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COMPREENDENDO AS REPRESENTAÇÕES SOCIAIS DO CONSUMIDOR SOBRE A CARNE CULTIVADA EM LABORATÓRIO: UMA ANÁLISE DE SENTIMENTO NO FACEBOOK

COMPREHENDING CONSUMER SOCIAL REPRESENTATIONS OF LABORATORY GROWN MEAT: A SENTIMENT ANALYSIS ON FACEBOOK

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Resumo

Este estudo explora o intrigante domínio das percepções públicas em relação à carne cultivada, que é desenvolvida em laboratório a partir de células extraídas de animais, evitando assim o abate animal. Ao empregar a análise de sentimentos em postagens do Facebook, a pesquisa fornece uma visão abrangente dos sentimentos do público. Notavelmente, as descobertas revelam uma atitude positiva dominante em relação à carne cultivada em laboratório, destacando particularmente seus potenciais benefícios ambientais e o potencial de reduzir o sofrimento animal. No entanto, um número considerável de respostas expressou preocupações,

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abordando aspectos como implicações para a saúde, considerações éticas e possíveis riscos imprevistos associados a essa tecnologia alimentar emergente. Entre a gama de opiniões, os comentários mais otimistas expressaram uma esperança fervorosa de que tais avanços pudessem levar à melhoria da qualidade da carne e, ao mesmo tempo, reduzir a demanda por carne de origem convencional. Para obter esses insights, o estudo analisou meticulosamente várias métricas, como reações, comentários e compartilhamentos nas postagens. Essa abordagem permitiu uma compreensão mais holística da profundidade e amplitude do interesse e sentimento do público sobre o tema. Em essência, esta pesquisa não só oferece um panorama oportuno e esclarecedor das respostas sociais à carne cultivada em laboratório, mas também desempenha um papel crucial no aprofundamento das discussões acadêmicas e sociais sobre fontes alternativas e sustentáveis de proteína.

Palavras-chave: Carne cultivada em laboratório; Análise de sentimentos; Mídia social; Percepção pública

Abstract

This study explores the intriguing domain of public perceptions regarding cultured meat, which is developed in a laboratory from cells extracted from animals, thereby avoiding animal slaughter. By employing sentiment analysis on Facebook posts, the research provides a comprehensive view of public sentiments. Notably, the findings unveil a dominant positive attitude towards lab-grown meat, particularly highlighting its prospective environmental benefits and the potential to reduce animal suffering. Yet, a considerable number of responses voiced concerns, touching upon aspects like health implications, ethical considerations and possible unforeseen risks associated with this emerging food technology. Among the array of opinions, the most optimistic comments expressed a fervent hope that such advancements might lead to enhanced meat quality while simultaneously reducing the demand for conventionally sourced meat. To achieve these insights, the study meticulously analyzed various metrics, such as reactions, comments and shares on the posts. This approach allowed for a more holistic understanding of the depth and breadth of public interest and sentiment on the topic. In essence, this research not only offers a timely and insightful snapshot of societal responses to lab-grown meat but also plays a crucial role in deepening academic and societal discussions about alternative and sustainable protein sources.

Keywords: Lab-grown Meat; Sentiment Analysis; Social Media; Public Perception.

1. Introduction

There are global appeals to reduce the environmental trace, mitigate food-related public health concerns and ensure sustainable food systems. In this context, reducing the world's consumption of animal-origin meat is one of the main solutions to these problems (Willet *et al*., 2019; Begho & Zhu, 2023).

Despite the fact aforementioned, projections indicate that meat consumption globally will increase in the decades to come due to world population growth estimated at 70% by 2050, which may impact the global environment in the future and generate the need for more efficient protein alternatives (Siddiqui *et al*., 2022).

Therefore, viable options to achieve sufficiency and sustainable protein production in face of increasing global and climate variability have been suggested as foods produced with new ingredients and/or by advanced technologies (Benke & Tomkins, 2017; Tian *et al*., 2016; Smetana *et al*., 2023).

One of these options is cultured meat, also known as in-vitro, synthetic or clean meat (Mancini & Antonioli, 2019; Baum, Verbeke & Steur, 2022; Siddiqui *et al*., 2022). In this article, the term “cultured meat” is used since according to Friedrich (2019) it is the most appropriate for neutrality, comprehensibility and consumer appeal.

The cultured meat (which can be bovine, swine or chicken) is produced from the culture, in a controlled environment, of muscle cells from living animals, so its production process takes place entirely in the laboratory (Yada, 2017). However, cultured meat represents a disruptive innovation (Small, 2017). This type of innovation introduces concepts and attributes that differ significantly from what traditional customers have historically valued (Bower & Christensen, 1995).

Consequently, cultured meat may encounter barriers, primarily due to consumer apprehension towards new foods and technologies (Bieberstein *et al*., 2013; Sharma *et al*., 2015). This is in line with the observation made by Lin *et al*. (2019, p. 10), who stated, "A successful adoption of biotechnology for animal agriculture will depend on a thorough understanding of consumer preferences."

Although laboratory-grown meat is not yet available to the public, the imminence of its commercialization has driven consumers to form and disseminate a body of shared knowledge. This process of collective construction of knowledge, which falls within the sphere of common sense, is a way in which consumers can deal with the uncertainty and novelty associated with

topics that are still unknown, as is the case with cultured meat (Huotilainen *et al*., 2006; Pindado & Barrena, 2021).

This type of knowledge, which includes a practical view of a common trend and is developed through sociocognitive processes, is what the literature has called social representations (Howarth, 2006; Pindado & Barrena, 2021).

In the food context, the Theory of Social Representations (SRT) helps in the construction of meanings related to food, which are inherent to people or social groups and aim to transform what is disturbing and unknown into something familiar and known (Bäckström *et al*., 2003).

Therefore, social representations, which are social cognitions that attribute meaning to social reality, manifest an assimilation, be it positive or negative, about a certain object or theme. This assimilation can directly affect attitudes, which are individual cognitions concerning that object (Howarth, 2006; Moscovici, 2001). In turn, attitudes have the power to considerably influence consumer acceptance of the product (Ploenkutham *et al.,* 2018).

Research by Silva and Cunha (2023) identified that the most frequent social representation associated with cultured meat was 'artificial.' Additionally, most frequently mentioned representations have a strong relation to the production method of cultured meat (artificial, innovation, laboratory, technology, science, and transgenic), as well as consumption aspects (alternative, beef, meat, veganism, protein, and vegetarian), and others with hedonic and sentiment characteristics like 'strange' and 'disgust.'

Based on the literature review presented and considering the relevance of social representation to understand consumers' perceptions, the objective of this article is: Investigate consumer perceptions of laboratory-grown chicken meat produced by the startup Eat Just, Inc. through the analysis of sentiments of comments and reactions in a notice, published on Facebook about the release of the sale of this product by the Food Agency of Singapore in December 2020. Specifically, the research sought to identify the predominant feelings and the main themes discussed by users to understand perceptions, concerns and possible barriers to acceptance of this new food product.

This research contributes significantly to the ongoing discourse in the field of food sustainability, public health, and environmental impact, emphasizing the role of cultured meat as a sustainable alternative to traditional meat consumption. It addresses a critical gap in understanding consumer perceptions of laboratory-grown meat, specifically chicken meat produced by Eat Just, Inc., an area that remains underexplored despite its growing relevance.

The focus on social representations and sentiment analysis of consumer reactions to the sale of this product in Singapore provides a novel approach to gauging public opinion and acceptance. This research is original in its integration of social representation theory with consumer sentiment analysis, offering insights into how consumers assimilate and respond to innovative food technologies. The findings have implications for marketers, policymakers, and the cultured meat industry, informing strategies to enhance consumer acceptance and address barriers.

2. Theoretical Framework

2.1 Cultured Meat

The production of synthetic foods is undergoing a revolution, as noted by Small (2017). These foods are produced in laboratories, without the need for farms and with minimal use of animals. Cultivated meat, also known as cultured meat, is genuine animal meat that is produced by cultivating animal cells directly.

This innovation involves the extraction of stem cells from animals, their cultivation in bioreactors with a nutrient-rich medium, and the induction of differentiation into muscle, fat, and connective tissues to form the meat (GFI, 2023). This process, which takes 2 to 8 weeks depending on the type of meat, is also being explored for creating milk and other animal products.

Initiated by Dutch scientist Mark Post in 2013, the field of cultured meat has rapidly expanded. By the end of 2022, more than 150 companies worldwide were involved, driven by significant investments and advancements in related scientific fields such as cell culture and tissue engineering. This technique creates meat with sensory and nutritional profiles similar to conventional meat, using the same cell types structured like animal tissues.

Post *et al.* (2020), Tuomisto (2019), and Smetana *et al.* (2023) point out that cultured meat is an interesting alternative, as its production causes less environmental and public health damage, in addition to avoiding the slaughter of animals. Compared to traditional meat production, cultured meat is considered healthier, disease-free, environmentally friendly, and safe for consumers (Arshad *et al.,* 2017; Jairath *et al.,* 2021).

However, research by Rolland, Markus, and Post (2020) indicates that cultured meat is characterized by a lack of consolidated scientific knowledge, and consumers respond to this uncertainty with risk perceptions, analogies to other risks, and constructions of what they consider unnatural. This perception of risk and consumer response reflect uncertainty regarding

cultured meat, highlighting the need for greater consolidation of scientific knowledge and communication about the product.

Additionally, Laviolette and Godin (2024) discuss consumer reception of representations associated with alternative proteins on Instagram. The study highlights that environmental protection themes frequently received positive reactions, helping consumers understand and act sustainably. However, some expressed doubts about the financial motives behind these messages.

Content about animal treatment elicited strong emotional responses, particularly among vegans and vegetarians, although sensationalist posts sometimes undermined the message and did not lead to behavioral changes among flexitarians and omnivores.

In summary, cultured meat emerges as a promising and sustainable alternative to traditional meat, with significant benefits for public health and the environment. However, consumer acceptance still faces challenges, mainly due to a lack of consolidated knowledge and associated risk perceptions. Understanding these perceptions and clearly communicating the benefits of cultured meat are crucial to overcoming barriers and promoting the adoption of this innovation.

2.2 Social Representations in Food

The need to understand both the biological and social aspects of humans is central to food studies (Fischler, 1988). The human and social sciences have deeply engaged in the domain of food, investigating the social construction of beliefs and representations about food and its consumption (Douglas, 1966, 1979), taste (Bourdieu, 1984; Grignon & Grignon, 1980), and culinary art (Goody, 1982). However, fundamental issues such as the social construction of collective beliefs and representations about food remain underexplored (Fischler, 1988).

SRT provides a theoretical and methodological framework to address these issues. Social representations are structured sets of ideas, opinions, knowledge, and beliefs shared by a social group about specific objects (Rateau *et al.,* 2011). These representations reflect what people believe they know about objects, situations, and groups, influencing behaviors and practices (Moscovici, 2001).

Food studies frequently use SRT to investigate the social construction of food-related beliefs and their consequences for individual and group identities (Bäckström, Pirttilä-Backman, & Tuorila, 2004; Lo Monaco & Guimelli, 2011). For example, the popularization of foods such as açaí and quinoa can be explained by anchoring these foods to familiar concepts of health and well-being, facilitating their acceptance and consumption. Advertising campaigns

use images and metaphors to objectify these concepts, making them accessible and comprehensible to the public.

Anchoring refers to linking new concepts to familiar references, while objectification transforms abstract concepts into something concrete and understandable. These processes are fundamental for understanding how new food trends, like cultured meat, are accepted and incorporated into daily life. The seamless integration of SRT into the study of food consumption highlights the importance of comprehending both the scientific and social dimensions to foster greater acceptance and adoption of innovative food technologies.

3. Methodology

3.1 Data Gathering

The analysis was conducted on posts written in English and published on the Facebook pages of several news portals (BBC News, CNN, The New York Times, MSN, The Guardian, Reuters, Bloomberg, and Fox Business). All the posts addressed a December 2020 event: the Singapore Food Agency's approval of the sale of lab-grown chicken meat by San Francisco-based startup Eat Just, Inc. At the time of data collection, the publications had accumulated 20,294 reactions, 6,142 comments and 3,315 shares, indicating the public's interest in the topic.

The selection of Eat Just, Inc. for this study was made out of convenience, as it represented a recent and highly engaging news topic and mentions of this news were identified through a combination of keywords " lab-grown chicken meat" and "Singapore.".

The secondary data were collected on January 12 and 13, 2021. These data, available on the internet or in printed media, are easily accessible, free of charge, and were not always created for the research in question. 344 comments, all in English, were manually collected and analyzed from 8 Facebook posts on the pages of the mentioned news portals. The headlines on these portals varied little, with most featuring: "Singapore Becomes First Country to Approve Sales of Lab-Created Meat".

Considering that the location of the profiles that commented is not always public, the choice to treat the comments as belonging to a virtual community, disconnected from specific territories, was made by the authors. According to Piérre (2007, p. 127), "a virtual community is built [...] regardless of geographic proximity and institutional affiliations.".

The sentiment analysis applied to social networks allows conducting opinion polls with several advantages, such as low cost, speed, non-invasiveness, authenticity and automation. This technique automatically extracts opinions, emotions and feelings from written language (Lombardo *et al.*, 2019), whose benefit is to effectively identify and classify users' feelings

(positive, negative or neutral) in texts to verify their understanding of products, subjects or services (Agüero-Torales *et al*., 2019; Salur & Aydin, 2020).

However, on Facebook, the collection had to be manual due to platform restrictions. Even so, manual collection allowed pre-processing of the text during collection, excluding comments with links, images, gifs, other users' tags, or that were too short (three words or less). Comments identified as explicitly ironic or sarcastic were also removed to avoid undue influence on the results.

3.2 Data Analysis

In this study, a lexicon-based approach was employed for sentiment analysis and textual analysis, using two software: Orange and IRAMUTEQ. The lexicon-based approach consists of analyzing the grammar of the text and assigning a sentiment score to the text, considering a predefined sentiment lexicon.

A tool that can be used for this purpose is sentiment analysis (Pang & Lee, 2008; Pindado & Barrena, 2021). Social media platforms such as Facebook, Twitter and LinkedIn have emerged as significant sources of data for sentiment analysis, providing insight into people's perspectives and opinions (Ibrahim *et al*., 2022).

This data may include online reviews, social media comments and other forms of consumer-generated content. By analyzing the sentiments expressed in these materials, companies can gain insight into how their products are perceived by consumers, identify areas for improvement, and make informed decisions about product development and marketing strategies.

A comprehensive, high-quality lexicon is essential for fast and accurate sentiment analysis. In this study, we used Vader (Valence Aware Dictionary for Sentiment Reasoning), which has demonstrated exceptionally good performance in the social media domain (Hutto & Gilbert, 2015). Vader was chosen for its sensitivity to expressions of sentiment in social media contexts and its ability to generalize favorably to other domains.

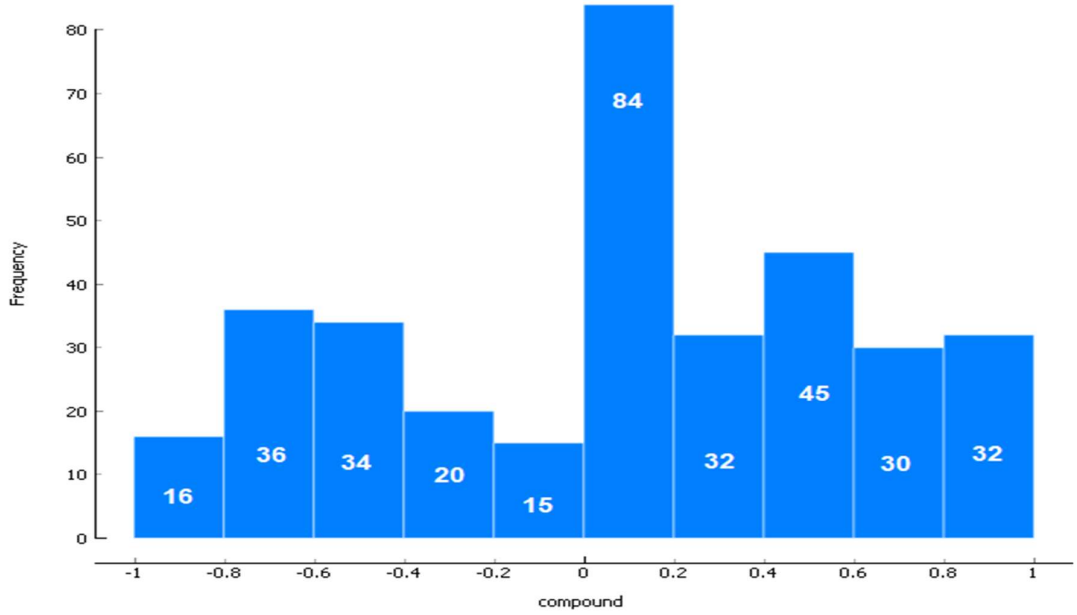
Orange is an open-source software package that provides a variety of mining and machine-learning algorithms (Demsar *et al*., 2013). In Orange, after inserting the document, it is necessary to carry out a pre-processing, which includes defining stopwords, stemming (or lemmatization) and tokenization. Then, two different and complementary analyzes were chosen: sentiment analysis using VADER and the Tweet Profiler module – which analyzes user opinions and classifies emotions into Anger, Disgust, Fear, Joy, Sadness, and Surprise and display them in a frequency distribution graph.

IRAMUTEQ is a tool that allows the application of some statistics for the analysis of how words relate to each other in a text. In IRAMUTEQ, the pre-processing follows definitions similar to Orange. The analysis chosen for this work was the Descending Hierarchical Classification (CHD) or Reinert's Method. This tool presents a hypothesis test, based on a certain probability and a chi-square statistic, regarding the level of correlation of terms in certain clusters.

4. Results

Figure 1 presents a polarity analysis that divides comments into positive (> 0) and negative (< 0) using the VADER lexicon. The numbers on the bars indicate the number of comments in each category. It is possible to infer that the majority of comments are positive, although many are close to neutrality.

Figure 1. Polarity Analysis



Source: Research Data

Orange also allows you to filter comments in order of positivity or negativity. The most positive comment (0.9492) was:

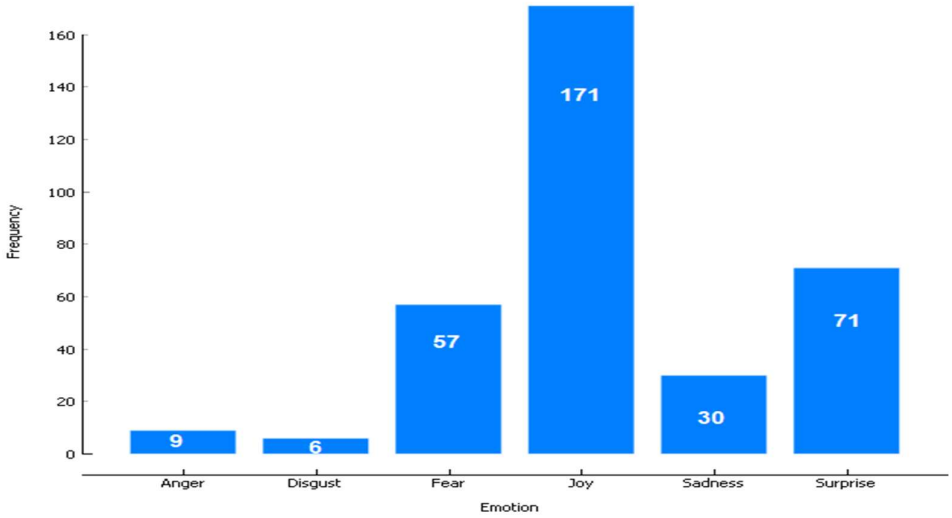
> *"Great idea! So maybe we can get better quality of real meat for meat lovers! Less people buying meat, then only way to sell is producing in a more human way a very good quality meat. Just like it should always have been instead of mass producing."*

The most contrary comment directed specifically at cultured meat can be read below:

> *I think this is a bad thing for the human being. The industrial pollution is more than this animal. It is enough not to cut the forest for agricol lands and plants some more trees. More than this now there are a lot of vegetarian people so, I really this that it is an invention who will damage our body. Why do they invent humanoid robot ,steril food ? Why don't invent thing necessary for human and not thing that can be use only in the war?*

Figure 2 brings a portrait of the sensations and emotions that the article evoked in the public. As expected from the polarity analysis, the predominant feeling was of 'joy', which demonstrates a low rejection of the idea of cultured meat in the digital sample used. Following emotions, surprise may be an indication that there is little consolidated information on the subject among potential consumers. Fear, although on a smaller scale, is also significant in this distribution of emotions, resulting from the perception of risk.

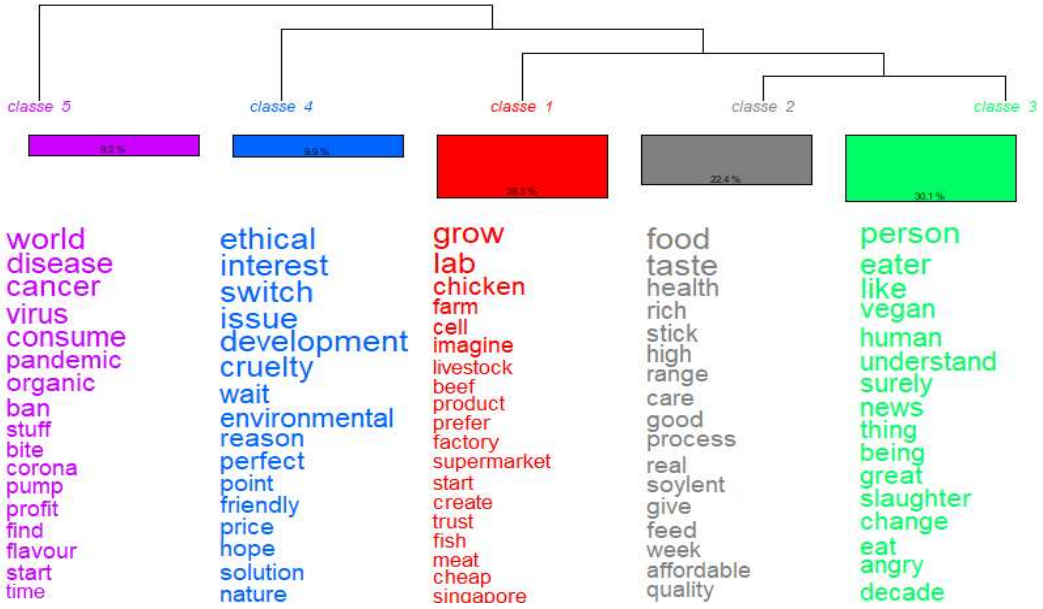
Figure 2. Sentiment Analysis



Source: Research Data

The Descending Hierarchical Classification (CHD) (Figure 3) allows the separation of the textual corpus through its vocabulary, identifying classes with the most frequent terms. In the dendrogram, the most expressive classes are formed by terms that contribute to the argument, but are not, in themselves, a topic for analysis. Classes 1 (28.3%) and 3 (30.1%) are the most representative within the text, however, they are formed by less relevant terms for the analysis, since they are directly related to the central theme of the news.

Figure 3. Descending Hierarchical Classification (CHD)



Source: Research Data

The other classes, however, provide a valuable set of information for the analysis of the most discussed topics about cultured meat, allowing us to infer perceptions of risks and benefits. Class 2, the most prominent among them, refers to a discussion regarding taste, health, and naturalness aspects of this food industry innovation. Class 4 highlights elements that refer to ethical, environmental, and animal cruelty concerns. While #5, the smallest and most pessimistic, echoes a common concern around cultured meat: food safety. The following section discusses these results in the light of the literature.

Lab-grown meat, an emerging development in the food industry, is expected to be made available to the public soon. The TRS, developed by social psychologist Serge Moscovici, offers a useful lens for analyzing emerging social attitudes toward lab-grown meat. This theory examines how information, particularly unfamiliar concepts, is integrated into our existing knowledge and social contexts. Positive social representations about cultured meat can mean equally positive attitudes and, ultimately, ensure the successful insertion of this product in the market (Pakseresht *et al*., 2022).

The polarity of the comments (Figure 1) shows a greater tendency towards positivity, indicating that a significant number of respondents see lab-grown meat as a potential solution to various social and environmental challenges.

Sentiment analysis (Figure 2) of Facebook comments shows that there are a variety of views on lab-grown meat. Some people are very positive about the potential of this technology, while others are very negative. Sentiment analysis of comments shows that the most common

emotions expressed are joy, fear, and surprise. This suggests that people are still trying to understand lab-grown meat and that there is a lot of uncertainty about this technology.

This analysis corroborates other studies such as the one conducted by Silva and Cunha (2023) with the Brazilian public, in which 75% of respondents expressed willingness to try cultured meat. Anderson and Bryant (2018) found a 66.4% approval rate for cultured meat among the North American public, while Wilks and Phillips (2017) reported a slightly lower rate of 65.3%. In Germany, Dupont *et al*. (2022) noted a 65% intention to try such products, compared to Weinrich *et al*. (2020), who observed a willingness below 50%.

The comments highlighted as more positive and more negative demonstrate the authors' attempt to anchor the most common elements. Negative commentary anchors cultured meat to concepts such as industrial pollution, deforestation and human health risks. This reflects a broad societal concern about the possible unforeseen consequences of new technologies and artificial methods of food production. Most positively, it anchors cultured meat to ideas of more humane animal treatment, better quality meat and an opportunity to reform existing livestock practices.

Despite the high approval rate of cultured meat demonstrated in previous studies, it is imperative to understand the challenges and enablers that can impact the commercialization of the product when it reaches the market. For this, Figure 3, CHD, is used, a tool commonly used to assess perceptions about food, as in Mazzonetto and Fiates (2014), Chloé *et al*. (2020) and Polli *et al*. (2021).

Class 1 (Figure 3) seems to focus on aspects related to the production process and the origin of laboratory-grown meat. The keywords suggest a debate about the technical differences between laboratory-produced and traditionally produced meat. Marcu *et al*. (2015) point to this dichotomy between "artificial" and "natural" when participants are asked to compare cultured and conventional meat. Similarly, Silva and Cunha (2023) identified that one of the most common objections to cultured meat is the perception that it is not natural, but artificial, due to the use of technology.

Furthermore, anchoring can also be seen in the way people compare this unfamiliar food product to traditional meat. References to familiar categories such as "natural versus artificial", "healthy versus unhealthy", or "ethical versus unethical" reflect this process. By anchoring lab-grown meat to these familiar social representations, can understand this new technology and develop their own opinions about it.

Class 2 (Figure 3) focuses on questions regarding the taste, health, and overall quality of lab-grown meat. This trend probably reflects the concerns of individuals regarding the taste of this new food, its health and accessibility for a wide range of consumers. The study by

Gijmez-Luciano *et al*. (2019) pointed to the perception of healthiness and nutrition of cultured meat as one of the most influential factors in the willingness to pay for this product. In this sense, Mazac *et al*. (2023) point out that meals with cultured meat have nutritional value comparable to meals with traditional foods of animal origin.

As for flavor, Fraeye *et al*. (2020) consider that it is not clear to what extent conventional meat flavor precursors will be present in cultured meat. According to Langelaan *et al*. (2010), if the cultivation process itself does not produce a product with a satisfactory flavor, the addition of artificial flavor compounds, similar to those currently used in plant-based meat substitutes, can be an alternative.

Class 3 (Figure 3) discusses the personal and social dimensions of lab-grown meat consumption, including eating habits such as veganism and vegetarianism. As the predominant class, it reflects individual beliefs about lab-grown meat and reactions to its introduction to the market. In this sense, Dr. Mark Post stated, "Frankly, vegetarians should stay vegetarian, that's better for the environment than cultured meat" (Mead, 2013, p. 1).

Objectification can be seen in the way individuals relate lab-grown meat to their existing food choices and personal identities. For example, those who follow a vegan or vegetarian lifestyle may see lab-grown meat as a symbol of their commitment to reducing harm to animals.

Classes 4 and 5 (Figure 3), although less frequent in the comments, are the ones that best express perceptions of barriers and drivers involving cultured meat. Still, regarding Class 4, it is observed that it includes terms related to ethical issues, sustainability, animal welfare and price.

The ethical discussion can be explored from two perspectives. In the deontological view, it is essential to respect the rights of all beings capable of feeling, who can, directly or indirectly, claim certain rights. In this context, laboratory-grown meat perfectly aligns with this approach, as it is an artificially generated product, incapable of feeling or claiming rights (Alvaro, 2022).

This is confirmed by observing that animal welfare was one of the main perceived benefits of cultured meat in previous studies (Bryant & Barnett, 2018). Specht *et al*. (2020) in debate, who reported that users specifically mentioned slaughter, which may suggest that cultured meat is likely seen as morally preferable to any process involving the death of an animal. Similarly, Weinrich *et al*. (2020) found that the perception of cultured meat as an ethical product was the main driver of purchase intention in a German sample.

But on the other hand, there are those who invoke ethical reasons to question the viability of cultured meat, arguing that the development of new food technologies is a

"manipulation of nature", and therefore morally dubious (Miles & Frewer, 2001; Verbeke *et al*., 2015). This position is aligned with virtue ethics, which emphasizes the development of moral character and virtues, to the detriment of rules, duties or consequences (Roberts, 2015).

Therefore, it is noted that the ethical debate surrounding laboratory-grown meat also demonstrates the process of objectification. It is objectified as an ethical-virtuous dilemma, with some perceiving it as an artificial and displaced relationship with nature, lacking in respect and connection. On the other hand, from the deontological point of view, laboratory meat is objectified as a beneficial product that respects the rights of sentient beings.

From this perspective, cultured meat can be problematized if we consider the virtue of authenticity or naturalness. The development and consumption of lab-grown meat can be seen as divorced from the natural processes of animal husbandry and food production. Therefore, it can be argued that this product promotes an artificial and displaced relationship with the natural world, which could be interpreted as a lack of virtue in terms of respect and connection with nature - which can even raise religious questions (Hamdan *et al*., 2018).

Still regarding Class 4, the presence of words related to the environment indicates a certain familiarity with the environmental benefits associated with cultured meat, as pointed out in the literature. Several studies suggest that reducing meat consumption, in favor of a more plant-based diet, will result in better environmental outcomes, including decreased greenhouse gas emissions, and land and water use compared to conventional production. of beef (Clark *et al*., 2019; Clark & Tilman, 2017; Heller *et al*., 2018).

This argument is because cultured meat will be produced virtually without the need for livestock, helping to mitigate the environmental problems associated with the high carbon and water footprint of traditional livestock (Hocquette, 2016; Tuomisto, 2019).

The price also proved to be a topic of interest for those who commented on the news in question. This is consistent with the arguments found in the literature, as it is noted that the first laboratory-grown hamburger cost around US$ 330,000 to be produced in 2013 (Hamzelou, 2022). Prices have decreased since then, however, according to Humbird (2021), with current technologies, it is still impossible to create a competitive product in terms of price.

Food safety is the focus of Class 5 (Figure 3). The words "Cancer" and "Disease" were mentioned, reflecting concerns about possible long-term effects and the artificial nature of cultured meat on human health. According to a review by Ong *et al*. (2021), a responsible, data-based approach to evaluating and demonstrating the safety of cell-cultured meat is needed.

Hocquette (2016, p. 170) states about the mention of 'cancer' that “these cancer cells are probably harmless because they are dead when the meat is consumed and, even so, they are

digested in our stomach and intestine, so it is unlikely that they are incorporated alive in our bodies". With these exposed results, some conclusions can be drawn, which will be discussed below.

5. Conclusion

This research aimed to examine Internet users' perceptions of lab-grown meat, using an analysis of reactions and comments on a Facebook post. It is not possible to generalize the data to the act of consuming or even experimenting with cultured meat, but the sentiment analysis obtained in this research points at least to public goodwill towards cultured meat. The results revealed both a positive perception and reservations regarding the introduction of this new type of food.

The positive comments suggest that people are excited about the potential benefits of cultured meat, such as its environmental impact and its potential to reduce animal suffering. However, the negative comments suggest that people are concerned about a range of issues such as health, ethics and potential risks of this technology.

The social representations theory lens in this article reveals society's attempt to integrate this cultured meat into existing knowledge structures, which can be useful to devise strategies that anchor and objectify this new concept - something critical to make new or abstract ideas more understandable and relatable (Staerklé, 2009).

For example, public education campaigns or marketing strategies can anchor cultured meat in concepts such as health, sustainability and animal welfare, which have significant positive connotations for many people. The anchoring process can also connect cultured meat with a forward-looking narrative of technological advancement that is very attractive to a sector of the population.

In the case of objectification, it may involve presenting the product in familiar shapes, such as hamburgers or chicken nuggets. It can also mean emphasizing a taste, texture and nutritional profile that mimics traditional meat, thereby allowing individuals to relate the new product to their existing eating experiences.

In addition, emphasizing the potential benefits of cultured meat, such as its environmental impact, its potential to reduce animal suffering and its perceived health benefits, and recognizing concerns consumers have about cultured meat, such as taste, price and safety can also be successful strategies.

In conclusion, reactions to lab-grown meat show an ongoing societal effort to integrate this new product into existing social norms and beliefs. Through the processes of anchoring and

objectification, people seek to understand and assign meaning to lab-grown meat within their existing knowledge structures.

The internet is a dynamic field where the exchange of ideas is constant and borderless, allowing a wide variety of perspectives to be presented and discussed. Thus, the results of this survey are a representative portrait of the opinions of a diverse and international audience.

Within this conclusion, it is important to note that, while this research provides valuable insights into internet users' perceptions of lab-grown meat, there are inherent limitations due to its methodology. As the study was conducted on social media, specifically analyzing reactions and comments on Facebook, the sample is not representative of any specific population.

Moreover, the nature of social media data collection does not allow for a demographic characterization of the participants. Therefore, while the findings offer an interesting glimpse into public sentiments and social representations of cultured meat, they may not comprehensively reflect the broader population's views.

Future studies should continue to track online opinions as lab-grown meat becomes more prevalent. It would be important to further investigate concerns related to food safety and better understand the nuances of the ethical concerns raised. The potential environmental impact of lab-grown meat and accessibility issues also warrant further investigation.

In summary, the study provides an intriguing insight into current online users' perceptions of lab-grown meat. The challenges identified are many, but public perception and observed enthusiasm suggest a promising path forward, provided legitimate concerns are addressed in a transparent and accountable manner.

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