

## **Introduction**

Today, consumers are considering alternatives to traditional meat in their diets (Slade, 2018). Due to environmental reasons, eating regimens, or other factors, consumers are considering alternatives to conventional meat (Fiala, 2008; Pimentel & Pimentel, 2003). These shifts in preferences have caused a larger focus to be placed on alternative meats—specifically plant-based and cultured meat. Plant-based meat is created by processing plant ingredients and is sometimes made to taste and look like conventional meat (Slade, 2018). Cultured meat is created by isolating and culturing animal stem cells but is not currently available for consumer purchase (Tomiyama et al., 2020). While plant-based meat is already affecting consumers' choices and the meat and food industry in general, both alternatives have the potential to impact choices and industries in the future.

While some major food companies are jumping to invest in these growing alternatives, livestock producers seem to have a different perspective on the competition (Popper, 2019). These agriculturalists have noted the need for different labeling on these products—so as not to confuse consumers as to what products are traditionally produced and what products are processed or lab-grown (Popper, 2019). And, through legislative processes, the U.S. Cattlemen's Association and other groups have made these views clear in terms of both plant-based and cultured meats (Popper, 2019). Agricultural communication will play a key role in communicating about the differences between these products and shaping the future of consumer preferences regarding these different products.

Using the Theory of Planned Behavior (TPB), consumers' intended purchasing behavior toward conventional, plant-based, and cultured meat purchases will be studied (Basha et al., 2015). The current study aims to assist the agricultural industry in making strategic decisions as they consider the changing marketplace of meat products. This goal can be accomplished through better understanding consumer attitudes toward purchasing, social norms, perceived behavioral control (PBC), and purchasing intent toward conventional, alternative, and cultured meats. The information produced because of this study may be helpful to meat and food producers and communicators. Specifically, the results may lead to marketing and branding decisions and guide producers' product and production decisions. This study is especially relevant at this time, as alternative meats have increased in popularity during the pandemic (Sternlicht, 2020). In fact, Nielsen found that fresh meat alternative sales went up by 255% in the final week of March 2020—in comparison with that week in 2019 (Sternlicht, 2020).

## **Literature Review**

Plant-based meat is more widely accepted by consumers who have concerns regarding animal welfare, the amount of conventional meat in their diet, environmental impacts, or a desire to follow a dietary regimen such as veganism (He et al., 2020). However, in recent years the food industry has begun to target plant-based meats toward all consumers (He et al., 2020). These meat alternatives have even started to be made to look and taste more like conventional meat to interest more consumers (He et al., 2020). Currently, the growth in popularity can be seen through the addition of plant-based meats to popular fast-food chains' menus, such as Burger King, Carl's Jr., Del Taco, White Castle, McDonalds, Dunkin Donuts, Pizza Hut, and other major entities (Wida, 2020).

Amid the coronavirus pandemic, conventional meat shortages have also impacted interest in plant-based options. There was a jump in the sales of plant-based alternatives during the pandemic as consumers seemed to become more open to trying them among the conventional meat shortages (Nierenberg, 2020). Hwang et al. (2020) found participants who had “high food curiosity” were considered more likely to buy alternative meat (p. 10). However, the study also found concerns regarding if this curiosity would lead to adoption of the products in the future (Hwang et al., 2020). There were questions if this trend would continue even after shortages ended.

Other concerns regarding plant-based meat have also been reported. According to van Vliet et al. (2020), plant-based meat “may put large portions of the population at greater risk for nutrient deficiencies and accompanying health issues,” since some nutrients found naturally in animal meat cannot be replicated in alternative products (Payne et al., 2016; van Vliet et al., 2020, p. 11). Furthermore, the processed nature of plant-based meat alternatives also raises concerns. Although some ingredient combinations are better than others, many ingredients are “highly processed” and contain large amounts of sodium (Roos, 2019, para. 9).

Additionally, although some experts have said alternative meat is better for the environment, there are still questions regarding this topic. Researchers noted,

While companies producing imitation meat boast of the environmental benefits, some researchers point out that for people wanting to substantially lower their carbon footprint, having unprocessed plant-based diets instead of eating imitation products is healthier and better for the planet. (Newburger & Lucas, 2019, p. 5)

While more research needs to be done regarding this, van der Weele et al. (2019) found some alternative meats were not sustainable, “due to the extensive processing that is required, which takes energy and leads to losses during the transformation from raw material into final products” (p. 511). The quality of plant-based meats has also been identified as a weakness as the similarity to conventional meat may need to be improved to entice consumers (He et al., 2020). In addition, researchers also note more research needs to be done regarding the marketing of these products (Graça, & Calheiros, 2015).

Although cultured meat is not yet commercially available, it is likely these products could be available in the “next few years” (Kateman, 2020, p. 26). Verbeke et al. (2015) found consumers felt the meat was disgusting, unnatural, scary, or risky—and did not seem willing to try it. However, many participants did note its benefits, such as “environmental and ethical ones” (Verbeke et al., 2015, p. 54). The study also suggested that “consumer acceptance of cultured meat will ultimately depend on the product-related expectations and experienced performance” (Verbeke et al., 2015, p. 57). Similarly, Slade (2018) examined consumers’ preferences for conventional and alternative beef and found the greatest preference for conventional. Additionally, the need for the alternative meats was driven by similar tendencies, yet “some individuals prefer plant-based burgers to beef, but not cultured meat burgers to beef” (Slade, 2018, p. 433). When considering cultured meat, Wilks and Phillips (2017) found “taste/appeal is the primary barrier, followed by ethical concern and price” (p. 6). In terms of production and costs, “Small-scale production looks particularly promising, not only technologically, but also for societal acceptance. Economic feasibility, however, emerges as the real obstacle,” (van der Weele & Tramper, 2014, p. 294).

Tomiyama et al. (2020) studied the barriers to consumers accepting cultured meat and how to address them. Researchers found some of these consumer preconceptions can be changed by communicating the “naturalness of cultured meat,” the current agricultural process versus the process of cultured meat, and the ethical benefits (Tomiyama et al., 2020, p. 148). The study also suggested shaping messaging around demographic and political information, as well as transparent messaging in general (Tomiyama et al., 2020). Tomiyama et al. (2020) proposed using “behavioral science, technology, science communication, and policy,” for full acceptance of cultured meat in the future (p. 151).

Although both cultured and plant-based meats have benefits, there are also concerns. There are questions around who will be producing this meat, who will be adopting the technology, and where it will be produced (Stephans et al., 2018). Additionally, Stephans et al. (2018) suggested this new market could possibly create a new frontier for multinational corporations to accumulate “further capital and power over the food system” (Driessen & Korthals, 2012; Stephans et al., 2018, p. 161). Furthermore, there are questions regarding how these innovations will impact the agricultural industry. Bonny et al. (2014) notes that alternative meats can help with increasing consumer demand in the meat industry, although they cannot completely replace conventional meat. Burton (2019) examined the possibility that cultured meat could cause some “panic” in parts of the agricultural industry due to the emerging protein options (p. 42). At the same time, plant-based meat already exists in the current market and is growing. If it continues to grow in popularity, the livestock industry could be impacted, Westhoek et al. (2014) noted.

In terms of agriculturalists’ views on plant-based meat, cattle ranchers are not pleased with the Impossible Foods and Beyond Meat companies that create these products (Reiley, 2019). All the while, food companies seem to be taking advantage of this opportunity. Tyson Foods, “the world’s second-largest processor and seller of beef, chicken, and pork,” has been investing in alternative meat such as Memphis Meats, Future Meat Technologies Ltd., and Beyond Meat (Piper, 2019, para. 1). Moreover, Cargill has also invested in Memphis Meats, Aleph Farms, and PURIS, which are two cultured meat companies and one plant-based meat company (Cargill, 2020). Among the companies creating these plant-based meats, a great deal of effort is going into imitating the taste of conventional meat (Reiley, 2019). Farmers seem to not only be concerned with the rise of popularity of these products but also concerned with their confusing food labels (Reiley, 2019). In fact, in several states, bills were proposed—and passed in some cases—to ban the use of words such as “meat, burger, sausage, jerky or hot dog” on food labels if the product was not produced traditionally (Reiley, 2019, p. 4).

Due to these innovations’ likely changes to the industry, agriculturalists can take steps to ensure there is still a prominent place in the future meat marketplace for them. Burton (2019) suggests that learning from similar evolutions in the food industry, farmers and agriculturalists should now be focusing on improving the natural process before the synthetic process yields a cheaper future product. Additionally, Lee et al. (2020) suggested that consumers will ultimately influence the future of these alternative products, which reinforces the value of how meat producers’ market their products. Other studies note that creating a consistent product, adopting new genetic technologies, and better addressing “consumer demands for quality animal welfare, sustainability and healthiness” will all be needed by the meat industry to combat the growing competition (Bonny et al., 2015, p. 261; Grunert et al., 2004; Novoselova et al., 2007; Polkinghorne et al., 2008). Additionally, Bonny et al. (2015) suggested better listening to consumer feedback, which can be achieved by not only improving the communication process

but also by meeting the previously specified demands. Overall, a greater emphasis on product quality, new marketing strategies, and paying attention to consumer interests can all allow the meat industry to co-exist with alternative meats. This study aims to use TPB attributes to better understand consumer buying intent, which can help the agricultural industry make strategic decisions in this changing marketplace.

### **Theoretical Framework**

The Theory of Planned Behavior (TPB) states that attitudes toward the behavior of interest, subjective norms, and PBC all affect individuals' intentions, which ultimately impacts their behavior (Ajzen, 1991). These factors lead to the idea that behavior can be influenced by the following:

“beliefs about the likely consequences or other attributes of the behavior (behavioral beliefs), beliefs about the normative expectations of other people (normative beliefs), and beliefs about the presence of factors that may further or hinder performance of the behavior (control beliefs)” (Ajzen, 2006, p. 1).

The theory also notes the importance of intentions, which can show how individuals put effort into behaviors (Ajzen, 1991). Additionally, the elements that impact intention relate to their power over their behaviors (Ajzen, 1991).

These ideas relate to the current study because the TPB can affect consumers' intent to buy meat products. According to (Ajzen, 2006), “behavioral beliefs produce a favorable or unfavorable attitude toward the behavior; normative beliefs result in perceived social pressure or subjective norm; and control beliefs give rise to PBC, the perceived ease or difficulty of performing the behavior” (p. 1). Therefore, the elements of attitudes toward the behavior of interest, subjective norms, and PBC influence consumers' behavioral intention, which can ultimately impact their buying behaviors. For example, Basha et al. (2015) found that consumers' food purchases were motivated by the following: “concerns for environment, health concern and lifestyle, food product quality and their subjective norms” (p. 451). Another study by Ajzen emphasized the influence of TPB in relation to consumers. Ajzen (2015) noted that TPB focuses on not only how individuals feel about aspects of products, but also the impact of perceived subjective norms and behavioral control. Ajzen also notes that other studies show how this theory can also be applied to extract, “readily accessible behavioral outcomes, normative referents, and control factors,” which can determine consumer buying habits (Ajzen, 2015, p. 136). This study will use the elements of attitudes toward purchase, subjective norms, and PBC to better understand, and even predict, consumer purchasing intent regarding meat options in Ohio.

A study regarding mobile slaughter units (MSU) and the theory of planned behavior focused on similar ideas to this study. Hoeskma et al. (2017) used TPB to determine if consumers were willing to buy meat from MSU, as well as to better understand consumer intention, attitudes, and personal norms. Researchers found that TPB—including attitudes, subjective norms, and PBC—did have a positive association with the intention to buy MSU meat (Hoeskma et al., 2017). Additionally, TPB “explained 55% of the variance in Dutch consumers' intention to purchase MSU meat” (Hoeskma et al., 2017, p. 20). Hoeskma et al. (2017) also noted that MSU was not yet available to the marketplace, so the future behavior could not be

completely predicted. However, the researchers noted this could be positive, as consumers would most likely not have a preexisting negative attitude toward buying the product (Hoeskma et al., 2017). This research relates to the current study not only due to the use of TPB, but also its approach to better understanding consumer perceptions. In addition, it also addresses consumers' intentions to buy a product that has not yet hit the market like cultured meat.

Lorenz et al. (2015) also examined TPB and consumers' behaviors. This study focused on better understanding how consumers chose to buy regional pork, as well as the role labeling plays in this process (Lorenz et al., 2015). The researchers found all "classical elements" of TPB to impact regional pork buying intention: cognitive attitudes, subjective norms, and PBC (Lorenz et al., 2015, p. 153). Subjective norms were also found to more so impact "personal moral convictions" rather than directly affect buying intent (Lorenz et al., 2015, p. 154). Moreover, additional variables in the study, along with TPB attributes, were found to impact consumer purchasing of regional pork. For example, subjective norms, impacted by personal norms/affective attitudes, had a strong influence on purchasing intention (Lorenz et al., 2015). Furthermore, according to Lorenz et al. (2015), personal norms/affective attitudes impacted intention the most, while subjective norms and cognitive attitudes were secondary elements regarding purchase intention. Concluding, Lorenz et al. (2015) found regional origin of pork does impact the consumer buying process. This study connects to the current study because it relates the consumer process behind purchase intention of meat, as well as secondary labeling aspects that goes into the decision.

Another study by Spence et al. (2018) examined how product packaging that allows consumers to trace their meat's origin—and the role of TPB in this process. This tracing practice was done through consumers scanning QR codes on the meat labels. The QR codes allowed consumers to gain information regarding the process of the creation of their food. Applying TPB, researchers found attitude toward purchasing a traceable product to be the "main determinant of intention to purchase each traceable product, followed by subjective norm and PBC which contributed comparatively less" (Spence et al., 2018, p. 145). Moreover, researchers also found attitudes to drive the intention to purchase, as well as recommended companies that use this traceable labeling to use this to shape consumer perceptions (Spence et al., 2018). Also, opinions of these participants' circles and those around them also affected their intention to purchase—and this idea could also be used in the marketing of these products (Spence et al., 2018). Overall, this study found that consumers looking for more information regarding the production process or country of origin to "positively predict intention to buy traceable beef steak" (Spence et al., 2018, p. 146). This study relates to the current study due to its focus on consumer information and labeling, as well as its findings regarding TPB.

## **Purpose and Objectives**

The purpose of this study was to understand consumer attitudes toward purchasing, social norms, PBC, and purchasing intent toward conventional, plant-based, and cultured meats to help the agricultural industry make strategic decisions as they consider the changing marketplace for meat products. The objectives of this study were to

1. Describe and compare attitudes toward purchasing, social norms, and PBC, and current and future purchasing intent of meat options;
2. Determine how attitudes toward purchasing, social norms, and PBC predict current and future purchasing intent of meat options.

## Methods

Researchers employed a quantitative approach to understanding consumer opinions through an online panel survey of Ohio consumers. Using a non-probabilistic sample, Ohio consumers were an ideal population to explore as Ohio produces a large quantity of conventional meat producing livestock as well as row crops extensively used in production of alternative plant-based meat products.

To reduce the limitations associated with non-probability samples (Baker et al., 2013), sample selection was matched to the Ohio population on the variables of gender, age, household income, race, and region of residence according to the United States Census (2020). A resulting sample size of 1,250 Ohio consumers 18 and older was reached. Data collection for the study was completed August through late October 2020. Due to the coronavirus pandemic and the desire to reach a census match, data collection was slower than anticipated. During this time, several restaurants and retailers introduced new plant-based proteins into their established product offerings. The country also faced meat shortages due to the coronavirus pandemic. These two phenomena could have influenced some responses.

This study is a portion of a larger grant-funded study that seeks to understand purchasing intentions of protein options and message effects on perceptions of cultured meat. Another paper has been drafted on the communication and information preferences of respondents regarding meat options (Rockers et al., 2021). The survey instrument was partially developed by the researchers and adapted from other current research. For this paper, four question blocks (attitudes toward purchasing, subjective norms, PBC, and purchasing intent) were used to assess consumers purchasing intent toward each of the three protein options. PBC was omitted for cultured meat due to a lack of product availability at the time of the study. Prior to answering these questions, respondents were provided with definitions of each meat option. Conventional meat was defined as flesh or other edible parts of animal (usually domesticated livestock or wildlife) obtained through the slaughter of animals; plant-based meat alternatives was defined as plant or vegetable based products that are developed to mimic the taste and texture of conventional meat; and cultured meat, also known as lab grown meat, in vitro meat, or clean meat, was defined as meat like tissue produced from animal cells in a laboratory without the need for animal slaughter. Each participant answered all the questions for each protein option, but the order in which they received questions about a protein type was randomized. For example, some people answered questions about conventional meat first, while others answered questions about plant-based or cultured meat first.

Attitudes toward the behavior of purchasing each type of protein was measured by a 4-item, 5-point semantic differential scale with bipolar adjectives such as good/bad, positive/negative, and beneficial/harmful. The Cronbach's alpha for attitude was acceptable for all meat options (conventional = .940; plant-based = .933, cultured = .951). Subjective norms were measured by a 4-item, 5-point Likert-type scale, ranging from strongly disagree to strongly agree for all meat options. For example, "The people important in my life, whose opinions I value, buy [meat type] on a regular basis," was one of the statements used to measure subjective norms. The Cronbach's alpha for subjective norms was acceptable for all meat options (conventional = .922; plant-based = .873, cultured = .922). PBC was measured by a 5-item semantic differential scale for conventional and plant-based alternative meat with bipolar statements asking respondents if their purchase was "possible for me/not possible for me" or "in my control/not in my control." The Cronbach's alpha for PBC was acceptable (conventional =

.855; plant-based = .820). All scales ranged from 1-5 points, with a mean close to 1 indicating a negative attitude, low PBC, or low social norm, and a mean close to 5 indicating a positive attitude, high PBC, or high social norm. Finally, current and future purchasing intent was measured by a dichotomous (yes/no) variable for both conventional and plant-based meat. The questions simply asked respondents if they currently purchased each type of meat or planned to in the future. The same dichotomous variable was used for the future purchasing intent of cultured meat. To address validity, a panel of research experts in agricultural communication, agricultural economics, and meat science reviewed the instrument prior to a soft launch, which helped to ensure the instrument was free from and errors and to test reliability of scales used.

Descriptive analyses were used in objective one to describe the means and standard deviations for attitudes toward purchasing, subjective norms, and PBC. Frequencies and percentages are reported for purchasing intent. Furthermore, a series of paired t-tests were used to compare variables between the different meat options. To analyze objective two, logistic regression was used to determine how the theory of planned behavior variables predicted current and future purchasing intent for the three different possible meat options.

## **Results**

### **Objective 1: Describe and compare attitudes toward purchasing, social norms, and PBC, and current and future purchasing intent of meat options**

Attitudes toward purchasing, subjective norms, and PBC were the highest for conventional meat in comparison to the other meat options (Table 1). Additionally, attitudes toward purchasing and social norms were higher for alternative plant-based meat options than cultured meat. When statistically compared, significant differences were observed for all comparisons ( $p = .000$ , unless otherwise noted in Table 1), but the effect sizes varied. The difference between social norms for conventional and cultured meat had a high effect size ( $d = .879$ ). Moderate effects were observed for social norms ( $d = .604$ ) and PBC ( $d = .588$ ) between conventional and plant-based meats. All other differences had effect sizes that fell below the moderate range. When looking at purchasing intent (Table 2), 87.0% of respondents reported currently purchasing conventional meat, and a 2.3% increase was observed for future purchasing. Current purchasing intent for plant-based meat was reported by 22.4% of respondents, but 49.4% of participants expressed intent to purchase plant-based meats in the future. However, only 10.9% reported future intent to purchase cultured meat.

**Table 1***Descriptive results of attitudes, social norms, PBC*

	Conventional <i>M(SD)</i>	Plant-Based <i>M(SD)</i>	Cultured <i>M(SD)</i>
Attitude	3.68(1.10) <sup>a*b**</sup>	3.56(1.11) <sup>c**</sup>	2.91(1.22)
Social Norms	3.98(0.91) <sup>a**b**</sup>	3.11(0.96) <sup>c**</sup>	2.71(1.01)
PBC	4.41(0.74) <sup>a**</sup>	3.79(0.93)	

*Note.* Perceived variable control not measured for cultured meat

<sup>a</sup> – significant difference between conventional and plant-based

<sup>b</sup> – significant difference between conventional and cultured

<sup>c</sup> – significant difference between plant-based and cultured

\* –  $p < .05$

\*\* –  $p = .000$

**Table 2***Descriptive results of current and future purchasing intent*

	Yes		No	
	<i>n</i>	%	<i>n</i>	%
	<i>Conventional</i>			
Regularly purchase	1087	87.0	163	13.0
Plan to purchase in the future	1116	89.3	134	10.7
	<i>Plant-Based</i>			
Regularly purchase	280	22.4	970	77.6
Plan to purchase in the future	617	49.4	633	50.6
	<i>Cultured</i>			
Plan to purchase in the future	136	10.9	1114	89.1

**Objective 2: Determine how attitudes toward purchasing, social norms, and PBC predict current and future purchasing intent of meat options**

Logistic regression was used to determine how the theory of planned behavior variables predicted current and future purchasing intent for the three different possible meat options. A model of current purchasing intent was not formulated for cultured meat as the product is not currently available for consumers to purchase. For conventional and plant-based meat, attitude, subjective norms, and perceived behavior control were the independent variables and current or future purchasing intent was the dependent variable. For cultured meat, the independent variables

and dependent variable (future purchasing intent) were the same except for PBC. This independent variable was omitted because the product is not yet available; thus, participants would have no control over the behavior of purchasing cultured meat.

In each model, the independent variables were all found to be significant predictors of current and future purchasing intent. In the current purchasing models (Table 3), attitude toward the purchase of plant-based meat was found to be the strongest predictor of current purchasing intent ( $B = .952, p < .01, OR = 2.59$ ). These results indicated that for every one-unit increase in attitude toward purchasing—individuals were 2.59 times more likely to intend to purchase plant-based meat. When looking at conventional meat, subjective norms was the strongest predictor of current purchasing intent ( $B = .835, p < .01, OR = 2.31$ ). For every one-unit increase in subjective norms, participants were 2.31 times more likely to intend to purchase conventional meat. Attitude toward purchasing was a stronger predictor of current purchasing intent for plant-based meat than conventional meat. However, subjective norms and PBC were stronger predictors of intent for conventional meat than plant-based meat.

**Table 3**  
*Logistic regression of current purchase intent*

Predictor	Conventional			Plant-based		
	<i>B</i>	<i>S.E.</i>	OR	<i>B</i>	<i>S.E.</i>	OR
Attitude	.803**	.105	2.23	.952**	.112	2.59
Subjective Norms	.835**	.115	2.31	.538**	.106	1.71
PBC	.784**	.122	2.19	.625**	.121	1.87
Chi-square		313.30			354.46	
<i>df</i>		3			3	
-2 log likelihood		654.56			975.36	
Cox and Snell pseudo R2		.222			.247	
N		1250			1250	

In the future purchasing models (Table 4), attitude toward the purchase of plant-based meat was once again found to be the strongest predictor ( $B = 1.28, p < .01, OR = 3.58$ ). For every one-unit increase in attitude, participants were 3.58 times more likely to intend to purchase plant-based meat in the future. Attitude toward purchasing intent was found to be the strongest predictor for the future purchase of cultured meat as well ( $B = 1.10, p < .01, OR = 3.01$ ), with a one-unit increase indicating participants were 3.01 times more likely to purchase cultured meat in the future. Although subjective norms were the strongest predictor of current purchasing intent for conventional meat, attitude was the strongest predictor for future purchasing intent ( $B = .1.07, p < .01, OR = 2.91$ ). For each unit increase attitude, participants were 2.91 times more likely to

purchase conventional meat in the future. Attitude and subjective norms were weaker predictors for the future purchasing conventional meat than plant-based and cultured meat. However, PBC was a higher predictor for conventional meat than plant-based meat.

**Table 4**  
*Logistic regression of future purchase intent*

Predictor	Conventional			Plant-based			Cultured		
	<i>B</i>	<i>S.E</i>	OR	<i>B</i>	<i>S.E</i>	OR	<i>B</i>	<i>S.E</i>	OR
Attitude	1.07**	.121	2.91	1.28**	.102	3.58	1.10**	.142	3.01
Subjective Norms	.756**	.131	2.13	.973**	.111	2.65	1.04**	.159	2.83
PBC	.765**	.130	2.15	.463**	.101	1.59			
Chi-square		310.50			688.88			293.57	
<i>df</i>		3			3			2	
-2 log likelihood		541.05			1043.78			566.42	
Cox and Snell pseudo R2		.220			.424			.209	
N		1250			1250			1250	

### Discussion and Recommendations

This study aimed to use the TPB attributes to better understand consumer buying intent regarding conventional, cultured, and plant-based meat, which can help the agricultural industry make strategic decisions in this changing marketplace. In terms of the descriptive results of attitudes, subjective norms, and PBC, significant differences between meat options were found. The biggest difference was observed between the subjective norms of conventional and cultured meat. This difference could be related to the fact that conventional meat has always existed, meaning there are subjective norms likely tied to the product, and cultured meat is yet to hit the market. The idea also relates to past research, as Verbeke et al. (2015) and Slade (2018) found most consumers were unwilling to try cultured meat. Slade (2018) also noted that consumers had a higher preference for conventional meat. Moreover, Tomiyama et al. (2020) proposed using “behavioral science, technology, science communication, and policy” for full acceptance of cultured meat, which shows how consumers would need to be convinced of this new product since they see it differently than conventional meat (p. 151).

Furthermore, a moderate significant difference in PBC can be seen between conventional and plant-based meat options. Ajzen (2006) defined PBC as the “perceived ease or difficulty of performing the behavior” (p. 1). These results show a difference between perceived ability to purchase these meat options, which is noteworthy. Past research has found consumers more interested in environmental issues, as well as animal welfare, are more likely to purchase plant-based meat (He et al., 2020). If consumers had conflicting views with these ideas, this could

affect the PBC of choosing between plant-based and conventional options. Additionally, views regarding the nutritional value of these products, as some are very processed and contain larger amounts of sodium, could also play a role in some consumers' control regarding buying these products for themselves or their families or friends (Roos, 2019). Price, availability, and familiarity with the products and how to prepare them may have also contributed to the results. Particularly, the conventional meat shortages observed during the pandemic, reportedly led more consumers to consider buying plant-based meat products, which also could relate back to PBC (Nierenberg, 2020).

Future buying intent of conventional, cultured, and plant-based meat also yielded interesting results. The highest percentage of consumers answered that they either regularly purchase or will purchase conventional meat. A larger percentage of consumers noted wanting to purchase conventional meat products in the future, compared to the percentage who said they regularly purchase now. Although, it was interesting that almost half of consumers said they would likely purchase plant-based options in the future. This result could have been influenced by the meat shortages with the coronavirus pandemic (Nierenberg, 2020) or may be indicative of a changing consumer preference or consumer curiosity (Hwang et al., 2020). Moreover, only about 10% of these participants said they would purchase cultured meat in the future. These findings are not surprising, as research has shown consumers' hesitation regarding cultured products—finding them disgusting, unnatural, scary, or risky (Verbeke et al., 2015).

This study also found attitude, subjective norms, and PBC about purchasing intent to be significant predictors of current and future purchasing intent regarding conventional and plant-based meat. This finding is supported by the Hoeskma et al. (2017) study that found attitudes, subjective norms, and PBC to have a positive association with the intention to buy mobile slaughter unit meat. Moreover, Spence et al. (2018) and Lorenz et al. (2015) also found the TPB attributes to play a role in consumer purchasing intent.

Additionally, the current study found attitude toward the purchase of plant-based meat to be the strongest predictor of current purchasing intent. This result is similar to the Spence et al. (2018) finding that attitude was the most significant predictor of intentions to purchase traceable meat products, which had some aspects of transparency similar to the marketing of plant-based meat. In addition, Lorenz et al. (2015) also found attitude to affect intent to buy conventional pork as well. This study finding suggests consumers use their attitudes to decide if they intend to buy plant-based meat products, which would make sense due to the fact of its newer place in the market. The strength of attitude as a predictor of plant-based meat may also be reflective of those who historically have chosen alternatives because of animal welfare, environmental, health, or diet concerns (He et al., 2020). It is likely that there are maybe not as many social pressures to try this newer meat option compared to conventional meat.

In terms of conventional meat, subjective norms were the strongest predictor of current purchasing intent. In the Spence et al. (2018) study, subjective norms were the second highest determinant of intention to purchase. And, Lorenz et al. (2015) also found subjective norms to impact purchase of regional pork—these norms also came secondary to attitudes in this study. This finding is also noteworthy because, in Table 1, a high effect was found, in terms of subjective norms, between conventional and cultured meat. Furthermore, a moderate effect was also found to be significant between conventional and plant-based meats here. These findings suggest that subjective norms, a “perceived social pressure to perform or not to perform the behavior” play a significant role in the intent to purchase conventional meat (Ajzen, 1991, p. 188). This result could relate back to conventional meat being the conventional option that has

typically been consumed and preferred in most Western diets. Previous research has shown attitude to be the strongest predictor of purchases (Lorenz et al., 2015; Spence et al., 2018) and this deviation from typical results warrants further investigation and monitoring as it may suggest less long-term stability in intent to purchase especially as purchasing norms change.

With future purchasing intent, attitude was the strongest predictor of both plant-based and cultured meats. Thus, suggesting that those who intend to purchase these products have strong, and perhaps, unchangeable attitudes. Moreover, this idea again relates back to previous literature, as Spence et al. (2018) and Lorenz et al. (2015) both found attitude to be the most significant predictor of purchase. However, in terms of conventional meat, subjective norms were found to be the strongest predictor for future purchase intent.

## Recommendations

Using these results, the food and agricultural industry can better understand consumer buying intent, which can allow them to plan for the future marketplace. Those involved with communications for conventional meat should shape advertising by including social aspects to messaging as this will highlight the subjective norms driving purchase intent. As researchers have suggested, improving upon the product, while addressing some of the claims that plant-based and cultured products claim to combat—animal welfare and the environment—conventional products can stay relevant (Bonny et al., 2015, Grunert et al. 2004; Novoselova et al. 2007; Polkinghorne et al., 2008). Conventional meat producers need to pay attention to consumer interests and focus marketing on the attributes consumers already like with this product. For those involved with plant-based or cultured meat, they should focus on developing consumer attitudes toward the new products to shape current or future buying intent. This can be done by framing messaging and focusing on other marketing efforts. Those in the food and agricultural industry need to focus on consumer needs and values, as purchasing intent was found in this study to be shaped mostly by attitudes and others' perceived opinions of products.

Future research should be gathered regarding what shapes consumer attitudes toward meat options. In addition, more research should be conducted on consumer attitudes specifically, as well as how companies can use their advertising to affect those attitudes. Subjective norms that influence these purchases should also be further explored. For example, what social pressures exist with conventional meat products, and how can the industry use strategic messaging to compete in the future? Or if the strong social pressures to buy conventional meat weaken, how will purchases be impacted? Actual purchases of differing meat options, rather than purchasing intent, could be another interest of future research. Furthermore, this research should not only include consumer interests and thoughts toward the product but also elements of the adoption process. Studies could use the Diffusion of Innovations theory, for example, to explore this idea and the adoption of alternative meat products. However, those in the food and agricultural industry should consider the noted TPB attributes and effect on purchasing when advertising and creating their future products.

## References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ajzen, I. (2006). Perceived behavioral control, self-efficacy, locus of control, and the theory

- of planned behavior 1. *Journal of Applied Social Psychology*, 32(4), 665-683.  
<https://doi.org/10.1111/j.1559-1816.2002.tb00236.x>
- Ajzen, I. (2015). Consumer attitudes and behavior: the theory of planned behavior applied to food consumption decisions. *Italian Review of Agricultural Economics*, 70(2), 121–138.  
<https://doi.org/10.13128/REA-18003>
- Baker, R., Brick, J. M., Bates, N. A., Battaglia, M., Couper, M. P., Dever, J. A., Gile, K. J., & Tourangeau, R. (2013). *Report of the AAPOR task force on non-probability sampling*. American Association for Public Opinion Research.  
[https://www.aapor.org/AAPOR\\_Main/media/MainSiteFiles/NPS\\_TF\\_Report\\_Final\\_7\\_revised\\_FNL\\_6\\_22\\_13.pdf](https://www.aapor.org/AAPOR_Main/media/MainSiteFiles/NPS_TF_Report_Final_7_revised_FNL_6_22_13.pdf)
- Basha, M. B., Mason, C., Shamsudin, M. F., Hussain, H. I., & Salem, M. A. (2015). Consumers attitude towards organic food. *Procedia Economics and Finance*, 31, 444–452.  
[https://doi.org/10.1016/S2212-5671\(15\)01219-8](https://doi.org/10.1016/S2212-5671(15)01219-8)
- Bonny, S. P. F., Gardner, G. E., Pethick, D.W., & Hocquette, J. F. (2015). What is artificial meat and what does it mean for the future of the meat industry. *Journal of Integrative Agriculture*, 14, 255-263. [https://doi.org/10.1016/S2095-3119\(14\)60888-1](https://doi.org/10.1016/S2095-3119(14)60888-1)
- Burton, R. J. F. (2019). The potential impact of synthetic animal protein on livestock production: The new “war against agriculture”? *Journal of Rural Studies*, 68, 33-45.  
<https://doi.org/10.1016/j.jrurstud.2019.03.002>
- Cargill. (2020, January 24). *Protein innovation: Cargill invests in cultured protein*. [Press release]. <https://www.cargill.com/story/protein-innovation-cargill-invests-in-cultured-meats>
- Driessen, C., & Korthals, M. (2012). Pig towers and in vitro meat: Disclosing moral worlds by design. *Social Studies of Science*, 42(6), 797-820. <https://doi.org/10.1177/0306312712457110>
- Fiala, N. (2008). Meeting the demand: An estimation of potential future greenhouse gas emissions from meat production. *Ecological Economics*, 67(3), 412-419.  
<https://doi.org/10.1016/j.ecolecon.2007.12.021>
- Graça, J., Oliveira, A., & Calheiros, M. M. (2015). Meat, beyond the plate. Data-driven hypotheses for understanding consumer willingness to adopt a more plant-based diet. *Appetite*, 90, 80–90. <https://doi.org/10.1016/j.appet.2015.02.037>
- Grunert, K. G., Bredahl, L., & Brunsø, K. (2004). Consumer perception of meat quality and implications for product development in the meat sector—a review. *Meat Science*, 66(2), 259-272. [https://doi.org/10.1016/S0309-1740\(03\)00130-X](https://doi.org/10.1016/S0309-1740(03)00130-X)
- Hwang, J., You, J., Moon, J., & Jeong, J. (2020). Factors affecting consumers’ alternative meats buying intentions: Plant-based meat alternative and cultured meat. *Sustainability*, 12(14), 5662. <https://doi.org/10.3390/su12145662>
- He, J., Evans, N. M., Liu, H., & Shao, S. (2020). A review of research on plant-based meat alternatives: Driving forces, history, manufacturing, and consumer attitudes. *Comprehensive Reviews in Food Science and Food Safety*, 5, 2639. <https://doi-org.proxy.lib.ohio-state.edu/10.1111/1541-4337.12610>
- Hoeksma, D. L., Gerritzen, M. A., Lokhorst, A. M., & Poortvliet, P. M. (2017). An extended theory of planned behavior to predict consumers’ willingness to buy mobile slaughter unit meat. *Meat Science*, 128, 15–23. <https://doi.org/10.1016/j.meatsci.2017.01.011>
- Kateman, B. (2020, February 17). Will cultured meat soon be a common sight in supermarkets

- across the globe? *Forbes*. <https://www.forbes.com/sites/briankateman/2020/02/17/will-cultured-meat-soon-be-a-common-sight-in-supermarkets-across-the-globe/?sh=2658e4947c66>
- Lee, H. J., Yong, H. I., Kim, M., Choi, Y. S., & Jo, C. (2020). Status of meat alternatives and their potential role in the future meat market - A review. *Asian-Australasian Journal of Animal Sciences*, 33(10), 1533–1543. <https://doi.org/10.5713/ajas.20.0419>
- Lorenz, B. A., Hartmann, M., & Simons, J. (2015). Impacts from region-of-origin labeling on consumer product perception and purchasing intention - causal relationships in a TPB based model. *Food Quality and Preference*, 45, 149–157. <https://doi.org/10.1016/j.foodqual.2015.06.002>
- Newburger, E. & Lucas, A. (2019, September 2). Beyond Meat uses climate change to market fake meat substitutes. Scientists are cautious. *CNBC*. <https://www.cnbc.com/2019/09/02/beyond-meat-uses-climate-change-to-market-fake-meat-substitutes-scientists-are-cautious.html>
- Nierenberg, A. (2020, May 22). Plant-based ‘meats’ catch on in the pandemic. *The New York Times*. <https://www.nytimes.com/2020/05/22/dining/plant-based-meats-coronavirus.html>
- Novoselova, T. A., Meuwissen, M. P. M., & Huirne, R. B. M. (2007). Adoption of GM technology in livestock production chains: an integrating framework. *Trends in Food Science & Technology*, 18(4), 175-188. <https://doi.org/10.1016/j.tifs.2006.12.005>
- Payne, C. L. R., Scarborough, P., and Cobiac, L. (2016). Do low-carbon-emission diets lead to higher nutritional quality and positive health outcomes? A systematic review of the literature. *Public Health Nutrition*, 19, 2654–2661. <https://doi.org/10.1017/S1368980016000495>
- Pimentel, D., & Pimentel, M. (2003). Sustainability of meat-based and plant-based diets and the environment, *The American Journal of Clinical Nutrition*, 78(3), 660S-663S. <https://doi.org/10.1093/ajcn/78.3.660S>
- Piper, K. (2019, March 22). The unlikely partnership that might decide the future of meat. *Vox*. <https://www.vox.com/future-perfect/2019/3/22/18273892/tyson-vegan-vegetarian-lab-meat-climate-change-animals>
- Polkinghorne, R., Thompson, J. M., Watson, R., Gee, A., & Porter, M. (2008). Evolution of the Meat Standards Australia (MSA) beef grading system. *Australian Journal of Experimental Agriculture*, 48(11), 1351-1359. <https://doi.org/10.1071/EA07177>
- Popper, N. (2019, February 9). You call that meat? Not so fast, cattle ranchers say. *The New York Times*. <https://www.nytimes.com/2019/02/09/technology/meat-veggie-burgers-lab-produced.html>
- Reiley, L. (2019, August 25). Veggie burgers were living an idyllic little existence. Then they got caught in a war over the future of meat. *The Washington Post*. <https://www.washingtonpost.com/business/2019/08/25/veggie-burgers-were-living-an-idyllic-little-existence-then-they-got-caught-war-over-future-meat/>
- Rockers, A., Stollar, M., Rumble, J. N., Specht, A. R., Buck, E. B., Hu, W., & Knipe, C. L. (2021, May 24-27). *Consumers’ information seeking preferences regarding meat and meat alternatives* [Paper presentation]. American Association for Agricultural Education, National Conference, Virtual Conference.
- Roos, O. (2019, October 13). Is fake meat better for you, or the environment? *NBC*

- News. <https://www.nbcnews.com/news/us-news/fake-meat-better-you-or-environment-n1065231>
- Slade, P. (2018). If you build it, will they eat it? Consumer preferences for plant-based and cultured meat burgers. *Appetite*, 125, 428-437. <https://doi.org/10.1016/j.Appet.2018.02.030>
- Spence, M., Stancu, V., Elliott, C. T., & Dean, M. (2018). Exploring consumer purchase intentions towards traceable minced beef and beef steak using the theory of planned behavior. *Food Control*, 91, 138-147. <https://doi.org/10.1016/j.foodcont.2018.03.035>
- Stephens, N., Silvio, L. di, Dunsford, I., Ellis, M., Glencross, A., & Sexton, A. (2018). Bringing cultured meat to market: technical, socio-political, and regulatory challenges in cellular agriculture. *Trends in Food Science & Technology*, 78, 155–166. <https://doi.org/10.1016/j.tifs.2018.04.010>
- Sternlicht, A. (2020, May 4). Alternative meat sales soar amid pandemic. *Forbes*. <https://www.forbes.com/sites/alexandrasternlicht/2020/05/04/alternative-meat-sales-soar-amid-pandemic/?sh=50bf2c6bedfd>
- Tomiyama, A. J., Kawecki, N. S., Rosenfeld, D. L., Jay, J. A., Rajagopal, D., & Rowat, A. C. (2020). Bridging the gap between the science of cultured meat and public perceptions. *Trends in Food Science & Technology*, 104, 144–152. <https://doi.org/10.1016/j.tifs.2020.07.019>
- U.S. Census Bureau. (2020). *Quick Facts: Ohio*. Retrieved from <https://www.census.gov/quickfacts/OH>
- van der Weele, C., Feindt, P., van der Goot, A. J., van Mierlo, B., & van Boekel, M. (2019). Meat alternatives: An integrative comparison. *Trends in Food Science & Technology*, 88, 505-512. <https://doi.org/10.1016/j.tifs.2019.04.018>
- van der Weele, C., & Tramper, J. (2014). Cultured meat: Every village its own factory? *Trends in Biotechnology*, 32(6), 294-296. <https://doi.org/10.1016/j.tibtech.2014.04.009>
- van Vliet, S., Kronberg, S. L., & Provenza, F. D. (2020). Plant-based meats, human health, and climate change. *Frontiers in Sustainable Food Systems*, 4, 128. <https://doi.org/10.3389/fsufs.2020.00128>
- Verbeke, W., Marcu, A., Rutsaert, P., Gaspar, R., Seibt, B., Fletcher, D., & Barnett, J. (2015). ‘Would you eat cultured meat?’: Consumers' reactions and attitude formation in Belgium, Portugal and the United Kingdom. *Meat Science*, 102, 49–58. <https://doi.org/10.1016/j.meatsci.2014.11.013>
- Westhoek, H., Lesschen, J. P., Rood, T., Wagner, S., De Marco, A., Murphy-Bokern, D., Leip, A., van Grinsven, H., Sutton, M. A., & Oenema, O. (2014). Food choices, health and environment: Effects of cutting Europe’s meat and dairy intake. *Global Environmental Change*, 26, 196–205. <https://doi.org/10.1016/j.gloenvcha.2014.02.004>
- Wida, E. C. (2020, March 5). These popular fast-food chains are all serving plant-based meats. *Today*. <https://www.today.com/food/all-popular-fast-food-chains-offering-plant-based-meats-t171328>
- Wilks, M., & Phillips, C. J. (2017). Attitudes to in vitro meat: A survey of potential consumers in the United States. *PloS One*, 12(2), e0171904. <https://doi.org/10.1371/journal.pone.0171904>