Twitter user posts and comments according to media frames and attitude components		
		Cognitive	Affective	Conative
Ethics	-Sustainability -Unnaturalness	**Post**: " Lab-grown meat and insects 'good for planet and health'#LabGrownMeat #Insects #ClimateChange #Environment #Food https://t.co/7h3Dwmu63l",	**Post**: "IMO, lab-grown meat is 100% the solution to scaling up meat production while reducing carbon footprint, water and land usage. https://t.co/PIydxUqaVI"	**Post**: « je pense que des solutions comme la viande cultivée serais beaucoup plus acceptable que de mutiler des animaux... https://t.co/rjWFSdhdZy" »
		Comment: "It's sometimes used as a meat substitute because the texture is similar, you make it by washing flour, which as a concept is hilarious.	**Comment**: to be my happiest self because the overpriced locally grown and fair trade meat substitute that I buy religiously is seventy-five percent off".	**Comment**: « La diminution de la consommation de viande ""naturelle"" ne s'est pas faite sans l'aide de la viande de culture de plus en plus populaire. Les terres utilisées pour élever/nourrir les animaux d'élevage retournent progressivement à l'état sauvage. 16/" »
Intrinsic	-Nutritional value and flavor -Absence of chemicals -Health concerns -Mistrust of biotechnology	**Post**: "Sia Invests in Pet Food Made from Cultured Meat https://t.co/hwhX6ez8HJ".	**Post**: "BioTech: the marketing of synthetic meat has already begun! Vincent Held - Liliane Held-Khawam's blog https://t.co/HB3LjQTOkg.").	**Post**: "Brave new bird: Tasting chicken grown in a lab from chicken cells. https://t.co/cb7AgQ4uPX".
		Comment: "Perhaps meat from animals. I bet lab-grown meat from animal cells that are sourced without significant harm to the animal will eventually be the norm.	**Comment**: « mais ya pas le choix, j'aime la viande et j'suis pas en capacité de faire ma propre viande, donc bon. »	**Comment**: "Disturbed Earth to animals in order to fatten them up for "meat," but it we could produce enough food to feed the entire world. Also there are options, synthetic meat produced in the lab from animal protein that doesn't require any cruelty, or if so not a huge% like today in factory farming")
Informational	-Curiosity -Regulation -Neophobia -Conspiratorial ideation	**Post:** *"DYK cellculturedmeat is often produced in large vats of fetal calf serum? Or from cells known to cause cancer? Tell @USDA to institute strong regulations of cell-cultured ''meat'' before this new industry weakens them! https://t.co/rHhwAfStUW @CFSTrueFood "*	**Post:** *"Lab-grown meat firms say post-Brexit UK could be at forefront Technology, touted as low-carbon, faces long regulation process in EU but industry hopes UK will expedite approval https://t.co/54uy1OPNMR*	**Post:** "Please weigh in! Is lab grown/cell-based / cultured / meat vegan? https://t.co/5tBNKSRep7",
		Comment: "Whether it's new foods like jellyfish, edible insects and cell-based meat, or new technologies like blockchain, artificial intelligence and nanotechnology, the future promises exciting opportunities for feeding the world, according to a new report https://t.co/byZw3qcZ9c https://t.co/wWYxN2BUgM"	**Comment**: "*Redefine Meat is applying proprietary 3D printing technology, meat digital modeling, and advanced food formulations to produce animal-free meat with the appearance, texture and flavor of whole muscle meat. Video source. https://t.co/UlXFu3tM0l* "	**Comment**: "*Eating organic, clean red meat is one of the most nutritious food sources there is.*)
Belief	Morality Conservatism	**Post:** "*Cultured meat is now being mass-produced In Israel* https://t.co/pwaHOJEuS2".	**Post:** " *Cultured meat is now being mass-produced In Israel https://t.co/pwaHOJEuS2 #Halal #meat is known to be clean, #nutritious, and has several health benefits. Here are some viable reasons to consume it in your daily diet. #Order it online from #HalalBox. To Know More, Read*	**Post:** "Cultured meat is now being mass-produced In Israel https://t.co/pwaHOJEuS2".

	the complete blog here - https://t.co/3zgYaADiHC ".	
Comment: *"IDK about lab-grown meat & am only just starting to learn about nuclear, but I know a fair bit abt dense cities (towns) & they're BY FAR the most time-tested way for humans to live, crucially, to thrive. We're social critters, we don't do well in isolated burbs & farms,*	**Comment:** *"I think the sad part is imma get stretched out by an artificial dildo instead of real meat -___- that's super sad",*	**Comment:** *"If it tastes as good as milk, and is just as nutritious, I'd try it. Especially once the cost comes down. I'm all for synthetic meat, and eggs, and dairy, if we can really make stuff that's just as nutritious and tasty as the real thing.*

4.2. Descriptive analysis

The respondent profile corresponds to all Twitter users who posted or commented on at least one tweet about Canadian grown meat in the period from January 1 to September 30, 2022. The samples of English- and French-language posts and comments were identified and extracted separately. The English-language sample corresponds to 89.91% of posts and 92% of comments. On average, each post was retweeted 5.383 times and received 3.38 direct replies and 8.73 likes. These results are indicative of the hype surrounding the topic of cultured meat on Twitter and the that it arouses. Furthermore, 58.28% of all comments influenced the cognitive component of consumer attitudes while dictionary keywords associated with the affective component triggered 25.31% of consumer reactions. Approximately 25.8% of Twitter users' reactions to cultured meat were related to purchasing behavior. However, two or three different attitude components can be associated with a single comment. In addition, 38% of posts conform to the ethical media frame and 46% of them to the intrinsic media frame. Although they have not yet consumed cultured meat, consumers therefore seem to be more concerned about the intrinsic and ethical factors of this innovation. Informational and belief media frames account for 37% and 24% of posts respectively. Some posts may be representative of more than two media frames at the same time, while others are free of media framing.

The samples of English- and French-language posts and comments were identified and extracted separately. The English-language sample corresponds to 89.91% of posts and 92% of comments. On average, each post was retweeted 5.383 times and received 3.38 direct replies and 8.73 likes. These results are indicative of the hype surrounding the topic of cultured meat on Twitter and the that it arouses. Furthermore, 58.28% of all comments influenced the cognitive component of consumer attitudes while dictionary keywords associated with the affective component triggered 25.31% of consumer reactions. Approximately 25.8% of Twitter users' reactions to cultured meat were related to purchasing behavior. However, two or three different attitude components can be associated with a single comment.

4.3. MANOVA data analysis

A multivariate analysis of variance (MANOVA, see Table 4) was used because there are several dependent and independent variables (Haase and Ellis, 1987), and because the former are scaled variables while the latter are categorical variables.

Table 4. Results of the multivariate analysis of variance (MANOVA).

Multivariate tests[a]							
Effect		Value	F	Hypothesis ddl	Error ddl	Sig.	η2
Ethical framing	Wilks' lambda	.999	8.945[b]	3.000	24271.000	<.001	.001
Intrinsic framing	Wilks' lambda	1.000	3.346[b]	3.000	24271.000	.018	.000
Informational framing	Wilks' lambda	.996	34.046[b]	3.000	24271.000	<.001	.004
Belief framing	Wilks' lambda	.999	10.772[b]	3.000	24271.000	<.001	.001

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The results of the MANOVA analysis show that all multivariate difference measures (Wilks' lambda) are significant ($p < 0.05$). Therefore, all dependent variables (cognitive, affective and conative components) vary across ethical, intrinsic, informational and belief media frames. This confirms that comments relating to cultured meat consumption vary according to the communication perspective of the main post. Consequently, Hypotheses 1 to 4 are verified.

4.3.1. Ethical framing

The analysis of the "ethical" media frame of cultured meat confirmed that there are differences of attitude in Twitter users' comments. The multivariate result was significant for the ethical media frame, Wilks' Lambda = 0.999, F = 8.945, df = 3, p = 0.001, indicating a difference in cognitive and affective components between ethically framed posts and posts having no ethical media framing. As a result of this difference, Hypothesis 1 is confirmed. Univariate F-tests show that there is a significant difference in cognitive (p = 0.011) and conative (p = 0.001) components between ethically framed posts and posts that are free of media framing (see Table 5).

Table 5. Multivariate analysis of variance of the different types of media framing.

Tests for inter-topic effects						
Source	Dependent variable	Sum of Type III squares	df	Medium square	F	Sig.
Ethical framing	cognitive_comp_att	1.543	1	1.543	6.491	.011
	affective_comp_att	.248	1	.248	1.406	.236
	conative_comp_att	3.810	1	3.810	21.329	<.001
Intrinsic framing	cognitive_comp_att	.672	1	.672	2.829	.093
	affective_comp_att	1.178	1	1.178	6.688	.010
	conative_comp_att	.162	1	.162	.906	.341
Informational framing	cognitive_comp_att	10.339	1	10.339	43.504	<.001
	affective_comp_att	.160	1	.160	.909	.341
	conative_comp_att	12.027	1	12.027	67.322	<.001
Belief framing	cognitive_comp_att	.408	1	.408	1.716	.190
	affective_comp_att	1.755	1	1.755	9.959	.002
	conative_comp_att	3.982	1	3.982	22.291	<.001
a. R-two = .007 (adjusted R-two = .007)						
b. R-two = .005 (adjusted R-two = .004)						
c. R-two = .007 (adjusted R-two = .007)						

Contrast results (K matrix) reveal that Twitter users' comments (cognitive, affective and conative) on posts with "ethical" media frames differ depending on whether their response is cognitive (0.022, p=0.011) or conative (0.035, p=0.001) (Partial eta squared= 0.001).

4.3.2. Intrinsic media frame

Analysis of the multivariate results for posts having an 'intrinsic' media frame and those with no media framing shows that there is a significant difference in user responses (Wilks' Lambda = 1; F = 3.346; df = 3, p = 0.018). Therefore, these results indicate that the means of cognitive, affective and conative attitude components generated by comments are different for posts having an intrinsic media frame and posts that are free of media framing. This result confirms Hypothesis 2 which posits that the intrinsic media frame influences each of the components of attitude. Univariate F-tests showed that there was a significant difference in the affective component (p=0.010) between posts having an intrinsic media frame and those with no framing.

Contrast results (K matrix) reveal that Twitter users who commented on tweets having an intrinsic media frame expressed a larger number of affective reactions (0.019, p=0.010).

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4.3.3. Informational media frame

Regarding the comparison between posts representative of informational media framing and posts having no media framing, the multivariate results were significant, Wilks' Lambda = .996, F = 34.046, df = 3, p = .001, indicating a difference between the cognitive, affective, and conative attitude components for the informational media frame, and hence support Hypothesis 3.

The univariate F-tests showed a significant difference between posts having an informational media frame and posts having no media framing for the cognitive (p=0.001) and conative (p=0.001) attitude components. This indicates a difference in cognitive and conative comments to posts containing informational determinants of cultured meat.

The contrast results (K matrix) reveal that Twitter users who commented on posts having an informational media frame expressed more cognitive reactions (0.057, p=0.001) and conative reactions (0.061, p=0.001), (Partial eta squared=0.004). We can therefore draw the conclusion that intrinsic media framing influences consumer attitudes, in particular the cognitive and conative components thereof.

4.3.4. Belief media frame

There is a difference between Twitter posts exhibiting a belief media framing and posts having no media framing as regards the cognitive, affective and conative components of attitude. Table 4 shows that these results are significant, Wilks' Lambda = 0.999, F = 10.772, df = 3, p = 0.001, indicating a difference between the two belief media frame groups (framed and non-framed). Univariate F-tests indicated a significant difference between posts conveying belief media framing and posts characterized by an absence of media framing for the affective (p=0.002) and conative (p=0.001) components of attitude.

Contrast results (K matrix) reveal that Twitter users responding to posts defined by a belief media frame expressed significantly more affective comments (0.023, p=0.002) and conative comments (0.035, p = 0.001) than users responding to posts characterized by other media frames (Partial eta squared= 0.001). We can infer from these results that the belief media frame exerts an influence on consumer attitudes, particularly on the affective and conative components thereof, thus supporting Hypothesis 4.

In fact, all dependent variables (cognitive, affective, and conative components of attitude) vary according to the type of media framing. This confirms all four research hypotheses.

5. Discussion

Comparative analysis of the means for each media frame (Figure 4) shows that posts with an informational frame (curiosity, food neophobia, regulation, and conspiratorial ideation around cultured meat) generate Twitter user comments with a higher mean (0.63) for the cognitive component of attitude. These results are consistent with those reported by Siddiqui et al. (2022) who argue that the inhibiting barriers mentioned by consumers, including lack of naturalness, safety, and trust associated with regulation, and neophobia, are used as marketing strategies to directly address these concerns (Hamlin, McNeill et Sim, 2022 et Siddiqui et al., 2022). In contrast, technological framing has been found to elicit negative associations and significantly reduce behavioral intentions to consume cultured meat (Bryant et Dillard, 2019a; Nguyen et al., 2022).

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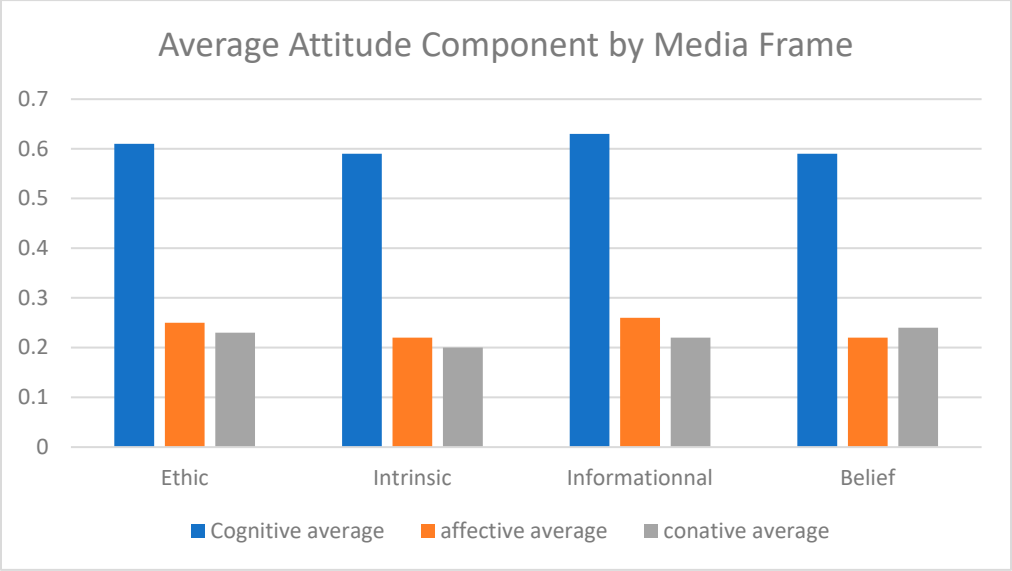

Figure 4. Attitude components according to media frame.

The results regarding the affective component of attitude show that posts characterized by informational (0.26) and ethical (0.25) media frames generate the largest number of affective reactions to cultured meat. This is concurrent with a number of other studies suggesting that it is the informational determinants, i.e., initial information received by consumers, that influence their cognition and therefore knowledge about cultured meat (Mancini and Antonelli, 2019, 2020; Hwang et al., 2020; Kouarfaté et Durif, 2023). Ethical media framing, emphasizing environmental and animal welfare benefits, can induce positive feelings and stimulate consumer intentions to buy insects and cultured meat (Bryant and Dillard, 2019a; Nguyen et al., 2022). There is also evidence that advertisements promoting healthy and environmentally friendly food consumption can prompt a behavioral shift toward sustainable diets (Lazzarini et al., 2016; Nguyen et al., 2022). Other recent studies have suggested partly similar results, confirming that a sustainability-based word association exercise revealed that consumer response to cultured meat was dominated by affective rather than cognitive factors (Hamlin, McNeill, Sim, 2022, Kouarfaté and Durif, 2023). However, studies among meat producers have shown that beliefs regarding the environmental friendliness associated with cultured meat are not associated with willingness to consume such meat (Cornelissen and Piqueras-Fiszman, 2023). However, these results are not contradictory to those of our study which suggest that the conative component of the attitude is much more marked by the factors of moral and religious beliefs while the affective component is more marked by the ethical factors associated with the sustainability and the well-being of humans and animals (Kouarfaté and Durif, 2023). Thus, based on the results of the work of Lin-Hi et al. (2023), opinions regarding the environmental friendliness of meat alternatives other than cultured meat do not appear to play an important role in determining consumers' behavioral intentions. This is not surprising given recent research showing that health is the main motivation for adopting a low-meat diet (Malek & Umberger, 2021b, Lin-Hi et al., 2023).

However, there are other results in the literature regarding the impacts of ethical factors on consumer attitudes. Indeed, several recent studies, on “green consumption values” describe the impact of an individual's personal ecological and environmental values on their consumption and purchasing behavior (Kusch, S.; Fiebelkorn, 2019; Nobre, 2022; Lin-Hi et al., 2023), strong environmental concern has been found to contribute to sustainable consumption behavior among German consumers (Gorissen, K.; Weijters, 2016; Dupont, Harms and Fiebelkorn, 2022). This difference could be explained by the socio-cultural specificities (Wang and Scrimgeour, 2023, and Liu et al, 2023) of the respondents and their level of prosocial engagement (Pakseresht, Kaliji, and Canavari, 2022). For example, several other studies have also shown that Western consumers are not willing to reduce their meat consumption (Tobler, Visschers, and Siegrist, 2011; Lin-Hi et al., 2023),

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but are increasingly concerned about the implications of meat for sustainability and animal welfare (Lin-Hi et al., 2023, Arango, Chaudhury and Septianto, 2023). This type of consumer is likely to adopt cultured meat over other meat alternatives given the resemblance that exists between cultured meat and conventional meat in terms of intrinsic attributes (Rombach et al., 2022). Analysis of the conative component of attitude expressed in comments shows that posts with a belief media frame generate the largest number of behavioral reactions (conative mean = 0.24). Although most studies suggest that beliefs influence meat consumption behavior in general and cultured meat consumption in particular, none of them had investigated the level of impact beliefs have on consumer behavior. Moreover, it has been found that there is less evidence on the effectiveness of interventions targeting beliefs and sociocultural factors such as social norms (Kwasny et al., 2022). Our study results are noteworthy for showing that cultured meat consumption is also strongly dependent on the extent of consumers' religious and cultural beliefs, in particular morality and religious and cultural conservatism. In this regard, they are in line with the findings reported by Bryant et al. (2019b) and Kouarfaté et Durif (2023).

Furthermore, a descriptive analysis of the results shows that Twitter posts combining the intrinsic, informational, and belief determinants trigger that the highest averages (cognitive =0.71 and overall attitude= 0.43) of Twitter user reactions. However, it is the joint effect of the intrinsic and belief media frames in Twitter posts that provoke the highest averages of affective replies (0.30). As for the highest conative response averages (0.39), they are the result of combined ethical, informational, and belief determinants. It can be inferred from this finding that identifying a dominant group of determinants per attitude component (cognitive, affective, and conative) and then combining these three determinants in a message or post would trigger a stronger overall attitude in consumers. This is consistent with the findings of the study by Kouarfaté and Durif (2023).

6. Limitations

It should be noted that this research was based on conversations on the social media platform Twitter, where posts are limited to 280 characters, forcing individuals and organizations to use a limited vocabulary. However, this constraint compels Twitter users to choose their vocabulary with care and constitutes an advantage insofar as we can assume that they use precise wording, hence the reliability of the keyword dictionary we have put together for the purpose of analysis (Saleh et al., 2021 and Chicoine et al., 2021).

Another limitation is related to the nature of the tweet sample and the conversion of variables based on the keyword dictionary. Although the keyword list is derived from the measurement scales identified in the literature, these words may not capture all the variables to the extent that Twitter users also employ analogous words. Nevertheless, we performed a preliminary analysis whereby we identified these synonyms in the tweet sample. In addition, this method has been used by several other authors (e.g., Tao et al., 2020 and Chicoine et al., 2021). The study conducted by Chicoine et al. (2021) demonstrated the potential of using social media and the lexicon-based approach in research addressing a natural phenomenon, such as the textual traces of social media users. According to them (p. 14), "The transformation of the frequency of words into data makes it possible to carry out statistical analyses, in particular, to see the divergences in valuation or image between the stakeholders of an industry, as is the case of the local food system."

Finally, we were not able to ascertain whether each comment was linked to a regular account or an automated, i.e., bot account (Tang et al., 2021). According to Broniatowski et al. (2018), bots are automated accounts that can be designed to disseminate misinformation and content on a topic. However, in their study, Yuan et al. (2019) found that only 1.45% of the accounts involved in vaccine discourse on social media were bots.

7. Contributions and research avenues

7.1. Practical and managerial contribution:

The results of this research revealed that the four media frames do not have the same impact on all attitude components, which confirms the existence of a group of "dominant" determinants (see Kouarfaté et Durif, 2023) for each component of attitude. In the practical and management field, this opens up the prospect of effective communication techniques for marketing and communication specialists, insofar as our findings provide a better understanding of the determinants that they will have to focus on in order to increase the effectiveness of their advertising message. In fact, this concurs with the recommendations put forward by Goodwin and Shoulders (2013), Dilworth and McGregor (2015), and Bryant and Dillard (2019a) in relation to the combination of determinants and or images chosen for the purpose of product messaging, as well as with recommendations of Kouarfaté and Durif (2023), particularly with regard to the application of the simultaneous actions theory of dominant determinants for each attitude component in an advertising message.

At the social level, this study has shown the importance of the informational frame on Twitter users' cognition and attachment regarding cultured meat, particularly in relation to the issue of regulation. Other studies have also shown that the level of acceptability of cultured meat is correlated with the trust generated by product manufacturing and consumption-related regulations (Fernandes et al., 2022; Kwasny et al., 2022). Therefore, one of this study's contributions is to bring to the forefront the importance of regulation in the cultured meat sector and to bring to the attention of government and administrative authorities the need for legislation and market regulation in order to increase trust in start-up producers.

7.2. Theoretical contributions and research avenues

Scientifically and methodologically, this study contributes to filling a research gap in the emerging field of food technology, highlighted by Goodwin and Shoulders (2013) and Dilworth and McGregor (2015), namely the media framing of cultured meat across countries and media types. For example, the study provides researchers with a mechanism for understanding how to use the determinants of meat alternatives in general in student and public education campaigns. Another contribution of this study is highlighting the importance of belief determinants (Hamdan et al., 2018) in the formation of behavioral attitudes (conative component). It opens up avenues for promising research such as assessing the impact of culture and/or religion on cultured meat purchasing and consumption behavior.

Moreover, conducting a similar study using data from another social media platform such as Facebook would also provide valuable insights, as would a comparative study of media framing on Twitter and Facebook and their respective impacts on consumer attitudes toward cultured meat. According to a number of researchers, it is likely that social media users who comment on posts related to specific issues such as vaccines (Puri et al., 2020; Tang et al., 2021) and cultured meat, are very ill-disposed to these products. In this vein, another line of research would be to specifically study the extent of negative comments about cultured meat on social media. Finally, other media framing on the issue of price, packaging and/or stakeholders involved in the production and marketing of cultured meat could be the subject of future studies.

8. Conclusion

This study examined the impact of Twitter post media framing on user comments and reactions regarding cultured meat. It identified and evaluated several significant differences in consumer attitude components based on 23 020 Twitter posts and 38 531 comments. Using a keyword dictionary both for the determinants of cultured meat and the components of consumer attitudes, this study showed that media-framed Twitter posts had a greater influence on consumer attitudes than posts that were not media-framed. Moreover, this study showed that media-framed posts influenced consumer attitudes more than did non-media-framed posts. Although the results indicate that the

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different types of media framing (ethical, intrinsic, informational, and belief) do not exert the same influence on each attitude component, they suggest that posts combining the ethical, intrinsic, and informational media frames have a greater impact on the acceptability of cultured meat and that the belief frame is equally important, particularly for the behavioral component. Relevant implications can be drawn for authorities and business on the use of differentiated education and marketing strategies. Thus, this study made it possible to fill the existing gaps in the literature by answering the research questions posed as to whether each publication about cultured meat on Twitter generates different consumer attitudes depending on the media frame, and whether these differences impact each component of attitude as well as purchasing and consumption behavior. It therefore made it possible to identify the best communication techniques (media framing) that have the most influence on each of the components of online consumer attitudes (Twitter).

Appendix A

Table A1. Data collection and cleaning.

		Type of tweet						
	Total tweets extracted	Quoted tweets	Repy tweets	Retweets	Duplicates	Main tweets selected	Quoted tweets selected	Retweets and reply tweets selected
English	153 727	3 249	27 273	102 686	96 681	7 611	1 222	48 213
French	12 023	331	2 509	8 247	7 517	239	137	4 129
Total	165 750	3 580	29 782	110 933	104 198	7 850	1 359	52 342

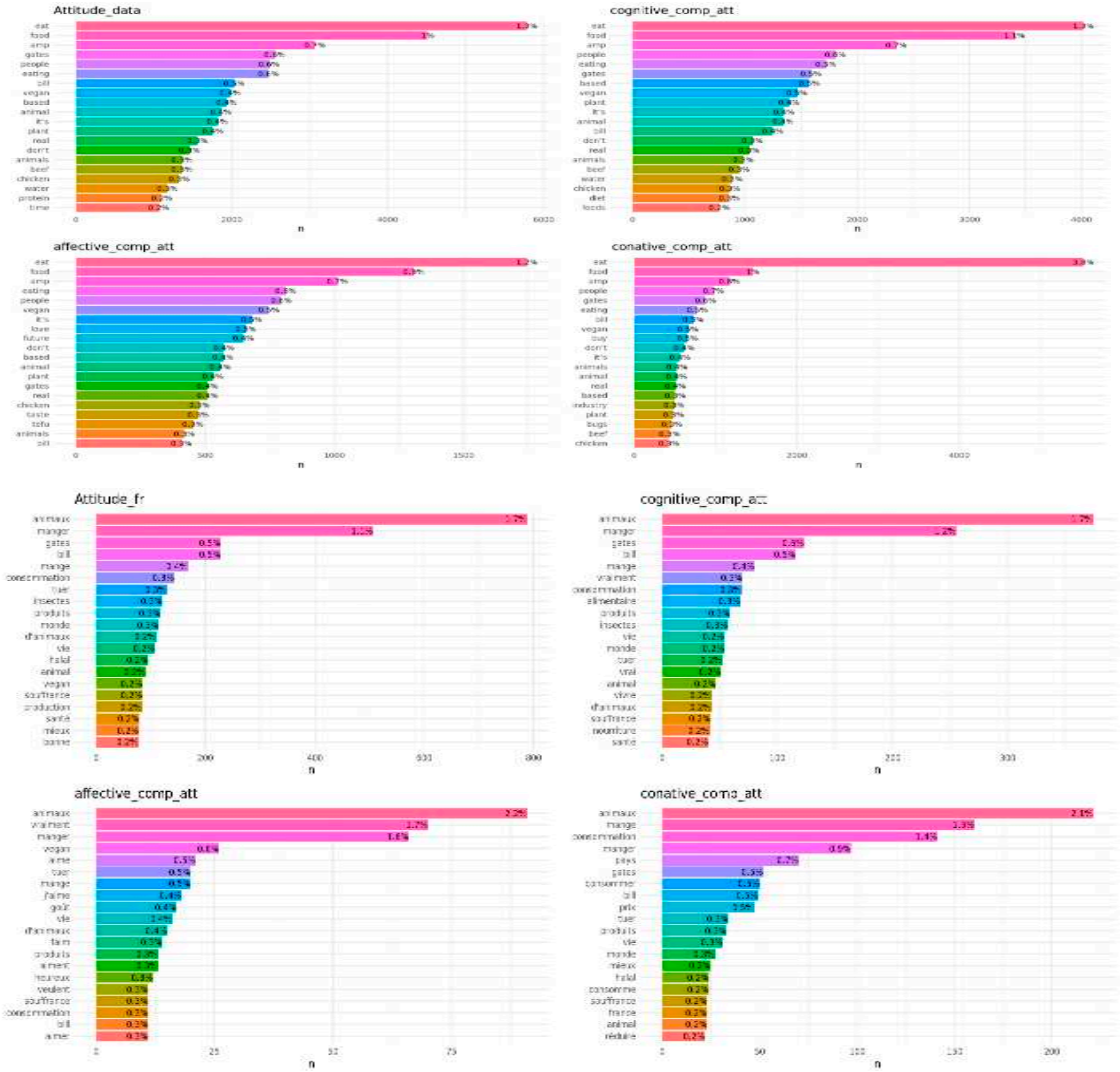

Figure A2. Attitudes expressed in Twitter user comments (English and French).

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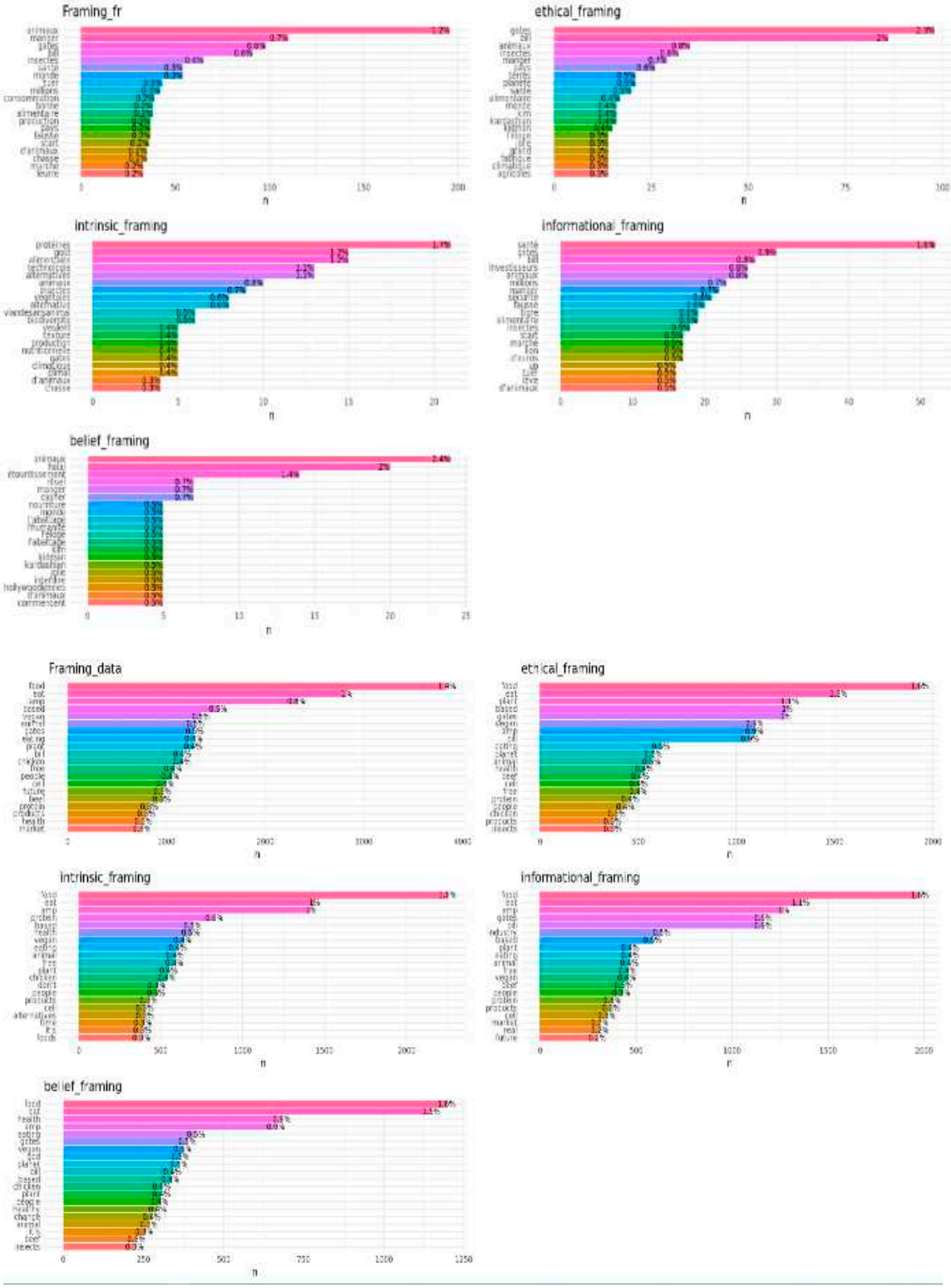

Figure A3. Media framing of English- and French-language Twitter posts.

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Table A2. Keyword dictionary derived from measurement items to capture the variables.

Variables	Keyword dictionary derived from measurement items drawn from the literature	Keyword dictionary of frequently occurring analogous words
Dependent	**MEASUREMENT ITEMS**	
Cognitive component (Crites et al., 1994), α = 0.94	Useful / useless, Sensible/ senseless, Sure/ unsure, Beneficial/harmful, Worth/ worthless, perfect / not perfect, healthy/dangerous	Diet, safety, bad, know, safe, curious, curiosity, aware, information, propaganda, taught, diseases, fake, true
	Utile/ inutile, sensée/ insensée, sûre/ non sure, bienfaisant/ nuisible, valeur/ sans valeur, parfaite/ non parfait, saine/ dangereuse	wrong
	MEASUREMENT ITEMS	
Affective component (Crites et al., 1994), α = 0.93	Like / hated, delicious / disgusting, soothing / annoying, cheerful/ sickening, relaxed/ nervous, accept/ refuse, happy / sad, festive/ boring	Love, agree, enjoy, fun, juicy, sentient, glad, dirty
	Aime / détesté, délicieuse/ dégoûtant, festive/ ennuyeuse, apaisante/ énervant, enthousiaste/ écœurant, détendu/ énervé, accepter/ refuser, joyeux/ triste	
	MEASUREMENT ITEMS	
Conative component (Weinrich et al., 2020, adapted from Wilks and Phillips, 2017, and Bryant and Dillard, 2019a), α=0.894	try/give up, eating/vomiting, buy/don't buy, recommend, Dissuade, discourage	Discount, purchase, paid, shopping, testing, prize, consumed, pay, bought
	Essayer/ renoncer, manger/ vomir, acheter/ne pas acheter, recommander/déconseiller, dissuader	
Independent	**MEASUREMENT ITEMS**	
Ethical framing		
- Sustainability (Adapted from Weinrich et al., 2020), α=0.716)	Animal welfare or vegetarian / animal abuse, ethical / natural, protects/ against the environment, disrespectful to nature, respectful of the environment, climate change	Plant, diet, green, land, emission, destroy, cruelty, methane, deforestation, pollution, carbon, suffer, energy, gas, slaughtering
	Bien-être animal/ maltraitance des animaux, éthique / naturel, protège/ contre l'environnement, irrespectueuse envers la nature, respectueuse de l'environnement, changement climatique	
	MEASUREMENT ITEMS	
- Unnaturalness (Adapted from Hwang et al., 2020), α=0.829	Unnatural cells, unnatural, against nature	Wild, gmo
	Cellules non naturelles, non naturel, contre nature	
Intrinsic framing	**MEASUREMENT ITEMS**	
- Nutritional value and flavour (Adapted from Almli et al., 2013 and Van Wezemael et al., 2012), α=0.89	Heathy, contaminated, nutrient, nutritious, good for health, healthy eating, taste	Protein, foods, alternative, texture, nutrition, vitamin, flavor
	Sain, contaminé, nutriment, nutritifs, bon pour la santé, alimentation saine, goût	
	MEASUREMENT ITEMS	
- Absence of chemicals (Adapted from Hwang et al., 2020), α=0.896	Absence of antibiotics, Sanitary condition, absence of hormones.	Gluten, clean meat, clean, chemical, safety, food hygiene
	Absence d'antibiotique, conditions d'hygiène, absence d'hormones.	
	MEASUREMENT ITEMS	
- Health concerns (Adapted from Verbeke, 2015 and the general health interest scale developed by Roininen, Lähteenmäki and Tuorila, 1999), α= 0.76	Disgusting, impure, unsanitary	Medical, contamination, delicious, health, sick, bacteria, cancer, toxic
	Dégueulasse, impur, insalubre	
	MEASUREMENT ITEMS	
- Distrust of biotechnology (Adapted from Hwang et al., 2020), α=0.883	Technology, gene technology, fear of new technologies	Biotech, tech, startup, science, gmo, labora, meatech
	Technologie, technologie génétique, peur des nouvelles technologies	
Informational framing	**MEASUREMENT ITEMS**	
	Love the novelty, to know, know what I eat	Try, test, innovation

- Curiosity (Adapted from Hwang et al., 2020), α=0.850	Aime la nouveauté, savoir, savoir ce que je mange	
	MEASUREMENT ITEMS	
- Regulation (items are associated with those of distrust) (Raven et al., 1998; Bryant and Dillard, 2019a; Marth et al, 2020), α=0.83	Regulation, control, sanctioning non-compliance	Processed, FDA, drugs, corruption, freedom, USDA, DNA, illegal
	Réglementation, contrôle, sanctionner le non-respect	
	MEASUREMENT ITEMS	
- Neophobia (Adapted from Hwang et al., 2020), α=0.887	Lack of confidence, fear of novelty, I fear,	
	Manque confiance, peur de la nouveauté, je crains	
	MEASUREMENT ITEMS	
- Conspiratorial ideation (adapted from Wilks et al., 2019); α=0.81.	Powerful Group, New World Order, conspiracy, conspiracy, complicity,	Bill, billgates, rich
	Groupe puissant, Nouvel Ordre Mondial, conspiration, complot, complicité	
Belief framing	**MEASUREMENT ITEMS**	
- Morality (measured by attitudes of perceived necessity and goodness) (Bryant et al., 2019b). (Moral Foundations Questionnaire, MFQ; Graham et al., 2009, 2011; Métayer and Pahlavan, 2014), α=0.79	Good actions, fair, loyal, respecting decisions, pure actions	God, halal, religious, moral
	Bonnes actions, équitables, loyal, respecter les décisions, actions pures	
- Conservatism (Hornsey et al., 2018, Wilks et al., 2019), α=0.90	Changement, habituel, conservatisme, libéral	
	Change, usual, conservatism, liberal	

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