Consumers' Perceptions of Ethics and Lab Cultured Proteins

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Abstract

Many consumers across the world are searching for alternatives to conventional proteins such as beef, pork, and poultry as our population grows and the ability to feed people comes into question. Cultured meat, or laboratory-developed proteins, could impact a large sector of industries and people such as livestock producers and processors, food safety workers, and food scientists. Previous research has shown that livestock producers and consumers view cultured meat negatively due to a lack of knowledge. Values and ethics come into question and consumers may make assumptions, with or without evidence, about the outcomes of cultured meat, which may include improving the environment with less greenhouse gas emissions, ethics of slaughter and harvest, rising cost of meat production cost globally, and greater demand for animal proteins driving higher prices.

In this study, I examined social media conversations and describe how ethics play a key role in consumers' and producers' perceptions of this technology. Using behavioral reasoning theory, I conducted a content analysis of Twitter conversations about meat substitutes to identify beliefs and values and the reasoning and evidence for those values, which may allow us to infer their future actions.

I analyzed a random sample of the Twitter data to further discuss the concepts of ethics. Using the behavioral reasoning theory, I examined the attitudes and inferred the conversations of ethics by choice of language and topic. I also took sentiments into consideration to allow for further understanding of consumers' views on the topic. This will allow both sides of the industry to develop marketing strategies for how to properly approach the topic of ethics within the media.

Introduction

When analyzing the topic of lab-cultured proteins, it is known that cultured meat could be an impact to the animal industry. Animal agriculture, though has a hand in this upcoming project, will still face issues whether financially or perception. According to Specht, Rumble, and Buck; acceptance of the new products or ideas is the biggest hardship. Consumers were found to be contradictory in accepting new technology such as smartphones or applications, but not supporting the new technology in agriculture such as genetically modified organisms or lab cultured proteins (Specht, Rumble, and Buck 2020).

Farmers, on the other hand, have a different reaction than consumers. This directly impacts their income and lifestyle. The discussion in Specht's article explains that farmers were either benefiting and supporting the new technologies to the industry, or not supportive of the alternative proteins as they would affect the meat industry. It was also noted in the article that taste was a topic that arose in discussion of the alternative proteins. Some of their research displayed a poor taste and others stated it was delicious (Specht, Rumble, and Buck 2020). This can be explained by many aspects of genetics, nutrition to the cells or animal allowing for the taste to by changed, and the cells chosen to begin the growth and where they are located on the animal.

Companies on the forefront of this trend such as Memphis Meats, Mosa Meat, Blue Nalu and others are leading the charge on the changes in food production. Whether it is farmers or ranchers, consumers, or the media, everyone will play a part in the changes on the industry. Consumers' attitudes about these changes may be based on their backgrounds and beliefs. The understanding and use of the behavior reasoning theory in this study allowed for the examination of the different ethical reasonings for the need for changes in our food production system. The

behavioral reasoning theory was used to conduct a qualitative content analysis of Twitter conversations. This allowed us to identify beliefs and values with reasoning and evidence based on ethical themes. Understanding the beliefs behind the conversations on social media allows the industry to develop marketing strategies to properly approach this topic within the media.

Behavioral Reasoning Theory is the understanding of the linkage between people's beliefs, attitudes, intentions and behaviors (Westaby, 2005). This theory allows us to take those beliefs and find the linkage to what their perception of ethics on cultured meats and how that can affect marketing and the overall perception of laboratory-developed proteins. We specifically looked at the behavioral beliefs concept to identify the different attitudes or reactions to the ethics of cell-cultured proteins. The attitudes can be viewed in a positive, negative, or neutral tone and can be further analyzed by key words used in the discussion.

The purpose of this study was to examine social media conversations and describe how ethics play a role in consumers' perceptions of cultured meats or laboratory-developed proteins.

Review of Literature

Consumers' Behaviors

The understanding and use of the behavioral reasoning theory in this study allowed for the examination of the different ethical reasonings for the need for changes in our food production system. The behavioral reasoning theory was used to conduct a qualitative content analysis of Twitter conversations.

According to J. D. Westaby (2005), behavioral reasoning theory (BRT) states that reasons serve as important linkages between people's beliefs, global motives (e.g., attitudes, subjective norms, and perceived control), intentions, and behavior. Below, you can see the chart

that displays the belief concepts to global motives into intentions and behaviors. In this study, we focused primarily on behavioral beliefs and attitudes and how that reflects online conversations.

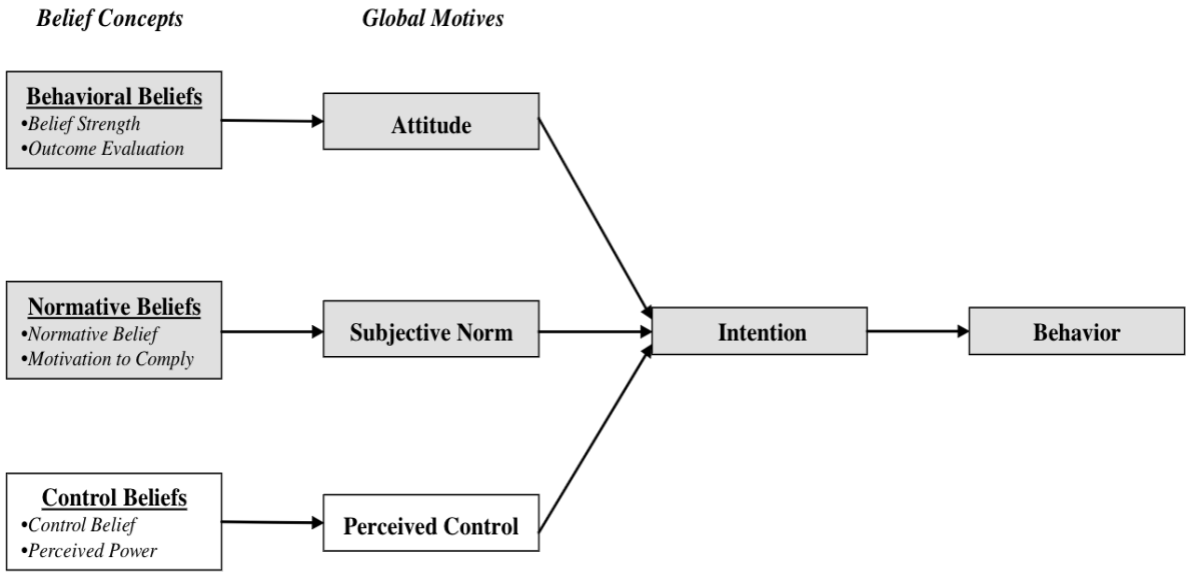

Figure 1. Westaby, J. D. (2005). Behavioral reasoning theory: Identifying new linkages underlying intentions and behavior. *Organizational Behavior and Human Decision Processes*, 98, 97–120.

In Dr. Rumble's study of consumer intent to buy local foods, she used a similar theory of Theory of Planned Behavior that was to predict consumer's intention to purchase local blueberries based on past experience and self-identity and moral obligation to supporting local businesses (Rumble, 2018). This is similar to our use of behavioral reasoning theory as we are looking at response to others and how they are making choices based on their preconceived notions, past experiences, and prior knowledge. This article comparison shows that it is a practical choice for research using the user's conversations to infer their sentiment and opinions on lab-cultured proteins.

Consumers' opinions and views

Consumers' perceptions and conversations online can affect our marketing strategies in both the animal industry and the new and unknown industry of lab-cultured proteins. Understanding the concept of logos, ethos, and pathos really aided in the review of sentiments and conversations in the Twitter data.

The interactions between logos, ethos, and pathos follow the concepts of truth, reliability, and emotional appeal. The concept of lab-cultured proteins and how the perceptions are read online really interact under from all three. Logos understands the truth and needs the backing by the evidence. Ethos and Logos allow for reliability and truth due to backing by evidence. This is where we are striving to be when discussing marketing concepts. Emotional appeal and pathos explain the concept that correlates with the behavioral reasoning theory and examining attitudes. The chart below explains the relationship between logos, ethos, and pathos and how they interact with each other.

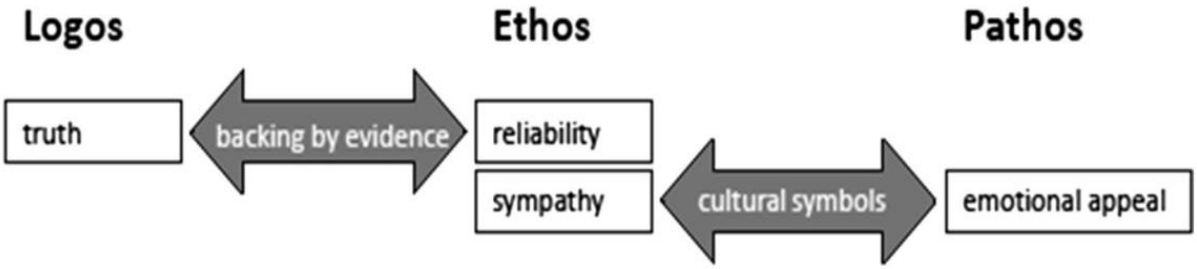

Figure 2. *Aristotelian framing: logos, ethos, pathos and the use of evidence in policy frames*. Stucki, I., & Sager, F. (2018, June 5). Policy Sciences.

Gaps in Research

Due to the concept of lab-cultured proteins still being under research and not readily available to the public, there is a lack of knowledge. The concept has not been submitted to public media because it is still new enough that the research is still on going. We are in the process of researching the preliminary reactions to the products but there is still research being conducted and will be for some time as this topic is still new and an unknown to the public consumer as well as the producers

Procedures and Methods

Data Collection

Data were collected through a Boolean search in the social network listening software, Meltwater Explore. Search terms were selected through a review of news media stories about cell-cultured meat as well as word clouds created by previous searches on the topic.

The final Boolean search used to collect data was: ("cultured meat" OR "lab-grown meat" OR "cell-cultured meat" OR "cultured tissue" OR "clean meat" OR "lab-grown protein" OR "lab-grown fake meat" OR "lab grown meat" OR "cell cultured meat" OR "lab grown protein" OR "lab grown fake meat" OR "in-vitro meat" OR "in vitro meat" OR "edible fiber" OR "slaughter-free meat"). Tweets were posted between February 1, 2020 and January 31, 2021 and were filtered by language (English) and country of origin (United States). This search yielded a total of 16,234 tweets that were downloaded from Meltwater Explore in .csv format.

In Microsoft Excel, we used a random-number generator to select a 10% sample of the resulting tweets, giving us a total of 1,625 tweets to examine.

Data Analysis

We conducted a key word search of the Twitter data to provide overall thoughts and attitudes through the user's tweets. We searched for key words that highlight the concept of ethics and further sorted those tweets into three theme categories.

The three theme categories are Environment Issues, Animal Cruelty, and Food Production and Consumption. We closely analyzed the tweets to find data to use as examples. These examples display conversations under these themes that display user's perception and opinions of ethics. It was concluded early in the analysis that only four tweets directly mentioned ethics. The 0.2% of the data was not substantial, but there are other ways users can describe their views and attitudes.

We also analyzed the sentiments of positive, neutral, and negative tweets based on the content of the tweet. This allowed us to examine their opinion in a more personal way. Lastly, we examined the Reach number that was attached to the tweet by Meltwater. Reach by definition is the total number of people who have seen your content. This allowed us to compare how many users actually view the tweet on the internet.

Results

The themes that were used to organize out findings were: Impact on the Environment, Animal Cruelty, and Food Consumption. These themes allowed for division of tweets into groups based on their keywords and positive, negative and neutral reactions.

The pie chart is an explanation of the sentiments that are recorded from the random 10% of the Twitter data. This was collected in the query and displays the positive, negative, and neutral reactions to the concept of lab-cultured proteins. It is clear that the majority of people

view this topic in a neutral tone. It is then followed by negative tones and then positive. When evaluating the data and understanding perspective, it was clear the negativity tones are depicted because of low credible sources available to the public on the media and low research from the user.

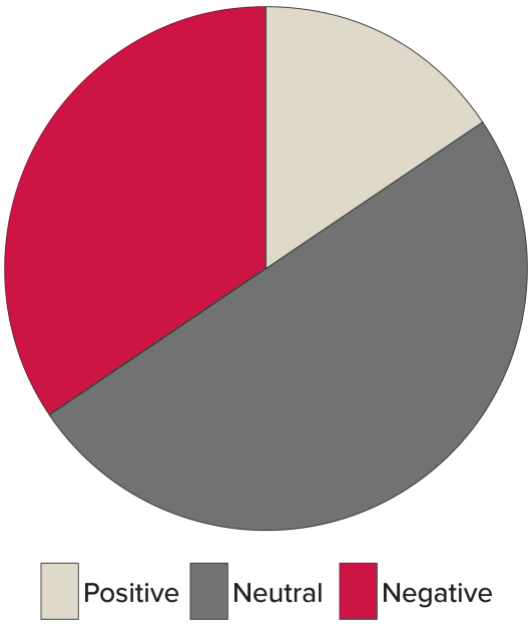

Figure 3. Visual Representation of Data Sentiments

The table below depicts examples in each theme that represents the inferred ethical arguments online. The tweets are categorized by sentiment and theme, allowing one sentiment example per theme. Each tweet has the reach included at the bottom. It is noticeable that some themes had a higher reach attached to the tweet it there was a mention, when the users tag others, use a hashtag, use a link, photo, or QT ("quote tweet")

Theme	Positive	Neutral	Negative
Effects on Environment	RT @NutritionDiva: This is a way of producing meat that uses less land, less water, and [creates] fewer greenhouse gas emissions. Thanks to @PaulHShapiro, author of Clean Meat, for this fascinating chat on tech that will allow us to produce lab-grown, animal-free meat. https://t.co/hHpx-k51NEP *Reach: 326*	The 1st lab-grown meat has been approved for use in Singapore. It's called cultured meat & is made from stem cells from live animals, amino acids, other nutrients & salts. Beef has largest carbon footprint, which could be reduced by 80 to 95% if people make switch from real beef. *Reach: 2,414*	@VegNews Years ago, at a meeting of the Sustainable Packaging Coalition, a McDonald's spokesman mocked me for bringing up the problem of animal ag and climate change and proposing they invest in plant-based and lab-grown meat. He laughed and said #vegans *Reach: 102*
Animal Cruelty	If we got lab grown meat that was just as good as the real thing, would you try eating lab grown human meat? *Reach: 12,418*	Do you have ethical problems with eating lab-grown meat...if it's human meat? *Reach: 29,357*	QT @Reuters: #Meat-BasedVegetables #SoWrong ; Remember this? Lab-grown meat, cultured from the stem cells of animals, is considered by many to be a sustainable and ethical solution to the demands of the meat industry https://t.co/v6VJnViQFJ *Reach: 64*
Food Production and Consumption	@veganhippiesol You should listen to podcast by @Plant_proof on the future of lab grown meat it's very interesting *Reach: 15*	QT @ElephantEating: If a vegan took the starter source from their own body, would it still be vegan? I mean it'll be animal cruelty free and they'll be like a hero so ; How long into the lab-grown meat trend until someone starts growing human meat for consumption? And how will it be legally and ethically resolved? *Reach: 1,534*	QT @o_rips: For the record, no vegan I know is eating this lab trash. If it needed to be said. If you're a vegan and will eat this, comment below. ; The World Economic Forum Is Warning of A Global Food Crisis... But Don't Worry, They Already Have The Solution... Lab Grown Meat... It's Not About Saving The Planet... It's About Control! https://t.co/u9y-qcwX19w *Reach: 25,365*

Table 1. *Example tweets from each theme and each feeling.*

Conclusions

The main themes found in this study were Environmental Impacts, Animal Cruelty, and Food Production and Consumption. These themes surfaced throughout the data sample due to the beliefs of the users. Their personal beliefs on climate change, animal rights, or veganism may impact the user's decisions to purchase and support the lab-cultured proteins when it becomes readily available to the public.

Taking into consideration and understanding their beliefs allows us to further evaluate how to portray to the media the concept of lab-cultured proteins and to help anticipate the ethical issues livestock producers may have to discuss when competing against cell-cultured meat in the future. The concept of understanding that the attitudes are connected to users' behavior and can affect their conversations online. Specifically looking into agriculture, we can see there is a market for both sides of this discovery: lab cultured proteins and animal agriculture products. In understanding there is always new technology and different options for all markets of consumers, we should promote both in a positive manner. It is not a discussion that will be able to be avoided completely, so as producers it is important to embrace the new technology and work on creating both markets to benefit our producers financially as well as our consumers wants and needs while educating them on the significance of both parts of the industry.

Understanding the viewpoints (positive, neutral, negative) can help gauge the views and behavioral reasoning of user related to cell-cultured meat. It is also important to see the reach is higher when they tag, use a link, photo, or QT ("quote tweet"). The highest reach out of the samples is a neutral tweet that aligns with animal cruelty and food consumption and it can be categorized in either theme.

ACKNOWLEDGEMENTS

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