

**A Qualitative Exploration of the Perceptions of Cellular Grown Meat and Seafood with
Virginia Tech Students**

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Abstract

The emergence of cultivated meat and seafood has the potential to transform the food science industry, particularly in the context of shifting consumption patterns influenced by health, ethical, and environmental concerns. This qualitative study explored the socio-ethical factors that shape college students' perceptions of cultivated meat, utilizing Social Cognitive Theory (SCT) to examine how cognitive processes shape social interaction and how environmental factors influence behavior. Semi-structured interviews were conducted with Virginia Tech students from the College of Agriculture and Life Sciences, Natural Resources and Environment, and Science. Findings revealed a dominant preference for traditional meat, shaped by sensory expectations, cultural traditions, and distrust of unfamiliar technology. Limited exposure, lack of trusted role models, and unclear information reduced students' confidence and outcome expectations. Despite this, many expressed conditional openness, highlighting the importance of transparent communication, institutional trust, and social modeling. The study recommends targeted education, clear labeling, and visible endorsement by trusted figures to improve acceptance. These insights can inform marketing, policy, and educational strategies aimed at fostering sustainable food choices.

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General Audience Abstract

Cultivated meat and seafood, grown from animal cells rather than harvested from live animals, are emerging as an innovative alternative to traditional meat. While these products could help address health, ethical, and environmental concerns, many people are still unsure about them. This study looks at what influences how college students feel about cultivated meat, focusing on Virginia Tech students studying agriculture, natural resources, and science. Using interviews the research explored students' beliefs, social environment, and outside influences shaped their opinions. Many students preferred traditional meat, often due to cultural traditions, expectations around taste and texture, and hesitations about unfamiliar food technologies. Most had little exposure to cultivated meat and lacked trusted sources to guide their understanding. Still, many were open to trying it, especially if information was clear, labeling was honest, and trusted figures or institutions supported it. The study recommends that cultivated meat can be introduced better to the public through education, marketing, and outreach. These suggestions are designed to help researchers, educators, and companies to encourage informed and sustainable food choices in the future.

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Chapter 1: Introduction

The development of cell-based meat and seafood has the potential to significantly transform the food science industry and address the challenges posed by traditional meat production (Reis et al., 2020). The shift in meat consumption varies between regions, with the most substantial rise occurring in economically advancing areas like Asia and Latin America. Regions like Europe and North America have seen stable or slightly declining consumption levels in recent years, driven by concerns surrounding human health, animal welfare, and environmental impact (Godfray et al., 2018). To meet future demand for meat production, food systems and their linked supply chains require transformative changes rather than just incremental improvements (Chen et al., 2022; Stoll-Kleemann & O’Riordan, 2015). The traditional approach of scaling up livestock-based meat production demands substantial resources such as land, water, and crops, raising concerns about its long-term sustainability (Stoll-Kleemann & O’Riordan, 2015).

As the world's total consumption of meat has significantly increased over the past fifty years and will likely continue to keep rising, the impact on the environment and public health becomes a growing concern (World Economic Forum, 2019; Food and Agriculture Organization Statistics Food Supply: Livestock and Fish, 2019). The technological innovation of cell-based meat has the potential to address several of the major ethical, environmental, and public health concerns associated with conventional meat production (Bryant & Dillard, 2019). These potential advancements include addressing various challenges in current livestock production, reducing the environmental impact of farming, concerns about animal welfare and slaughter, and enhancing meat safety and healthiness. Although, some of these potentials have been debated over time, they remain an essential focus area for sustainable development (Bhat & Fayaz, 2010;

Hocquette, 2016; Munteanu et al., 2021). Cell-based meat offers a range of potential benefits, but a clear understanding of this innovation is essential for its successful introduction.

Cell-based meat has been defined as muscle grown meat without the involvement of raising and slaughtering livestock, but it is still meat at the cellular level (Stephens et al., 2018). The commonly used names for the resulting product include cultured, *in vitro*, synthetic, artificial, laboratory grown, and factory grown meat (Asioli et al., 2021; Verbeke et al., 2015). The term “cultivated meat” will be used in the present paper.

In the realm of social science research, a growing number of published studies have focused on sociological, moral and ethical, and philosophical arguments around the creation of cultivated meat (Bryant & Barnett, 2020 ; Gaydhane et al., 2018 ; Pluhar, 2009 ; Verbeke et al., 2015). Despite the significance of the topic, there is limited understanding regarding the potential consequences of cell-based technology in the United States, particularly those that play a significant role in the meat industry (Chen et al., 2022). Several published studies have taken a comprehensive approach, focusing on the technological advancement and challenges associated with cultivated meat, and how it can be addressed within the realm of natural sciences research (Guan et al., 2021; Hadi & Brightwell, 2021; Ramani et al., 2021). Apart from this, the question about its acceptability by consumers must be addressed (Verbeke et al., 2015). Given the limited market availability in the US, the reaction of consumers to cultivated meat remains uncertain, leaving unanswered questions about its acceptance and adoption as a novel food.

Consumer attitudes towards cultivated meat are an important determinant of the success of the innovation, but they first need to understand the broader implications before accepting it (Saavoss, 2019). When analyzing the consumer market, it is crucial to understand consumers’ attitudes and perceptions towards cultivated meat, specifically amongst young adults. Dietary

behaviors in young adulthood tend to be more individualized, reflecting the increased control that individuals have over their everyday lives, including their food choices (Hackman & Knowlden, 2014). Although there is limited market availability, consumer insights will be invaluable for future marketplace acceptance (Goodwin & Shoulders, 2013). A prominent theme highlighted in prior research on the acceptance of cultivated meat is the evaluation of both the advantages and drawbacks for individuals and society (Bryant & Barnett, 2020). Different age groups may prioritize societal implications versus personal considerations differently. Younger participants focused more on personal interaction with cultivated meat, while older participants considered broader societal transitions (Van Der Weele & Driessen, 2019).

The purpose of this qualitative study is to examine socio-ethical factors that influence students' perceptions of cultivated meat and seafood. Further examining students' subjective knowledge and how this might change their perception of cultivated meat is essential for understanding and shaping future consumer behavior. The proposed audience for data collection is Virginia Tech college students, 18 years or older, in the College of Agriculture and Life Sciences and the College of Natural Resources and Environment.

Problem Statement

Younger consumers' perceptions of cultivated meat have not been extensively studied, but exploring their attitudes is important, especially considering that young adults typically exhibit more flexible dietary habits and are more likely to consume meatless meals (Ruzgys & Pickering, 2020). As cultivated meat grows, researchers are exploring ethical and societal dilemmas of cultivated meat. While earlier works have been useful in eliciting some of the ethical and societal concerns surrounding cultivated meat (Hopkins & Dacey, 2008; Pluhar, 2009; Van Der Weele & Driessen, 2019), there have been few studies subjecting cultivated meat

debates to more detailed discursive analysis examining how different socio-ethical dilemmas are actively shaping how consumers perceive and understand the technology. As startup companies such as Mosa Meats, Memphis meats, BlueNalu, and Wildtype are at the forefront of creating cultivated meat, there is a dire need to make sure it is worth the time and investment. This research is especially necessary given the increasing investments in this technology by companies like Tyson Foods (*Tyson Logo*, 2018) and Cargill (Bunge, 2017). These companies have long been invested in traditional livestock production methods, making their transition towards cultivated meat technology as a sector within their company especially noteworthy. Consumer attitudes are an important determinant of the success of the industry, given the uncertain reaction of consumers in the US due to its limited market availability. This uncertainty leaves unanswered questions about the acceptance and adoption of cultivated meat as a novel food (Saavoss, 2019).

The research questions guiding this work is:

1. What are college students' perceptions of cultivated meat?
 - 1a. What factors influence college students' perceptions of cultivated meat?
 - 1b. What socio-ethical factors do college students share when discussing their perceptions of cultivated meat?

Reflexivity

Growing up in Richmond, Virginia, in a suburban neighborhood, I found myself harboring a deep fascination for animals and nature. Despite this innate curiosity, my opportunities to explore these passions were limited during my formative years. While my parents grew up in rural areas, with my father growing up on a 200-acre farm in North Carolina, my direct exposure to such environments was sporadic, relegated to occasional visits.

Nonetheless, these visits formed the bedrock of my childhood memories, steeped in the rich history of the land tended by my grandparents and great-grandparents who were farmers. My passion for animals prompted me to ponder its origins, leading me to embark on a journey of self-discovery. This experience catalyzed my decisions to pursue higher education in animal sciences with a concentration in livestock and a minor in biodiversity conservation, broadening my perspective on agriculture and its multifaceted intersections.

Throughout my academic journey, I delved into diverse research realms, such as animal behavior, private land conservation among marginalized communities, and various branches of social science. As my understanding of social dynamics deepened, I recognized the significance of agriculture in shaping our collective impact on the world. Considering pressing global challenges such as food security, climate change, and systemic policy change, I felt compelled to explore avenues for meaningful intervention. It was that thought process that gravitated me towards cellular agriculture (cultivated meat), an emerging field that has the potential to revolutionize the food landscape. This innovative approach holds immense potential in addressing critical issues like food security and climate change. However, its success relies on widespread acceptance, particularly among the upcoming generation of consumers, college students like me, who are poised to play a pivotal role in shaping the future of food consumption. Common ground was shared with most participants in this study as a current student in the College of Agriculture and Life Sciences and as a member of an organization focused on agriculture and natural resources. I aimed to understand the social dynamics and moral considerations that college students have that might influence their perceptions of cultivated meat.

Chapter 2: Literature Review

The food science industry may experience a significant and impactful change because of the development of cultivated meat (Ellies-Oury et al., 2022). According to Shen and Chen (2020), cultivated meat represents a major innovation within the agri-food industry, with potential to significantly alter conventional agricultural practices, food supply chains, and market dynamics. Research further suggests that broader and structural shifts, including challenges within traditional livestock sectors and evolving societal values, will also shape the future of food production (Böhm et al., 2018; Heidemann et al., 2020). It is essential to dissect this topic to observe and analyze the potential underlying impacts of growing cultivated meat.

Understanding the nuances of consumer acceptance and the implications on the moral and social fabric of society, particularly among college students, can benefit the broader implications of its continuous development. College students ages 18–25 will be used as the demographic for this work. College-aged students are known for their receptiveness to new ideas and social movements, which plays a crucial role in shaping the trajectory of societal attitude towards cultivated meat (Hall, 2013). Moral considerations and ethical concerns surrounding animal welfare and environmental sustainability significantly influence consumer acceptance of cultivated meat (Verbeke et al., 2015). The social environment within college campuses, characterized by diverse perspectives and advocacy for ethical consumption, further amplifies discussions around the adoption of alternative food technologies like cultivated meat (Sexton et al., 2019). Examining the interplay between morality, social environment, and acceptance among college students is paramount in understanding the broader implications of cultivated meat adoption on the food industry and society at large.

Introduction to Cultivated Meat

Cultivated meat and seafood is typically grown from live animal cells in a lab. This is muscle-grown meat without the involvement of raising and slaughtering livestock but is still meat at a cellular level (Stephens et al., 2018). This innovation is accomplished by the application of biotechnology, tissue engineering, molecular biology, and synthetic procedures. Cultured muscle tissue is not considered meat but can be called an alternative product of postmortem biochemistry (Rischer et al., 2020). Scientists are currently experimenting to see which way of growing cultivated meat is the most efficient. There are still several issues with functional engineering, such as whether cell-based meat can offer necessary vitamins and minerals to the same degree as traditional meat (Faustman et al., 2020). Although the necessity of replicating the nutrients received through traditional meat is important, this is not the only problem with cultivated meat development. The showcasing of the first cultured hamburger led by Dr. Mark Post exemplifies this as it was produced for \$325,000 and required two years to produce (Faustman et al., 2020). This study reveals that cultivated meat is in the process of being placed on the market everywhere, but production must be just as efficient as traditional meat. This dilemma has led to more than 34 companies getting involved with efforts to produce cultivated meat at a more affordable and impactful rate (Faustman et al., 2020).

Cultivated Meat: A Brief Timeline

The idea of cultivated meat is not new, but there have not been techniques to produce it until recently. The concept of cultivated meat appears to have been initially introduced in 1897 in the science fiction novel titled “Auf Zwei Planeten,” and was subsequently referenced in several other novels throughout the 19th century (Hildreth & Hildreth, 2023). In 1931, Winston Churchill predicted that the absurdity of growing an entire chicken to consume specific parts like the breast

or wing would be bypassed by cultivating these parts separately in a suitable medium, foreseeing the use of synthetic food in the future (Flood, 2023). In the late 1990s, Willem van Eelen was the first applicant to file the patent for cultivated meat manufacturing methods leading to NASA making the first attempt to grow goldfish meat within a laboratory as a part of its food production research in space (Hildreth & Hildreth, 2023). Leading to 2005, the Dutch government allotted funds for two research projects on cultivated meat and the medical research team, Mark Post, and Google's cofounder, Sergei Brin, joined together to accelerate its development.

After years of research and development, cultivated meat made its widely public debut in 2013, where food critics were served the first ever cultured hamburger made from cattle stem cells (A Brief History of the Cultivated Meat Industry, 2023). This debut marked the growing investments in startups in the cultivated meat industry, which provided innovators and young cultivated meat companies with the resources to take the next step in refining their products and moving them closer to consumers' plates. Some of these companies include Memphis Meats (chicken nuggets, beef, meatballs, duck tissue), Blue Nalu (mahi-mahi, red snapper, yellowtail), and Finless Foods (bluefin tuna) (Dent, 2020). Cultivated meat companies have also been found broadly ranging across five other continents including Israel (43), United Kingdom (17), and Singapore (12). Roughly 60% of the companies concentrate on formulating and manufacturing products, while the remaining entities specialize in various components of laboratory processes, including the development of cell culture media, maintenance of bioreactors, and optimization of ingredients (Benson & Greene, 2025). With various newly developing products around the world, questions remain about the future of cultivated meat production and its implementation.

Policies and Regulations

Navigating the emerging landscape of cultivated meat involves understanding the intricate web of policies and regulations governing its development, production, and commercialization. The United States and Singapore are the only countries that allow cultivated meat products to be sold to consumers. The Singapore Food Agency approved the sale of GOOD Meat cell-cultivated chicken in the country in December 2020 (Waltz, 2021). In June 2023, Food Safety and Inspection Service granted final premarket approval to GOOD Meat and Upside Foods for the production and sale of cultivated chicken in the United States (Waltz, 2021).

From February 2018 to February 2019, a heated debate unfolded between Congress, the Food and Drug Administration (FDA), and the United States Department of Agriculture (USDA) regarding which agency should regulate cultivated meat products. The United States Cattlemen's association (USCA) petitioned the USDA to establish meat labeling requirements excluding products not directly derived from slaughtered animals from being labeled as beef or meat (U.S. Cattlemen's Association, 2018). The USDA initially asserted sole jurisdiction over meat and poultry, while the FDA argued its authority under the Federal Food, Drug, and Cosmetic Act. A congressional appropriation bill proposed USDA regulation of cultivated meat, but this provision was not enacted (Office of the Commissioner, 2018). Amidst the debate, the Good Food Institute advocated for collaboration between the FDA and USDA in regulating cultivated meat. Eventually, the agencies jointly hosted a public meeting to address the use of cultivated meat technology in meat production (FDA 2018). Regulatory oversight was divided between the FDA and USDA, with the FDA responsible for overseeing the cell development process and the USDA taking over during food processing (FDA, 2019). FDA evaluated the safety of cultivated meat through its premarket consultation process, while the USDA oversaw processing facilities

and labeling (Office of the Commissioner, 2021). The labeling of cultivated meat became a focal point with various proposed terms, including “lab-grown meat,” “clean meat,” and “cultivated meat.” Consumer preferences and industry agreements influenced labeling decisions, with the USDA ultimately approving the term “cell-cultivated chicken” for products developed by UPSIDE Foods and GOOD Meat (Plumb, 2022).

Despite regulatory challenges and debates over terminology, cultivated meat made its market debut in 2023, with UPSIDE Foods and GOOD Meat becoming the first companies to receive premarket clearance for their products. This marked a significant milestone in the regulatory landscape surrounding cultivated meat products (“GOOD Meat Gets Full Approval in the U.S. for Cultivated Meat,” 2023). During the 2024 legislative sessions, four states—Alabama, Arizona, Florida, and Tennessee—considered bills aimed at banning the manufacture, sale, or distribution of cell-cultured meat. Florida and Alabama successfully passed the legislation, and their governors signed it into law (Stone, 2024).

Framing Consumer Acceptance

One of the main factors that innovations like cultivated meat bring is acceptance by consumers, which must be addressed and compared to more traditional livestock production methods for human consumption. A significant obstacle involves pinpointing the genuine and perceived advantages and drawbacks associated with cultivated meat and its production techniques, while also ensuring transparency regarding which entities (such as primary producers, industries, individual consumers, or society at large) are impacted by them (Verbeke et al., 2015). Recent research highlights that cultivated meat, as a novel agri-food innovation, could reshape industry dynamics by influencing both consumer behavior and traditional meat production practices (Shen & Chen, 2020). The lack of data on the technology surrounding

cultivated meat has professed agnosticism or skepticism toward cultivated meat, but participants noted that they were not fully committed to their positions (Chiles, 2013).

Identifying issues impacting consumer acceptance of novel agri-food technologies, especially when compared to cultivated meat, provides valuable comparative material for future analysis (Chiles, 2013; Frewer et al., 2011; Rollin et al., 2011). Consumers seem to view the act of implementing a technology as contradictory to their fundamental attitudes and values, and they express this perceived contradiction when they perceive food as ‘unsafe’ or ‘risky’ (Verbeke et al., 2007). Technology related perceptions that influence rejection or acceptance typically relate to the product itself (product properties and price), social trust and norms (trust in institutions or industry, cultural norms, prior attitudes towards technology, and environmental attitudes, etc.), and marketing strategies to increase public acceptance. These have been shown to play a significant role in shaping consumers’ attitudes towards agri-food technologies (Siegrist, 2008). Comparative findings suggest that consumer perceptions of cultivated meat are strongly influenced by its positioning as a sustainable alternative, though barriers such as unfamiliarity and skepticism persist (Fu et al., 2023). This can be compared to consumers’ apprehension toward cultivated meat. They hesitate to fully trust this technological advancement, their skepticism is fueled by uncertainty about what cultivated meat can offer them on a personal level (Van Der Weele & Driessen, 2019).

Another concern relates to the perceived healthiness or consequences for personal health from eating cultivated meat. Cultured products have the potential to be safer and healthier than conventional animal-based products as conventional meat is the most common food source linked to contamination from pathogens or fatal infections (Chriki & Hocquette, 2020).

However, studies show that consumer hesitancy is often heightened by first impressions and food technology neophobia, particularly when visual information about cultivated meat appears unfamiliar (Baum et al., 2023). Consumers may become concerned about potential risks associated with producing and distributing a new “technological” product that hasn’t undergone validation or assessment for its impact on human health (Olmedilla-Alonso et al., 2013). Willingness to try novel foods has also been found to best be predicted by disgust attributes in novel animal and nonanimal foods among consumers (Martins & Pliner, 2005). As seen with barriers to adopting plant-based meat alternatives (Jähn et al., 2021), the introduction of cultivated meat is likely to spark controversy. Its widespread acceptance may depend on a gradual understanding of cultivated meat benefits and drawbacks, coupled with assurances from reliable public authorities and market stakeholders (Verbeke et al., 2015).

Trust in the regulatory system and science, along with public involvement and awareness greatly influences the acceptance of new agri-food technologies like cultivated meat. Cognitive associations tied to the technology’s name or processes, such as terms like “in vitro” or “artificial,” can affect perceptions and evoke thoughts about cultivated meat. Ethical considerations which involve animal welfare (which can aid in the favor of cultivated meat), and socio-cultural differences also impact consumer reactions as alternative meat can be perceived as tampering with nature (Hopkins & Dacey, 2008; Verbeke et al., 2007). A recent segmentation study found that messaging around cultivated meat must be framed to resonate with consumers’ values and reduce resistance based on ethical or naturalness concerns (Szejda et al., 2021). It was also determined that technologies labeled as “bioactive,” in particular, elicit significant concerns among individuals. The rising concern of agri-food technology is primarily due to apprehensions regarding potential unpredictable consequences, the risk of unregulated utilization, and ethical

consideration, rather than perceptions of unnaturalness or unfamiliarity (Frewer et al., 2011). In addition to these intrinsic concerns, external factors such as information delivery, media portrayal, and communication strategies have been found as determinant of consumer acceptance or rejection; as well as consumers' objective (factual) and subjective (perceived) knowledge (Rollin et al., 2011). A social media analysis found that online discourse frames cultivated meat as a futuristic, sustainable solution or as a natural, risky alternative, influencing acceptance trends (Pilařová et al., 2022).

Morality in Cultivated Meat Production

While cultivated meat is not yet commercially available, consumers' perceptions of it are starting to take shape. Evaluating consumers' perceptions of the ethics behind cultured meat is a crucial step in addressing the development of this new food product. Cultivated meat is being advocated as a technological means of addressing environmental, human health, and animal welfare problems (Bhat & Fayaz, 2010; Dilworth & McGregor, 2014; Hopkins & Dacey, 2008). If this technology is successful it is expected to use less resources (water direct and indirect use), result in less greenhouse gas emissions, cause less suffering for animals, and address public health issues (Dilworth & McGregor, 2014; Tuomisto & De Mattos, 2011). As this will be addressed in more detail below, this technological advancement has been promoted as a solution for the future of the planet and its growing population. Opponents to this development view cultivated meat as a distraction from the responsibility for modifying our consumption habits in the present (Miller, 2012).

Animal Welfare

Academic literature concerning cultivated meat advocates for a future with diminished animal suffering, eliminating the necessity for factory farms and often questionable treatment of animals associated with them (Bhat & Fayaz, 2011; Treich, 2021; Welin, 2013). The suffering inflicted during stem cell collection from animals is minimal compared to that experienced by animals in traditional meat production. The procedure, typically conducted under local or complete anesthesia using a biopsy syringe, lasts only a few minutes and carries a low risk of long-term complications (Melzener et al., 2021). This idea draws attention to various concerns that inform ethical lifestyles such as vegetarianism, as it has prompted a shift of the relation between meat and slaughtering animals. The foundation of moral concern to adopt veganism is centered around animal welfare, climate change, and health (Beck and Ladwig, 2020; Alvaro, 2017; Ismirili and Philips 2011; Radnitz et al., 2015). Concepts such as modest ethical veganism believe that it is immoral to use animals for food when equal plant-based alternatives are readily available (Alvaro, 2017).

College students that are vegans have the highest level of concern about killing animals because of the ethical implications about life termination, not related to suffering during slaughter (Izmirli and Phillips, 2011). While some vegetarians may be open to cultivated meat due to potential health and ethical benefits, others who have developed strong emotional aversions to meat itself are unlikely to support it, regardless of its benefits (Hopkins, 2015). As the discussion shifts towards cultivated meat as a potential solution to alleviate such concern, it becomes apparent that some individuals may be receptive to its benefits, and others with deeply ingrained moral objections to meat consumption itself may remain skeptical, thus emphasizing a significant gap in the literature on perceived moral concern of cultivated meat.

The Ethics of Sustainability

Conventional meat production and consumption are linked to various environmental concerns. In terms of sustainability, cultivated meat offers environmental benefits that are less ecologically damaging compared to current production methods, such as factory farming (Swartz, 2021; Tuomisto & De Mattos, 2011; Welin, 2013). These notions draw on the ethics of sustainability that suggest:

“Societies that have a good quality of life have an obligation to ensure both future societies and contemporary...for future generations it means ensuring the availability of a wide range of resources: nature, cultural, education, foods, clean air and water, etc.”
(Kibert et al., 2011, p. 6).

Arguments in favor of cultivated meat believe that it may reduce the environmental impact caused by current meat production methods (Datar & Betti, 2010). While there is a moral imperative to eat in environmentally responsible ways, the empirical evidence supporting the claim that cultivated meat is less environmentally damaging is not conclusive (D'Silva, 2013). Although the initial life cycle assessment has indicated that cultured meat might offer superior environmental benefits, the authors recognize that this conclusion relies on various uncertainties and assumptions (Tuomisto & De Mattos, 2011). For instance, stem cells present challenges in obtaining an appropriate cell source for cultivated meat production, which have environmental implications primarily due to the resource intensive nature of the process (Zhang et al., 2020). These uncertainties need to be considered when marketing to diverse consumers. Promotional appeals should emphasize the effectiveness of addressing environmental concerns, while remaining mindful of potential misconceptions about the products environmental impact (Fraj & MartíNez, 2006). Substitution of “unethical food” with one that is more sustainably ethical

would be meaningless if it can be argued that consumption of this food is unnecessary in the first place and should be eliminated overall on a functional level, assuming that conditions of availability and affordability are met (Neo, 2014).

Food Equity

To address concerns of food equity, one must take into accounts the ways in which the production and distribution of cultivated meat may support equitability and access to food that is safe, nourishing, and culturally acceptable, regardless of socioeconomic status or geographic location. The creation of alternate food sources has been hindered by worldwide deforestation and environmental degradation associated with traditional meat production, which exacerbates the world food crisis (Alexander et al., 2017; Barrett, 2010). Numerous advocates of cultivated meat emphasize its potential to enhance food security, proposing that lab-grown products could alleviate severe food shortages by offering an affordable protein source to meet the increasing demand for meat (Bhat & Fayaz, 2010; Laestadius, 2015; Verbeke et al., 2015). The primary potential barrier to the widespread adoption of cultivated meat is its extremely high prohibitive cost, although large scale production and market penetrations typically lead to a substantial price decrease (Bhat et al., 2019).

As discussed earlier, the adoption of cultivated meat has been subject to debate. The development of cultivated meat technology, according to critics of the food security narrative, may give priority to satisfying the moral concern of the rich while ignoring the pressing needs of the underprivileged (Dilworth & McGregor, 2014). Questions have been raised on what could happen if less developed countries can't export meat to richer countries, or if it will affect producing feed crops for animal agriculture, considering the development of cultivated meat production (Dilworth & McGregor, 2014; Welin, 2013). Additional concerns arise regarding the

scalability of cultivated meat technologies and their potential to pose a threat to the social, economic, and cultural well-being of ranchers, farmers, and rural communities (Newton & Blaustein-Rejto, 2021). Some authors propose that cultivated meat may evolve into an expensive niche product satisfying the ethical desires of the rich rather than becoming a cheap protein for the world's poor (Cole & Morgan, 2013; Metcalf, 2013).

Social Environment Influence on Food Choice

Fully understanding the impact of social and food environments on people's food choices necessitates qualitative research into how people make decisions regarding food choices in the context of their lived economic and social realities (Turner et al., 2018). The social and food environments play a pivotal role in shaping individuals' food choices, and this influence is equally important when considering the acceptance and adoption of novel food technologies like cultivated meat. Social facilitation, a well-documented phenomenon, explores how the presence of others can enhance or impair individual performance depending on task complexity, individual traits and social context (Strojny et al., 2020; Van Meurs et al., 2022). Recent research extends this phenomenon beyond physical gatherings, showing that even virtual or perceived social presence can shape eating behaviors and performance outcomes (Strojny et al., 2020; Van Meurs et al., 2022). These results are further shaped by individual traits, such as social orientations or sensitivity to external feedback, which can determine how strongly a person responds to being observed (Uziel, 2006).

It has been concluded that sources of peer pressure for consuming foods can come from family and friends (Nestle et al., 2009). Participants identified that social facilitation leads to lower levels of food consumption when people eat alone and to higher levels when eating occurs

in a group setting (Nestle et al., 2009). Hardcastle et al. (2015) strengthens this point by examining how food choice values are shaped by social and psychological influences; their study suggests that individuals, particularly frail adults, may rely more on social networks such as family, friends, and neighbors for guidance, rather than society on personal preferences like taste, cost, or dietary beliefs. Just as social facilitation affects consumption patterns through peer pressure, family traditions, and cultural norms, similar dynamics can be expected to influence how people approach cultivated meat.

Food Choice in College-Aged Students

The transition from high school to college is a developmental time for young adults. In the absence of a parent or guardian, young adults are tasked with making decisions, solving problems, and shouldering all the responsibilities that were once overseen by parents or guardians by utilizing their social environment and ethics (Dhillon et al., 2019). Influences on food choice amongst college students include intrapersonal factors, social environment, and physical environment (Deliens et al., 2014; Vilario et al., 2017). Intrapersonal factors are described as characteristics of an individual such as knowledge, behavior, and self-concept (McLeroy et al., 1988).

Students often perceive their generation as more health-conscious than previous ones. However, the growing availability of fast-food options has been identified as a barrier to maintaining a healthy lifestyle for some students (Sogari et al., 2018). Interaction with students' food environment on campus is mediated by their subjective norms that governed their eating behavior before college along with the new normative beliefs acquired in a new social environment (Dhillon et al., 2019). Most of their eating occurs in the company of others and is

frequently seen as a pleasurable aspect of their cultural experience (Rozin, 2005). The desire to affiliate is a form of modeling proposed to develop a social bond with one's eating companion (Cruwys et al., 2015; Exline et al., 2012; Robinson et al., 2011).

Food choices can significantly predict college students' self-esteem, with social modeling playing an important role; specifically, greater susceptibility to modeling the eating behaviors of others has been associated with lower self-esteem (Fielder-Jenks, 2010; Robinson et al., 2011). Based off the study, college-aged individuals adjusted their food intake based on the amount eaten by a peer in an online interaction, and this relationship was also influenced by self-esteem (Bevelander et al., 2013). This pattern of peer influence through social media highlights the need for deeper explorations of how online social interactions shape behavior, an especially relevant topic in today's digital age.

This social context is particularly important when introducing novel food technologies like cultivated meat. Studies show that younger consumers are more likely to engage with alternative proteins when they are presented in familiar socially accepted ways (Szejda et al., 2021; Giezenaar, 2023). College students often rely on peer groups, cultural values, and social environments to guide food-related decisions, meaning that cultivated meat may face resistance if introduced without strong social modeling or community-based messaging. The perceived unfamiliarity or “unnaturalness” of cultivated meat can heighten food technology neophobia among this demographic, especially when peer norms do not validate its consumption (Baum et al., 2023). However, interventions that increase familiarity and align cultivated meat with traditional food practices, such as taste, appearance, or preparation, can significantly improve perceptions and willingness to try it (Fidder, 2023).

Social marketing has been found to be a potential tool for influencing food choices. It involves using marketing principles for noncommercial purposes such as promoting healthy eating (Harker et al., 2010). Information on healthy eating can lead to misunderstanding or contradicting presumptions about food, which can lead to varying degrees of understanding about food and nutrition and ultimately influence consumption patterns (Daly et al., 2021). The quality of diet advice given online rarely matches evidence-based guidance (Daly et al., 2021). Social media exposure in adolescents is linked with more body dissatisfaction, body image concerns, and with more disordered eating habits (Daly et al., 2021; Holland & Tiggemann, 2016). Adolescents who see their friends or celebrities exhibiting body standards may become dissatisfied with their own body type (Daly et al., 2021). Adolescents acknowledge the impact of social media on various aspects of their diet and nutrition, making it easier for them to give into unhealthy diet trends (Daly et al., 2021; Depa et al., 2019; Mousa et al., 2010).

Family Structure

Students believe that the change in daily rhythm from once living with their parents (more structured) to now living in dorms (less structured) has influenced their eating habits (Deliens et al., 2014). The mother or guardian typically plays a vital role in planning, purchasing, and preparing the meals for the child every day (Wright et al., 2015). In short, “mothers’ food-work” is essential for comprehending how familial eating habits are related because the association between social origins and children's food consumption established the foundation for how the child will view food choice in the future (Oncini & Guetto, 2016). Children's dietary compliance is influenced by social origins, even when a common measure in society, such as school meals, intervenes in their nourishment (Oncini and Guetto, 2016).

Multiple studies have indicated that “bad food choice” are a result of an individuals’ social class, social network, and family influence (Enríquez & Archila-Godínez, 2021; Nestle et al. 2009; Ocini and Guetto, 2016). Based on the study, families of higher socioeconomic status were able to spend more time together during meals, which is associated with healthy eating habits (Neumark-Sztainer et al., 2003). Enríquez & Archila-Godínez (2021) suggest that poor food choices can result from external stimuli, particularly when individuals are stressed, excited, or exposed to environments rich in the smells of high calorie foods. Recent studies indicated that over 90% of undergraduate students consume less than the recommended servings of fruits and vegetables per day, highlighting the persistent gap in meeting dietary guidelines. Additionally, only 5.6% of college students report consuming more than five servings of fruits and vegetables (Longyear et al., 2018) Compared to independent students, students living in the family home consume more vegetables and fruit, suggesting family structure affects dietary habits (Harker et al., 2010b).

These early family influences not only shape students’ food preferences but also affect how they perceive unfamiliar food technologies such as cultivated meat. Students from more traditional or food secure households may be more hesitant to adopt novel food products that deviate from familiar practices. Conversely, those from more food insecure or flexible eating backgrounds may be more open to alternative if cultivated meat is positioned as affordable, sustainable, or health-promoting (Fu, 2023; Szejda, 2021). This suggests that cultivated meat communication strategies must account for early family socialization and how it informs current food values, trust, and risk perception (Circus, 2019; Egolf, 2019). Efforts to improve consumer acceptance may benefit from framing cultivated meat in ways that align with family-centered

values, such as safety, traditions, and care while also introducing it as a part of future oriented habits.

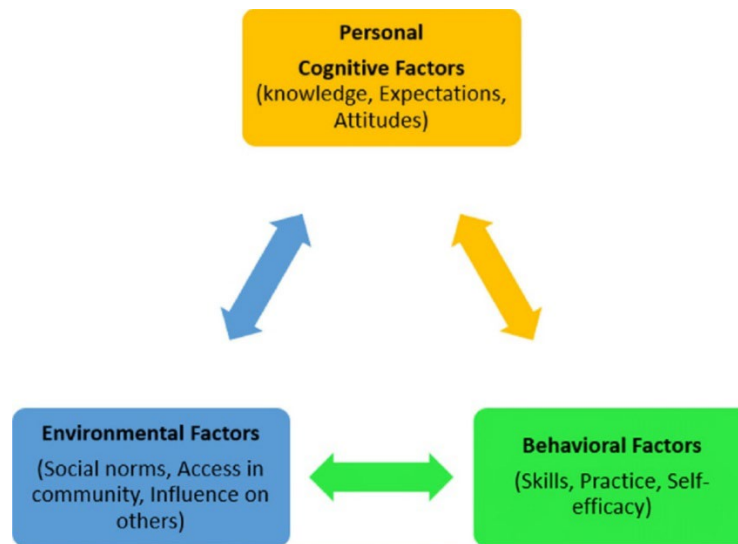
Theoretical Framework

The study employs Social Cognitive Theory (SCT), see Figure A, to explore how cognitive processes shape social interaction and how environmental factors influence behavior (Schunk, 2011). By using SCT, the research aims to gain insight into participants' perceptions of cultivated meat and seafood. SCT provides a framework to analyze how symbolic communication influences human thought, affect, and action through directly and socially mediated pathways (Bandura, 2001). It explains human behavior through triadic reciprocal causation, where behavior, cognitive factors, and environmental events interact bidirectionally (Bandura, 1988; Schunk & Usher, 2012). Key motivational processes in SCT include goal setting, self-evaluation, outcomes expectations, values, social comparisons, and self-efficacy, which influences task choices, effort, persistence, and achievement (Bandura, 1991; Schunk & Usher, 2012). It posits that individuals are agents who influence their own functioning and life circumstances, rather than merely being products of them (Bandura, 2008).

SCT's applicability across various fields underscores its versatility and significance in understanding and influencing human behavior. In mass communication, SCT has been used to analyze the social diffusion of new behaviors and the psychosocial factors governing their adoption and spread through social networks (Bandura, 2001). In information science, SCT has been used to study information-seeking behavior, knowledge sharing, and workplace learning, highlighting its interdisciplinary applicability (Middleton et al., 2018). Based on the literature, the use of SCT has been successful in one application using a qualitative content analysis investigating social media discourse surrounding the topic of cultured meat in the U.S. (Specht et

al., 2020). Given these applications, SCT is particularly relevant for examining how college students' social networks, cultural norms, and personal values interact to influence their perceptions of cultivated meat, especially concerning ethical considerations such as animal welfare, environmental sustainability, and food technology trust.

Figure A: Social Cognitive Theory



Observational Learning (Modeling)

Social Cognitive Theory emphasizes the importance of observing and modeling the behaviors, attitudes, and emotional reactions of others. This concept positions that learning can occur in a social context purely through observation, even without direct reinforcement (Bandura et al., 1961; Bandura et al., 1963). The effectiveness of observational learning is influenced by the characteristics of the model. Models that are perceived as similar, competent, and successful are more likely to be imitated (Ma et al., 2020). Observing a modeled event leads to the formation of cognitive constructs, which shape future behaviors. This means that individuals

form mental representations of observed behavior, which guide their future actions (Devi et al., 2017). Learning is shaped by the continuous reciprocal interaction between personal factors, behavioral patterns, and environmental influences. Individuals gain knowledge from their environment which includes observing and modeling others' behaviors and attitudes (Devi et al., 2017).

The effectiveness of observational learning depends on several processes: attention (noticing the behavior), retention (remembering what was observed), motor reproduction (ability to replicate the behavior), and motivation (having a reason to imitate the behavior) (Bahn, 2001). Studies based on SCT, including observational learning, have been shown to significantly improve healthy eating behaviors, such as increased fruit and vegetable consumption among students (Anderson et al., 2007; Najimi & Ghaffari, 2013b). Observational learning is also important in educational settings to enhance students' self-regulated learning, motivation, and academic performance. Effective modeling by teachers can promote better learning outcomes and self-efficacy among students (Devi et al., 2017; White, 2017). This concept, known as vicarious reinforcement, is crucial in understanding how observational learning can lead to behavior change without direct reinforcement (Hidayat & Ramli, 2019; Thompson, 2008). When individuals observe successful models and see those behaviors rewarded (vicarious reinforcement), their self-efficacy strengthens, increasing the likelihood of behavior adoption, as demonstrated in education and health settings (Hidayat & Ramli, 2019; Ma et al., 2020; White et al., 2015). In the context of cultivated meat, observational learning may influence college students' perceptions if they see peers, influencers, or public figures positively endorsing or adopting cultivated meat products, thereby normalizing these choices and reducing social stigma associated with alternative proteins.

Self-Efficacy and Outcome Expectations

Self-efficacy plays a significant role in shaping an individual's attitudes, behaviors, and decision-making processes, including how they engage with emerging technologies like cultivated meat. Social cognitive theory posits that self-efficacy is a fundamental mechanism influencing self-regulation, motivation, and personal agency, which can affect how students' approach and discuss topics like food innovation (Bandura, 1991; Pajares, 2002; Zimmerman, 2000).

Individuals with higher self-efficacy tend to exhibit greater motivation and perform better across a range of tasks (Pajares, 1996; Van Der Bijl et al., 2001). In academic contexts, students with higher self-efficacy are more likely to explore new interests, form well-defined opinions, and engage in critical discussions about topics relevant to personal and societal values (Betz & Hackett, 1981; Lent et al., 1994), including topics like environmental sustainability and ethical food production.

An individual's self-efficacy is shaped by four primary sources: performance accomplishments, vicarious experiences, verbal persuasion, and physiological states. These sources interact to build confidence in one's abilities and influence future performance (Bandura, 1997; Schunk, 1989). In SCT, self-efficacy is part of a broader self-regulative system that governs moral conduct. This system enables individuals to monitor their behavior, assess it against personal and societal standards, and react emotionally to their actions (Bandura, 1991). Environmental factors such as support and barriers indirectly shape individuals' choices, goals, and actions by influencing their sense of self-efficacy. In this way, self-efficacy serves as a mediator between contextual factors and behavioral outcomes, highlighting how external influences can affect motivation and persistence through internal beliefs (Lent et al., 2017).

In SCT, outcome expectations refer to the anticipated consequences of one's actions (Bandura, 1978). Bandura's theory often distinguishes between efficacy expectations (beliefs in one's ability to perform a task) and outcome expectations (belief in the results of performing a task) (Teasdale, 1978; Rollnick & Heather, 1982; Williams, 2010). Self-efficacy is posited to influence outcome expectations, meaning that individuals who believe in their capabilities are more likely to expect positive outcomes from their actions (Compeau et al., 1999; Williams, 2010). Outcome expectations are derived from various sources, including personal mastery, verbal persuasion, vicarious learning, and affective experiences. These sources also significantly influence self-efficacy, which in turn affects outcome expectations (Lent et al., 2017; Schaub & Tokar, 2004). In educational and career contexts, outcome expectations play a crucial role in shaping students' and adolescents' aspirations and choices, particularly in STEM fields (Compeau et al., 1999; Schunk & DiBenedetto, 2023). Applied to this study, understanding how college student's self-efficacy and outcome expectations influence their perceptions of cultivated meat can reveal important social and ethical drivers of acceptance or resistance, including trust in food innovations, sustainability concerns, and personal agency in ethical consumption.

To effectively explore college students' perceptions of cultivated meat, SCT provides a useful framework for developing the interview protocol. SCT emphasizes the role of personal, environmental, and behavioral factors in shaping behavior (Bandura, 1986). In this context, interview questions can assess students' self-efficacy (their belief in their ability to choose cultivated meat), outcome expectations (their beliefs about the benefits or risks), and the influence of social modeling (how peers and societal norms impact their choices). By aligning interview questions with SCT constructs, this approach ensures a deeper understanding of the cognitive, social, and environmental drivers influencing student's decisions.

Research Gap

Most existing studies on cultivated meat perceptions rely on quantitative models like the Theory of Planned Behavior (TPB), which structures studies on food-related behaviors (Dupont & Fiebelkorn, 2020; Engel et al., 2024; Lin-Hi et al., 2022; Wilks & Phillips, 2017). While these models have contributed valuable insights into attitudes, intentions, and behaviors toward cultivated meat, they often rely on structured survey tools that reduce perceptions to isolated variables. As a result, these studies tend to offer surface level insights that may overlook the complex and socially embedded nature of food perceptions.

SCT provides a valuable framework for examining how personal factors, environmental influences, and behaviors interact to shape food-related choices (Anderson et al., 2007). Although SCT has been applied to a variety of health and behavior studies, its use in understanding perceptions of cultivated meat is very limited, especially in qualitative research settings. While these studies have advanced the understanding of cultivated meat acceptance, they primarily provide surface level insights, often missing the complex social and cognitive factors at play that could influence perceptions of the product. For instance, Shen (2020) and Quevedo-Silva and Pereira (2022) investigated purchase intentions through structured models but did not fully explore the interpersonal or environmental context in which those intentions form. Qualitative research using SCT can address this gap by examining how observational modeling, self-efficacy, and outcome expectations influence college students' attitudes toward cultivated meat.

Chapter 3: Methodology

Research Questions

Research Question: What are college students' perceptions of cultivated meat?

Sub Question 1: What factors influence college students' perceptions of cultivated meat?

Sub Question 2: What socio-ethical factors do college students share when discussing their perceptions of cultivated meat?

The purpose of this intrinsic case study was to examine socio-ethical factors that influence students' perceptions of cultivated meat (CM) (Yin, 2017). The location and audience for collecting information were Virginia Tech college students, 18 years or older, in the College of Agriculture and Life Sciences, the College of Natural Resources and Environment, and the College of Science. Based on the numbers of participants, interviews were conducted until data saturation was met. Data saturation was reached with nine participants, this happened when the ability to obtain new information has been attained, and when further coding is no longer needed (Fusch & Ness, 2015; Guest et al., 2005). Interviews were transcribed and coded to find recurring themes amongst all participants. This study was approved by the Virginia Tech Institutional Review Board #24-919.

Context of study

Virginia Tech, a public land grant university located in Blacksburg, Virginia, had a total enrollment of 31,035 undergraduate students and 7,129 graduate students. The study focuses on students from the three colleges within Virginia Tech: the College of Agriculture and Life Sciences (CALS), the College of Science (COS), and the College of Natural Resources and Environment (CNRE). As of recent data, CALS enrolled approximately 3,605 students, COS enrolled 5,659 students, and CNRE enrolled 1,320 students. These colleges were selected due to

their emphasis on life sciences, environmental studies, and sustainability, areas closely related to the topic of cultivated meat (Virginia Tech Institutional Data, 2025).

Virginia Tech's institutional culture, rooted in its land grants mission, emphasizes research, innovation, and community engagement. The university's motto, "Ut Prosim" ("That I May Serve"), reflects its commitment to societal impact. This ethos may influence students' openness to novel food technologies like cultivated meat, especially when framed within contexts of sustainability and ethical consumption.

Furthermore, Virginia Tech's diverse student body provided a rich environment for exploring varied perceptions and attitudes toward food innovations. These institutional and cultural factors are integral to understanding the social dynamics that shape student's perceptions of cultivated meat.

Research Design

A case study design allows holistic focus to be targeted on a situation within an existing natural setting (Butina et al., 2015; Creswell et al., 2007). A case study provided the setting for participants to encompass the problem, program, or activity, inviting holistic inquiry for exploration through methods like semi-structured interviews, documents, reports, and audio-visual materials (Creswell, 2014). In this setting, it was used to facilitate a deep exploration of the unique case of student perceptions regarding cultivated meat, particularly within the context of social and ethical factors (Johnson & Stake, 1996). The purpose of an intrinsic case study is not necessarily to learn about other cases or generalizable concepts but to gain an in-depth understanding of a unique case researched for its own sake and value (Johnson & Stake, 1996). Researchers commonly opt for exploratory methodologies when examining casual relationships, as was proposed in this study (Yin, 2010). It has been highlighted that case study methodology is

particularly suitable in situations where study participants' behaviors are not easily influenced, the contextual environment is critical to the phenomenon under investigation, the relationship between the phenomenon and its context is unclear, and the researchers aims to explore participants perceptions regarding "how" and "why" questions (Yin, 2009).

Recruitment

The criteria for participation included students at Virginia Tech, ages 18 years or older, who were currently enrolled in the College of Agriculture and Life science (CALS), the College of Natural Resources and Environment (CNRE), and the College of Science (COS). Recruitment was carried out by me via email, included in Appendix I, two times per week for two weeks through CALS departmental listservs, the Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS) general body listserv, and two CNRE/CALS class discussion boards made by professors within the college. Students were recruited from two in-person classes with a five-minute presentation based on instructor permission. These classes were selected based on their foundational focus on agricultural and food science knowledge. Students were provided with a summary of the purpose of the study and an invitation email was sent with a link provided to sign up for an interview timeslot. Professors were asked to either share the sign-up link with their classes or allow time during class for the research objective to be presented to the students at the beginning of class. These participants were selected because students from the CALS typically have a strong background in traditional agriculture practices, including animal science, plant biology, and food science. Students in the CNRE additionally bring knowledge about sustainability, environmental conservation, and resource management to the study. Students in the COS offer a unique perspective due to their familiarity with biotechnology and lab-based processes, as well as their frequent exposure to emerging

technologies. These diverse backgrounds offered different perspectives and insights into consumer preferences and behaviors. Their knowledge of these topics offered valuable insight into social aspects of the innovation of cultivated meat.

Data Collection and Instruments

The primary method of data collection was one-on-one semi-structured interviews with participants who met the participation criteria. Semi-structured interviews enabled reciprocity between the interviewer and participant (Galletta, 2013; Kallio et al., 2016), providing the opportunity to improvise follow-up questions based on participants' responses. The interview guide was used for a detailed exploration of participants' social environments, values, and beliefs (see Appendix II). The guide included questions based on SCT examining how observational learning, perceived self-efficacy, and outcome expectations influence college students' attitudes toward cultivated meat (Bandura, 2001; Schunk, 2011). Questions included opinions on 1) the development of cultivated meat and seafood; 2) factors of influence (social stigma, family structure, cultural background) reflecting observational modeling; and 3) external factors (availability, pricing, support, knowledge) aligned with environmental influences. The interview guide questions ensured that a similar range of topics was discussed in each interview. Also, follow-up questions were used to delve deeper into specific areas of interest and facilitate richer discussions (D. W. Turner, 2014). Interviews were concluded once data saturation was met. Interviews were transcribed verbatim, allowing for detailed analysis of participants' attitudes and social norms regarding cultivated meat (Krauss et al., 2014; Barriball & While 1994).

Before conducting the formal interview, a pilot interview was carried out to assess the clarity, flow, and effectiveness of the semi-structured interview protocol. The pilot was conducted with a Virginia Tech student who shared similar demographic characteristics to the

target population but was not included in the final study sample. This process helped me evaluate whether the questions were understandable, neutrally worded, and capable of eliciting in depth responses relevant to the research objectives. Feedback from the pilot interview led to minor revisions in question phrasing and order to improve the conversational flow and ensure alignment with the theoretical framework. Piloting the interview also allowed the researcher to practice active listening and refine follow-up prompts, thereby enhancing overall preparedness for the full data collections phase. The only question added after the pilot interview focused on the participants background in agriculture to provide additional context for interpreting their perspectives.

Interviews were conducted either in person or via zoom based on the preference of the participants and transcribed using Otter.ai transcription software (Otter.ai, 2025). For all interviews, a handheld recording device was used, along with a backup recorder on the computer. In person interviews were held in an academic building where most participants classes are typically held. This helped create a safe and familiar environment, allowing interviewees to feel comfortable sharing their perceptions (Roiha & Iikkanen, 2022). Pseudonyms were assigned to each participant to protect their identity and ensure confidentiality throughout the research process.

Participants were required to read a brief fact sheet about cultivated meat at least 24 hours before their scheduled interview so that they all had access to the same information (see Appendix III). The information was adapted from a published scientific article (Stephens et al., 2018). The fact sheet included a definition of cultivated meat, an explanation of how it differs from conventional meat, a step-by-step overview of the production process, and a summary of its

current market status. This approach supported more informed and reflective discussions, particularly given the varying levels of prior knowledge among participants.

Participant Profile

A total of nine were included in this study ranging from 21-37 years in age. Details about participants are provided in Table 1. It is important to note that exposure to agriculture varied, with some participants growing up on farms and others gaining experience later during their academic years. Knowledge of cultivated meat also differed, with some participants learning about it as early as high school, while others became familiar with it more recently, in the past couple of years.

Table 1:

Participant Information

Participant	Current Major/ Background	Year of Study and Degree	Gender	Grew up on Farm?	In person or zoom interview
Maria	Wildlife Conservation Background: Animal and poultry sciences; avian science; animal welfare	Third Year PhD	Female	No	In person

Iyana	Soil, Plant and Environmental Sciences Background: Biology; plant sciences	Fourth Year PhD	Female	No	Zoom
Cameron	Biochemistry Background: Minimal exposure to agriculture or food technology	Third Year Undergraduate	Female	No	In person
James	Biological Sciences Background: Exposure to agricultural knowledge	Fourth Year PhD	Male	No	In person
Jenifer	Agriculture Sciences/	Fourth Year Undergraduate	Female	Yes	In person

	Education				
	Background: Agriculture and livestock production				
Catherine	Agricultural, Leadership, and Community Education Background: International agricultural development; Agricultural communications	Fourth Year PhD	Female	Yes	In person

Keith	Agricultural, Leadership, and Community Education Background: Laboratory animal science; agricultural education	Second Year PhD	Male	Yes	In person
Ciera	Agricultural, Leadership, and Community Education Background: Worked on farms/gardens; urban forest	First Year Masters	Female	No	Zoom

Krysten	Agricultural; Leadership; and Community Education Background: Animal science; animal lab; animal research; food safety	Second Year PhD	Female	No	Zoom
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Analysis

Thematic analysis was employed to systematically code the interview transcripts, allowing the identification and interpretation of key themes that emerged from the data (Braun & Clarke, 2012). All interviews were transcribed verbatim ensuring a complete and accurate representation of the participants' responses. Once audio transcripts were edited and double-checked for accuracy, they were imported into Atlas.ti to facilitate the coding process, ensuring thoroughness and consistency in the analysis (Atlas.ti, 2023). The transcripts underwent a detailed coding process, where data was organized into meaningful categories that reflected overall perceptions and socio-ethical influences. This process included open coding to identify initial codes, axial coding to explore relationships between codes, and selective coding that integrates themes that align with the research questions (Li & Zhang, 2022).

During the first cycle of analysis, line-by-line open coding was conducted to generate a comprehensive set of concepts that were relevant to the research question regarding CM perceptions (Glaser & Hon, 2016). A second coding cycle was conducted to identify connections between categories that emerged during open coding. Descriptions of the meanings behind the codes were written down and revised as necessary. During the third cycle of coding, the final themes and subthemes were developed to construct a representation of participant responses. The resulting themes were compared against existing literature to validate findings and provide a comprehensive understanding of the socio-ethical factors shaping college students' perceptions of cultivated meat (Creswell & Creswell, 2017). This analysis allowed for the exploration of nuanced perspectives and insights into the future acceptance of cellular agriculture among college students, contributing to implications for industry stakeholders, educators, and policymakers.

Trustworthiness

To ensure the trustworthiness of this qualitative study, several strategies were employed to uphold its rigor and integrity. Credibility was supported using peer debriefing, where a fellow researcher (the advisor) reviewed the coding and thematic development process. This collaborative engagement allowed for critical feedback, challenged potential biases, and helped ensure that the emerging interpretations were consistent and grounded in data (Tisdell et al., 2025). Confirmability was addressed through reflexive practices, including a written record of what was done throughout data collection and analysis process. This enabled awareness of personal assumptions and to document rational behind analytical decisions (Creswell & Poth, 2018).

To promote transferability, rich descriptions were provided regarding participants' backgrounds, age, gender, and if they grew up on a farm. These contextual details allow readers to assess the relevance and applicability of the study to other settings or populations (Lincoln & Guba, 1985). The use of direct quotations throughout the findings further contributed to both confirmability and transferability by showing how interpretations were grounded in participants' lived experiences. Together, these techniques fostered a strong foundation for the credibility and overall trustworthiness of this study.

Chapter 4: Findings

A total of 436 individual quotes were coded from nine transcripts. Results were organized by research questions, with the identified themes presented under each corresponding question. Theme development was triangulated using participant perspectives to ensure accuracy and depth of interpretation. As described in chapter three, the primary framework for this research is SCT (Bandura, 2001).

What are College Students' Perceptions of Cultivated Meat?

Theme 1: Perceptions and Preferences about Cultivated Meat

Theme overview. Participants' initial reactions to Cultivated Meat (CM) revealed a complex interplay between personal beliefs, sensory expectations, cultural norms, and family traditions. Across interviews, preferences were largely rooted in established behaviors and sensory familiarity with traditional meat. Participants often expressed “skepticism” about CM’s “processing,” “taste,” and “appearance,” while also acknowledging curiosity or cautious openness to trying it. This theme captures participants' perceptions regarding cultivated meat and their reasoning behind their preferences.

Sub-theme 1.1: Traditional vs Cultivated Meat Perception and Preference

Participants often compared cultivated meat to traditional meat, with a consistent preference for the latter. Cultivated meat was frequently perceived as being “less natural,” “more processed,” and “somewhat artificial,” leading to hesitation towards outright rejection. As Catherine explained, “but when it comes to food, I tend to think less processed is better...that is probably more of a negative perception that would deter me from purchasing it.”

These judgements reflect outcome expectations, showcasing participants anticipating negative sensory or health-related outcomes from consuming cultivated meat compared to traditional meat. While some expressed curiosity and willingness to try cultivated meat, their underlying comfort with conventional meat, based on familiarity, tradition, and sensory expectations like taste, texture, and appearance, dominated their preferences. Keith shared, “I think I would still reach for traditional meat...it’s just something that I’m comfortable with.” This reliance on familiarity socially reinforces choices that reflect observational learning and environmental influences, where modeled behavior (e.g., growing up eating traditional meat) shapes their food norms and preferences.

Participants shared their uncertainty about CM, acknowledging that CM may have potential benefits (e.g., control over nutritional content or sustainability), but the “unnatural” production process, lack of bones, and lack of knowledge about how it might taste made them lean towards traditional meat. Several participants referenced taste and texture uncertainties: “I feel like it probably wouldn’t taste as good traditional meat, but I really don’t know,” (Maria) while another imagined CM might resemble “how vegan, plant-based meat taste a little off... just is different.” (Iyana)

These examples highlight the importance of perceived behavioral outcomes SCT, as unfamiliar sensory characteristics and processing methods create uncertainty about the consequences of consumption. However, a minority of participants like Maria showed a neutral or positive openness, “no, lab grown doesn’t really scare me...I know there are ways to make things pretty comparable.” Here, SCT’s principle of self-efficacy is evident—these individuals felt confident in their ability to evaluate CM due to their knowledge of the process.

Sub-theme 1.2: Skepticism and Fear of New Technology

Skepticism emerged amongst participants, rooted in a lack of trust in the science and production behind cultivated meat. This skepticism often described as a “gut feeling” or “ick factor” demonstrates emotional arousal, an SCT mechanism that can deter adoption. “I’m pretty skeptical of any new invention...especially when it comes to food,” Ciera shared, while Krysten said, “sometimes they are formed in a way that looks really artificial, so just the appearance itself turns me off.” These concerns reflected their perceived risk and low outcome expectations, contributing to resistance and avoidance.

For some, the lab-based environment evoked concerns about cell propagation, microplastics, and artificial enhancements (Cameron, Jenifer, and Keith). Others worried about the scalability and transparency of cultivated meat production, questioning whether companies would prioritize ethics or profits (Krysten and Catherine). James asked questions such as “What nutrients are going into this meat? Where are they coming from?” exemplifying low perceived environmental control, further discouraging behavioral engagement.

Even among those open to the innovation, the uncertainty about what goes into cultivated meat, such as nutritional input, and how it's made contributed to general discomfort. This included both emotional responses and rational concerns. Some participants worried about potential “additives,” “growth hormones,” or unknown long-term health effects, such as “carcinogens...that can cause cancer in humans.” Another participant explained the uncertainty behind labels and what CM production plants would include on them:

“It includes a lot of additives that we are just unaware of, and you already have to read labels with everything. I just feel like with the traditional meat, that's just one less thing that I have to read, like one less label, because I see what I see, and I know what's in it,

even if they're pumping it up with nitrates to make it redder and things like that.”

(Krysten)

Sub-theme 1.3: Influences Behind Consumer Preference

Consumer preferences were closely linked to familial, cultural, and personal upbringing. Many participants were raised in agricultural or meat-consuming households, with deep ties to traditional food practices, especially in rural or farming contexts. Jennifer shared, “I’m a fifth-generation beef farmer...that definitely pushed me to consume more beef products.” This experience illustrates observational learning, where family behaviors and early food exposure serve as primary models of influencing adult preferences and food entities. For some, these values instilled a strong sense of what “real meat” is supposed to be, and cultivated meat deviated too far from that norm.

Participants also noted the role of cultural and ethnic food traditions, expressing doubt about how well cultivated meat could align with or replicate specific culinary needs (e.g., meat with bones and particular cuts). Iyana shared “just traditional foods...like pig feet and ears,” and Keith explanation of how his “mom’s family raised animals and processed them for their own meat,” illustrate how culturally embedded behaviors shape food expectations and preferences. James added, “culturally as a black person, we are skeptical about new technologies,” showing how collective historical experiences contribute to group level outcome expectations.

In some cases, the views of family and friends created internal conflict. “My family and friends do not want to eat cultivated meat...I don’t know if that’s influencing my opinion, but my opinion is the same,” illustrating SCT’s notion of reciprocal determinism, where individual attitudes are simultaneously shaped by contributing to the social environment.

What Factors Influence College Students' Perceptions of Cultivated Meat?

Theme 3: Confidence in Cultivated Meat

Theme overview. Participants' willingness to engage with CM was marked by both cautious interest and significant informational gaps. Rather than firm acceptance or rejection, many participants expressed a tentative openness. While some participants were curious and willing to try CM, their engagement was often dependent on factors like clarity about the production process, affordability, and trust in institutional motives. This theme illustrates how personal knowledge, modeled behavior, and the broader informational environment influences interact to influence individual decision making amongst participants.

Subtheme 3.1: Desire to Engage with Cultivated Meat

Although skepticism was present across many interviews, several participants expressed a genuine desire to learn more and engage with cultivated meat before forming a definitive opinion. Rather than outright rejection, these participants described a cautious curiosity indicating that more exposure, clarity, and transparency could positively shift their perceptions. This curiosity reflects the dynamic interplay of cognitive, behavioral, and environmental factors outlined in SCT. For some, the willingness to try cultivated meat was framed as a matter of fairness and open-mindedness. As Ciera stated, "Now, would I try it? Yes...I'm a person that feels like I can't down a product without trying." This openness was often coupled with a need for better understanding, particularly around the production process, ingredients, and industry motivations.

One of the most prominent influences was lack of observational learning. Several participants noted that the lack of public conversation and visibility around cultivated meat influenced some participants' hesitation. Maria noted, "It makes me more hesitant that more

people aren't talking about it...we're all social creatures." In SCT terms, the absence of modeled behavior such as peers trying cultivated meat, public figures endorsing it, or its presence in the media, reduced participants' likelihood of forming favorable perceptions or trying it themselves. Without vicarious experiences, cultivated meat remains abstract and unfamiliar.

The data reflected outcome expectations, where participants wanted to know what to expect if they tried cultivated meat, how it would taste, how much it would cost, and whether it was truly healthier or more sustainable. Cameron stated, "I need to know more to understand it." Positive outcome expectations that arose, such as nutritional benefits or environmental impact, could increase engagement, but uncertainty or perceived negative consequences (e.g., additives, high prices, loss of agricultural jobs) often dampened interest.

Self-efficacy, or individuals' belief in their ability to make informed decisions, also played a role. Some participants with backgrounds in agriculture or science felt confident in their ability to seek out reliable information and critically assess it. Ciera noted, "I think I would be able to decipher things like misinformation or a bad source." However, others highlighted a broader issue: the public may lack access to or understanding of technical information, suggesting that lower self-efficacy could hinder broader acceptance of cultivated meat.

Both physical and social environmental influences shaped how participants viewed potential engagement. The economic environment was especially salient. Even when participants viewed cultivated meat positively, many admitted that cost would ultimately drive their decision making. "If its \$20 more than a regular steak...it's not worth it," James said, emphasizing how structural barriers such as affordability and access could override positive attitudes.

Finally, trust in the intentions of companies and institutions influenced participants' readiness to engage. Some expressed concern that cultivated meat was being developed primarily

for profit and not for public good. This perception shaped their moral reasoning and willingness to participate in the cultivated meat movement. This showcases another example of how environmental and cognitive factors interact to influence behavior, as SCT describes. Maria shared, “If I understand it with more clarity and had a bigger peek into that process, that could very easily eliminate those fears.”

Sub-theme 3.2: Information and Awareness

A consistent pattern across participants was a perceived lack of accessible, trustworthy information about cultivated meat, which created a barrier to forming positive or informed perceptions. From a SCT perspective, this theme reflects how limited environmental cues, unclear outcome expectations, and weak observational learning contribute to hesitation and uncertainty.

Many participants reported hearing about cultivated meat only in fragmented or informal ways, such as scattered news stories or social media posts, often framed negatively. This reflects a lack of modeled behavior or credible role models, which are key components of observational learning. Without exposure to people they trust, who are actively engaging with cultivated meat (e.g., peers, influencers, educators, or institutions), participants were less likely to feel confident or motivated to explore it themselves.

I think in my mind, the only thing that I've ever heard about cultivated meat has been negative, and it was years and years and years ago. So, when it was first a new topic, anything new is automatically scary, right? So, I think there should be more public knowledge about it. (Jenifer)

Participants stressed the importance of transparent, consistent messaging not just for clarification on what cultivated meat is, but to provide information on how it's produced, its

nutritional value, and environmental implications. These details tie directly to outcome expectations, the belief that individuals hold about likely consequences of their actions. In this case, when information is missing or framed negatively, participants are more likely to expect adverse outcomes or remain uncertain about the benefits of cultivated meat. Ciera shared, “I think if enough information is put out, like I said, transparency about how it's produced... I think that could change people's perceptions.”

Amongst this theme, self-efficacy was evident in participant responses. Some participants, particularly those with educational experience in agriculture or science, felt more confident navigating available research or evaluating sources. However, many emphasized that the average consumer lacks background knowledge or access to interpret technical or academic content. As Cameron shared, “The research is out there, but it’s not in a form that most people can understand or even find.” This reflects a gap in behavioral capability, the skills and knowledge necessary to engage with cultivated meat as an informed consumer.

The physical and informational environment also played a role. Participants expressed a need for government-backed information, clear labeling, and consistency across platforms, suggesting that environmental structures such as regulation, marketing, and labeling practices strongly influence perception and potential behavior. When asked what would help normalize cultivated meat, one participant had some suggestions:

“I think if there is an environmental benefit to consuming cultivated meat, or a health benefit to consuming cultivated meat over conventional meat, they should, like put that on the advertisement in black and white...” (Ciera)

Theme 4: Government and Policy Impact

Theme overview. Government policy, regulation, and communication emerged as external factors shaping college students' perceptions of CM. Students described the importance of institutional trust, the need for clear and accurate labeling, and concern around policy restrictions and bans. These influences demonstrate how external environmental structures and anticipated consequences (outcome expectations) affect individual decision-making about novel foods. This theme captures the impact of government and policy influences on participants' decision-making and cognitive processes.

Sub-theme 4.1: Trust in Regulations

A dominant theme in this category was participants' belief that government approval or endorsement directly influences public trust in cultivated meat. As one participant states “getting it backed by a sponsor or testing through the USDA or FDA...to make sure that it could be in like grocery stores more often than they already are.” For many, federal agencies were viewed as confirmation of legitimacy. Other participants indicated that if CM were deemed safe by a credible authority, that would significantly increase consumer willingness to consume it. As Cameron stated, “if the government says something is safe, then people feel safe enough to consume it.”

These responses demonstrate SCT's concept of environmental influence, where trust in external structures directly shape behavioral intentions. Students described regulatory approval as a signal of safety, which in turn formed the basis for positive outcome expectation. Ciera shared, "I think it's going to be huge, because once cultivated meat is trusted by the consumer, I feel like it'll be trusted by the consumer if it's backed by the government.”

At the same time, some participants acknowledged that the government's regulatory stance might not always be consumer-driven. Iyana expressed skepticism about regulatory motivations, stating "the government does typically try to protect the agriculture industry, and so I perceive that to be a large motivating factor for regulation, rather than consumer protection." Others emphasized the role of government funding in expanding research and development, and how that could influence the "availability," "affordability," and "acceptability" of CM. Krysten shared, "they can pour money into more research...then again, it could be a really good, viable alternative to traditional meat."

Overall, the perception of strong, credible, and well-intentioned regulatory backing functioned as a major enabler of students' trust and acceptance. Conversely, ambiguity or state-level bans were seen detrimental to student perceptions. Ciera shared, "If a state banned cultivated meat, something like that would probably give people a negative perception of it."

Sub-theme 4.2: Labeling and Transparency

In some interviews, participants stressed the importance of transparent labeling and consistent terminology when discussing how they would approach trying or purchasing CM. This relates to the SCT construct of behavioral capability, where participants need accurate information to help them make informed decisions. Cameron stated, "If it's got the organic stamp on there, or if it's got a USDA inspection stamp, that labeling choice is going to help sell it...especially to your mainstream consumer."

Participants felt more confident in trying CM if familiar labels or certifications were used, demonstrating observational learning, where trusted visual cues modeled what is safe or acceptable. Maria stated, "obviously, it's got to be FDA approved. It's got to be tested in a

certain way. The labeling has to be clear.” The demand for specific, easy-to-understand information was a recurring theme.

Participants suggested “documentaries” or “time-lapse videos” showing the full CM production process as ways to improve transparency and public understanding. Catherine expressed, “I would love a documentary or something that really brought cameras into the lab... and let me see what’s going on.” James similarly expressed, “honestly, I would love to see a time-lapse video from tissue sample to bioreactor.” Maria expressed ethical concerns tied directly to the transparency of labeling and production, stating, “my main ethical consideration in transparency for consumers...and also adequate research done on short and long-term impacts.”

These quotes show that students’ self-efficacy was tied to how well the product was explained and labeled. Without clear information, participants felt hesitant and even distrustful. Cameron shared, “just knowing what will be inside of it, even if it’s micro thing, could still lead to situations in the body. It’s just important to know.” Participants clearly indicated that transparent communication and consistent language were prerequisites for building trust and supporting informed consumer choice.

Sub-theme 4.3: Restrictions on CM Due to Policy

Students overwhelmingly opposed outright bans on CM, arguing instead for consumer choice rooted in clear, accessible information. These responses align with SCT concepts of outcome expectations, where participants anticipated negative consequences, such as public skepticism or industry stagnation if bans were enacted prematurely. Maria shared, “as long as consumers are informed and it’s clear what they’re eating, I think it should be an option,” and Krysten agreed by expressing, “I don’t agree with the bans. People should have the opportunity to choose whatever meat they want.”

Participants emphasized the importance of “consumer choice,” stating that if the product is transparent and regulated, the government should not limit access. Ciera shared, “I wouldn’t say they should just ban it on principle.” Catherine also expressed, “I come from an angle that would like to protect the agriculture industry, but also I think people have the right to choose.” Some noted that government decisions may be influenced by misunderstanding or misinformation, particularly among those not well versed in science. Iyana stated, “I feel like, as our government is right now there’s a lot of people that don’t really understand science making science choices.”

Others recognized that bans could stifle innovation and market growth, especially in regions already showing resistance. Krysten shared, “If there’s that big of a pushback, then it’s just going to fall into the thing that happens with research where...it doesn’t grow.” These insights reflect SCT’s emphasis on environmental constraints; these external systems and structures can either enable or suppress behavior, regardless of individual intention.

What Socio-Ethical Factors Do College Students Share When Discussing Their Perceptions of Cultivated Meat?

Theme 2: Uncertainties in Scaling Cultivated Meat Production

Theme overview. Participants expressed a mix of cautious feelings about the scalability of CM, particularly regarding its health impact, environmental tradeoffs, and ethical implications. While many participants acknowledged the theoretical benefits of CM, such as decreased animal suffering, customizable nutrition, and sustainability, these views were often tempered by limited access to trustworthy information and unresolved questions about product transparency. This theme captures how students’ limited support for CM not only affects

perception of its perceived benefits, but also influence the broader structural, social, and informational conditions necessary for its successful adoption at scale.

Sub-theme 2.1: Perceived Health Impacts Of CM

Participants' reflections on the potential health impacts of cultivated meat revealed a nuanced balance between optimism and uncertainty, shaped by perceptions of "scientific control", "naturalness," and "nutritional equivalence." These discussions are well aligned with SCT, particularly constructs of outcome expectations, behavioral capability, and environmental influences.

Many students acknowledged that, in theory, cultivated meat could be as healthy, if not healthier, than traditional meat. These beliefs were based on the idea that lab environments may allow for greater control over "fat content," "protein composition," and "nutrient quality," thus influencing positive outcome expectations. For example, Cameron noted, "I think it would be about the same, maybe potentially healthier...I feel like they have more control over which cells they can basically cultivate."

Others echoed this sentiment, highlighting that CM could be tailored to meet dietary needs, offering a potential health advantage. Iyana shared, "I would imagine it'd be healthier...there are fewer variables, like with animals, anything could happen. It's in a more controlled environment." These perceptions suggest that students weighed the anticipated outcomes of CM consumption based on what they understood about traditional meat production, such as animal feed, fat levels, and disease risks.

Confidence in these health claims was often conditioned on who was producing the meat and how transparent the process is. Keith explained, "depends on, again, the priorities of whoever is cultivating the meat...what are the nutrients they're giving to those cells to grow that

meat?” This indicates the role of environmental influences, where the perceived trustworthiness and transparency of CM producers affects whether students believe the product will have positive or negative health outcomes.

Despite some openness, students also expressed uncertainty rooted in limited knowledge about how CM is produced and how its nutritional content compares with traditional meat. This reflects behavioral capability, where some participants lacked the information or confidence to fully assess CM’s health implications. As Catherine stated, “I perceived it to be about the same, with the caveat that there’s nothing harmful in its production.”

Others made similar comparisons, suggesting that while CM uses the same animal cells, its health impacts ultimately relies on how it is grown and processed:

“Going to be different, just because it may not have the fat structure or whatever experience we’re used to. But if it is truly just replicated cells from meat, that’s going to have the same amount of protein as a steak that it was cultivated from.” (Catherine)

“I would say probably the same, since it is the same cells going into it. It still consists of animal muscles. I don't think it would be healthier.” (Jenifer)

These statements reveal underlying cognitive tension. While students recognized the scientific knowledge behind CM’s potential health benefits, they remain uncertain due to limited exposure to reliable models or evidence, a gap in both observational learning and self-efficacy.

Sub-theme 2.2: Environmental Outcomes and Considerations

Participants expressed a variety of perspectives regarding the potential environmental sustainability of CM, ranging from optimism to skepticism. These reflections were often speculative, shaped by limited personal research and assumptions about lab-based systems. Several students believed CM held promises for reducing environmental harm, particularly when

compared to traditional meat production systems, which are often linked to methane emissions and water overuse. Maria shared, “Probably much better environmental impacts compared to traditional meat, just because...what goes into farming has a cost on the environment and can contribute to pollution.”

Others described how CM could play a role in filling specific market niches with a more sustainable alternative to resource-intensive animal proteins. Catherine shared, “I kind of wonder if it would maybe fill the void of some like specialty meats, like crab meat or scallops...and it would kind of maybe meet that cost, but for sustainable reason.” These examples reflect positive outcome expectations, where students anticipate that CM could contribute to a lower carbon footprint and more efficient protein sources. However, even among those who believed in CM’s potential, there was an underlying uncertainty about the scale and unintended consequences of lab-grown systems. As Jenifer shared, “The environmental impact would be different because it’s not the animals, it’s more so the technologies that go into it... which have an energy source, and the waste and things from those labs.”

This tension highlights how students are evaluating CM within a broader environmental context, considering not only emissions reduction but also the resource intensity of laboratory infrastructure. These concerns show how outcome expectations are influenced by environmental awareness, even when direct knowledge is limited. Importantly, some participants recognized the lack of personal investigation into these claims, suggesting low behavioral capability in terms of understanding the full environmental lifecycle of CM. Krysten shared, “Honestly, I haven’t sought that out because of my own belief...there’s a possibility that there are food companies out there that are trying to reduce...that carbon print.”

Others maintained a more skeptical stance, expressing doubt that CM could compete with traditional meat in meaningful environmental terms. Jenifer states, “Wouldn’t say they influence me that much, because I am pretty set on consuming traditionally farmed meat, and I don’t feel like cultivated meat will have that much of an impact with sustainability...in the big scheme of things.” Still, the potential for CM to reduce methane and greenhouse gases was acknowledged, though often paired with caution:

“Greenhouse gases, or the methane from livestock farming, could cut well over in half... if we just lean more into cultivated meat. However, got to be careful with it, because you got to make sure this is good for the community.” (James)

Participants voiced concerns about hidden or indirect environmental costs related to lab-grown meat production, particularly the use of energy, water, and materials in laboratory settings:

“One thing I think people don’t think about when you’re dealing with labs is their output...the usage of water, electricity, the exhaust. There’s a lot of factors that go into these lab facilities, so they also have an environmental impact.” (Keith)

These reflections indicate that while students are generally aware of CM’s sustainability narrative, they also seek a more balanced, transparent understanding of both its promises and tradeoffs, showing how environmental influences and access to information shape evolving perceptions.

Sub-theme 2.3: Ethical Considerations

Participants expressed a broad range of ethical concerns and values-based reflections when considering CM, indicating that socio-ethical reasoning played a significant role in shaping perceptions. A dominant theme was the ethical appeal of reducing harm to animals, which many

participants framed as a potential strength of CM. Participants with agricultural, scientific, or philosophical backgrounds spoke favorably about the opportunity to consume meat without the ethical burden of slaughter:

“Especially the fact that an animal doesn’t have to die is a major plus...that’s one thing against meat, it kind of sucks that you have to kill an animal.” (Maria)

“Ethically, it’s better. If you believe that meat is murder, then you’re cutting out that negative little bit. Take a small sample of the animal and then you’re creating more meat.” (James)

These responses reflect positive outcome expectations—that CM may offer a moral push for meat consumption, especially for those concerned about animal suffering. Others described technology as an ethical solution for future sustainability, especially in the context of climate change and food security. Krysten shared, “we need to be able to feed all of our people,” similarly Maria expresses, “I perceive it to be a solution to issues...food insecurity, feeding people, and also cost-effectiveness.”

Despite these ethical appeals, participants frequently expressed concern about the affordability of CM, reflecting a socio-economic dynamic to their ethical evaluations. Participants questioned whether CM would be accessible or if it might reinforce existing food disparities:

“I think the biggest thing, like I mentioned before, it would be price. Because what's the point? If it's so costly that only wealthy people can afford it.” (Maria)

“The cost would be something that I currently perceive it to be not as accessible or a solution to global food security issues.” (Catherine)

This tension reveals how environmental influences, such as economic systems and market pricing, shape the practical feasibility of ethical ideals. For some, the price outweighs the ethical benefit, especially when compared to budget constraints or cultural norms around traditional meat. Ciera explained, “animal welfare is important to me, but price is more important.” Similarly, James expressed, “it would have to taste good and be affordable, otherwise, it’s not worth it.”

Participants also described how personal upbringing, cultural food practices, and community values shaped their ethical stance on CM. For some, CM was seen as “aligned” with their values around “sustainability,” “environmental care,” or “animal ethics.” For others, it felt unfamiliar or morally ambiguous. For example, one participant shared, “I think it aligns with my values...especially around food waste and sustainability” (Catherine). While another participant shared, “It challenges them, because it makes me think about where my ethical line is and why I wouldn’t try those things.” (Ciera)

These quotes illustrate self-reflective ethical reasoning and suggest SCT’s principle of self-efficacy. Some participants felt confident navigating the moral complexity, while others were less certain or deferred judgement due to unresolved internal conflict.

Many students emphasized that trust in the ethical standing of CM would depend on transparency in how it is produced, who regulated it, and whether companies uphold responsible practices. These concerns reflect environmental influences (trust in institutions) and behavioral capability (access to information):

“With my values, it still aligns...it would just be like making sure the regulatory and ethical process is all good.” (Maria)

“It comes down to knowing who’s behind it and what their intentions are.” (Krysten)

Others requested more educational resources or clearer industry communication to better assess ethical validity:

“I think the market would grow as more information becomes available.” (Jenifer)

“I think if it was widely offered at grocery stores and I knew more about it, I’d be more inclined to try it.” (James)

Theme 5: Observational Learning and Social Norms

Theme overview: Participants’ perceptions of CM were not formed in isolation but were shaped by a range of external social, cultural, and educational factors. This theme explores how attitudes and behaviors of friends, family, academic peers, and media sources influenced participants’ “openness,” “skepticism,” or “curiosity” towards cultivated meat. These external influences often intersected with personal values and community norms, demonstrating how social contexts and learned knowledge shape individual decision-making. This theme illustrates the influence of observational learning and social norms amongst participants.

Sub-theme 5.1: Influence of Friends, Family, and Media

Students frequently acknowledged the opinions and behaviors of peers, family members, and media figures subtly or directly shaped their openness to CM. These social dynamics reflect observational learning, where attitudes are informed by other reactions, both positive and negative. As Ciera stated, “if a family member or friend or on the media, I heard somebody consume cultivated meat and have a bad experience, that would probably affect my perception of it.”

For many, family values around food, particularly those rooted in agricultural or rural upbringings, played a significant role in framing CM as unfamiliar or unnatural. Others described inherited preferences for local meat or skepticism about lab-grown alternatives,

highlighting environmental influences and social norms rooted in tradition. Krysten shared, “my mom’s family comes from a background of raising and processing their own meat... that strong, ancestral connection still influences me today.”

Media exposure, though often limited or biased, also contributed to perceptions. Several students noted that what little they knew of CM came from negative portrayals or unclear messaging. Iyanna expressed, “maybe just because of media and the negative attitudes I’ve been exposed to... I really don’t know much about cultivated meat.” At the same time, students with more agency and critical media awareness expressed the ability to filter or dismiss unreliable sources, suggesting self-efficacy in shaping their own attitudes. Catherine shared, “I tend to ignore sources that are not valid...I block anything I perceive to be source of misinformation.”

While many stated that their food choices were independent, nearly all acknowledged that the attitudes or behaviors of those around them, even if indirectly, played a role. James shared, “if someone around me cooked it or tried it, I’d be more likely to try it myself.” This reflects how social modeling and perceived social acceptability may play a role in influencing eventual behavior, particularly in early adoption stages of a new food technology.

Sub-theme 5.2: Educational Background Influence

Students’ educational backgrounds, especially in science, agriculture, or conservation, influence how they process information about CM. Those with exposure to topics like biotechnology, food safety, and animal science felt more “confident” evaluating the risks and benefits, reflecting high levels of behavioral capability and self-efficacy. Maria shared, “As someone in animal science and conservation, I feel more open to science and less afraid of things I don’t understand.”

Participants familiar with concepts such as GMO's, amino acids, and lab procedures were more likely to approach CM with curiosity and critical thinking. Some felt better equipped to challenge public misconceptions. Iyana shared, “we have GMOs, and GMOs have that same struggle. It’s just another piece of food engineered you know. My field helps me understand that.”

This level of scientific literacy fostered positive outcome expectations, where participants believed CM could support sustainability or food security if implemented ethically and transparently. As Maria stated, “I’m very interested in its capability to help with food insecurity... especially since an animal doesn’t have to die.” However, education also brought nuance.

Some participants, such as Keith, emphasized that their background in agriculture ethics made them more attuned to potential risks or gaps in current regulatory frameworks: “I’ve seen people follow ethical practices in labs, but I’ve also seen the opposite...that worries me.” Participants were torn between respect for the science and cultural or emotional discomfort around cultivated meat, showing how personal values interact with learned knowledge to shape complex attitudes.

Theme 6: Future Outlook

Theme overview. Participant reflections on the future of CM revealed a combination of cautious optimism and skepticism, influenced by external forces such as societal norms, industry adaptation, global food needs, and perceptions of agricultural sustainability. Their projections not only reflected attitudes about CM’s scalability and social acceptance but also underscored how personal agency is shaped by larger systemic and environmental cues. This theme illustrates participants’ perspective on the future of CM.

Sub-theme 6.1: External Influences Shaping Behavior

Participants articulated a range of possible futures for CM, with many suggesting it could gain broader acceptance if certain conditions such as taste, cost, and social validation were met. These reflections demonstrate SCT's reciprocal determinism, where individual perceptions of CM (personal factors) are influenced by anticipated market trends and consumer behavior (environment), which in turn may shape future actions such as trying or purchasing CM (behavior). This dynamic highlights how students are not only shaped by their environment but also actively imagine and contribute to future norms around food, suggesting that their current beliefs could play a role in shaping broader societal acceptance of CM.

Catherine explained how positive reinforcement could shift normative behavior, stating “it could easily become mainstream if those two conditions are met, taste and price...and more people try it and speak of their benefits environmentally.” Jenifer reflected on a possible evolving cognitive change in consumers driven by environmental pressure (e.g., food insecurity or climate change): “I think our attitudes will change eventually... because we’ll be like, okay, what else do we have to eat.”

Many participants still hesitated to label CM as “mainstream,” citing long standing consumer habits, skepticism, and cultural resistance. These factors represent observational learning and outcome expectations. These expectations were shaped not only by direct knowledge, but also experiences through social discourse, media narratives, and analogies to other alternative proteins like organic or plant-based products. As one participant noted, “I don’t know if I would say mainstream, because it takes a long time to change people’s perception and their purchasing habits, like we’ve seen with organic food.”

Jenifer echoed this by saying, “I don’t foresee it becoming mainstream. I think that it may end up being a long-term option for people that want cultivated meat.” These expressions align with SCT’s outcome expectations, as participants anticipated that broader adoption would be slow due to current cultural norms and consumption habits, particularly in the U.S., where traditional meat is widely accepted and deeply rooted in food identity. Iyana noted the role of media and industry perception on cultivated meat: “if the media starts leaning on to it as fake and not as good, then there’s probably not going to be that much funding and backing.”

This underscores the role of observational modeling, where negative messaging may inhibit consumer willingness to try CM. Similarly, perceived credibility of institutional actors played a role, with another participant stating, “I think big companies like Tyson will eventually buy into it...they might build a whole new facility to carry it out more rapidly.” This reinforced the idea that modeling from influential industry players could influence consumer trust and behavior. Participants also reflected on the evolving role of the agricultural industry. Keith indicated that environmental restructuring could shape new consumer pathways: “That’s on the agriculture industry to adapt and innovate...maybe they need to market their food differently to capture consumers’ perception.”

James highlighted how past observations shape their current skepticism and cautious expectation for the future: “Cultivated meat has been around for a minute... I feel like it’s a slow expansion, so I don’t envision it going far.” Overall, participants outlook on CM were dynamic and influenced by a complex interplay of personal knowledge, perceived social norms, structural access, and anticipated media framing.

Sub-theme 6.2: Agriculture Industry impact

Participants expressed a range of perspectives regarding the potential impact of CM on the agricultural industry, with responses shaped by both personal ties to farming and broader understandings of market dynamics. These views aligned with SCT, particularly those interactions of personal cognition, environmental observations, and anticipated behavioral outcomes. Many participants emphasized concern for small and local farmers, anticipating that large-scale producers would more easily adapt to the introduction of CM. Maria stated, “it won't take long for the larger companies to jump on board... it's going to be the smaller farmers, smaller companies, that's going to be affected.”

This reflection aligns with SCT's environmental influences, as individuals observe and interpret broader structural shifts in industry power and resource distribution. Participants' outcome expectations, beliefs about the future consequences of CM, fueled concerns about economic displacement and local sustainability. As Krysten shared, “I think it'd be devastating for small farmers... I order from a local farm just to support them.”

Further demonstrating how individual behaviors (supporting local farmers) are shaped by both personal values and the anticipated environmental impact of technological change. There was also recognition that consumer demand may ultimately dictate the direction of the meat industry, further aligning with SCT's principle of reciprocal determinism. Catherine stated, “The industry will always follow what consumers want... Many industries have died because consumers no longer want them.”

Suggesting that collective behavior change could prompt structural transformations, which in turn influence individual decision-making and perceptions of norms. Despite concerns, some participants expressed nuanced views, acknowledging both the challenges and potential for

integration. For example, Krysten stated, “I think it might have more of an impact than anticipated, but I don't think it will completely eliminate traditional farming.” This suggests that behavioral intention is informed by both observational learning (seeing how similar trends played out) and personal reflection on economic sustainability.

Other participants, like Cameron, imagined a hybrid model, where large companies might create separate divisions for CM: “Tyson would probably have its own separate branch for cultivating... and expand on that.” This reflects the belief that established industry players will likely play a key role in commercialization.

Some participants’ reflections on the agriculture industry reveal SCT’s aligned dynamics in which environmental awareness (e.g., market trends, economic shifts), personal experiences (e.g., farming background), and predicted consequences (e.g., industry adaptation or decline) merge to form evolving perceptions of cultivated meat’s societal role. These interpretations underscored the importance of industry transparency, inclusive innovation, and equitable adaptation pathways if CM is to be widely accepted without exacerbating rural or economic inequalities. This suggests that participants view CM not only as a technological shift, but also as a system level change that must consider the social fabric of traditional agriculture.

Chapter 5: Discussion

Summary of Findings

This study explored college students' perceptions of cultivated meat through SCT, while also examining the socio-ethical factors that emerged in their discussions. Through in-depth interviews, it became evident that participants' attitudes towards CM were seen as cautiously interest or conditional openness. Overall, attitudes were largely characterized by skepticism, uncertainty, and a preference for traditional meat.

Research Question 1: What are College Students' Perceptions of Cultivated Meat?

This study revealed that college students' perceptions of CM are nuanced and shaped by a complex interaction of personal values, cultural identities, and sensory expectations. While some participants expressed openness to innovation and sustainability, the dominant narrative centered around skepticism and preference for the familiar (traditional meat), often rooted in naturalistic belief about food production. These perceptions align with Bandura's (1986) assertion that individual behavior is mediated by internal cognitive processes and external influences, including cultural norms and personal experiences. Such findings are also affirmed by Circus and Robison (2018), who found that consumers' attachment to traditional meat and associated practices often limits openness to alternative proteins, reinforcing how cultural values play a significant role in shaping dietary attitudes.

Participants like Ciera, who identified as leaning toward "naturalist" food preferences, expressed hesitation toward lab-based innovations. Her skepticism reflects the SCT concept of outcome expectations—in this case, uncertainty or anticipated negative outcomes associated with consuming a novel product. Emotional responses, shaped by perceived "unnaturalness" of CM, compounded this effect, reinforcing avoidance behavior despite the theoretical benefits. Egolf et

al. (2019) emphasized that disgust sensitivity and the perception of unnaturalness are powerful barriers to acceptance of novel food technologies, particularly when the products are associated with artificiality or contamination. Similarly, research suggests perceptions of CM as “unnatural” are a key psychological hurdle, often overriding rational evaluations of sustainability or ethics (Bryant et al., 2019).

Furthermore, Marcu et al. (2014) found that lay consumers often used metaphors like “Frankenfood” or “space food” to interpret synthetic meat, which adds to their perception of CM as foreign or threatening. These findings illustrate that perceptions are not merely informed by knowledge but are also heavily influenced by personal identity and anticipated sensory experiences. This supports Bandura’s (2001) claim that affective and cognitive factors jointly shape behavioral tendencies. To enhance perceived taste and naturalness, evidence has shown that aligning CM with conventional meat, such as presenting it in familiar meat format, can have a great impact on perception (Fidder & Graça, 2023). This supports the idea that anticipated sensory outcomes are key to shaping openness.

Sub-Research Question 2: What Factors Influence College Students’ Perceptions of Cultivated Meat?

A major factor influencing students’ willingness to consider CM was the absence of strong social modeling, a key construct in SCT. Many participants noted that they had not seen peers or public figures actively consuming or endorsing CM, which limited its perceived normalcy. Bandura (2001) emphasized that people are more likely to adopt behaviors modeled by individuals they trust or relate to. In the absence of visible role models, unfamiliarity persisted and reduced self-efficacy in trying or supporting CM. Showcasing CM adoption visually, especially through social groups, significantly impacts consumer willingness to try it. Early

adopters were often those with direct exposure to CM or who had seen it modeled in positive ways (Szejda et al., 2021).

Self-efficacy, or confidence in one's ability to make informed food choices was often hampered by inconsistent or inaccessible information. Participants expressed the need for clearer, science-based, and culturally resonant content to make judgements of CM. This reflects Bandura's (1997) perspective that when individuals lack confidence in their ability to understand or engage with new technologies, they are less likely to adopt them. Baum et al. (2023) supports this view, finding that visual and information clarity significantly influences consumer evaluation, especially for those with higher levels of food neophobia. Without adequate, trustworthy information, participants felt disempowered in their ability to make informed choices, thereby reinforcing avoidance.

Outcome expectations further influence perceptions, particularly in relation to policy and regulation. For instance, participants described increased trust if government agencies labeled CM as safe. It has been found that regulatory framing and safety-focused messaging were more persuasive in shaping positive consumer attitudes than innovation-oriented language, especially in prevention-focused populations (Shi et al., 2022). Likewise, transparent governance and messaging are essential to mitigating perceived risks (Fu et al., 2023). The broader environmental influences of policy, media messaging, and educational background became clear in shaping both awareness and trust in CM amongst participants, validating Bandura's (1986) view of environmental structures as co-determinants of behavior. Keith's comment underscores the importance of institutional credibility in shaping anticipated consequences, a core element of SCT: "If the government says something is safe, then people feel safe enough to consume it...but if a state banned cultivated meat, that would probably give people a negative perception of it."

Sub-Research Question 3: What socio-ethical factors do college students share when discussing their perceptions of cultivated meat?

Participants often considered the broader ethical, environmental, and systemic implications of CM. While many recognized the potential benefits, such as reducing animal suffering or mitigating climate change, there were lingering concerns about “transparency,” “equity,” and “scalability.” Catherine’s reflection—for example, “it seems healthier and more sustainable in theory, but it really depends on who’s making it and how much we actually know about the process”—illustrates conditional support rooted in the perceived integrity of the production process. This aligns with Bandura’s (2001) argument that moral and ethical considerations are part of the self-regulatory mechanisms that govern decision-making. Wilks et al. (2019) similarly found that ethical alignment, especially concerning animal welfare and climate issues, was a major predictor of CM support, but this support diminished when transparency or fairness was in doubt.

Students’ broader decision-making environments also shaped their evaluations. As they navigated greater autonomy in college, participants described relying more heavily on peer norms, cultural expectations, and digital influences when it came to their food choices in college (Dhillon et al., 2019; Deliens et al., 2014). These environmental factors, amplified by social media exposure, contributed to both evolving ethical perspectives and confusion about food innovations. Within SCT, this highlights how personal values, modeled behaviors, and external information sources interact to shape judgements about CM (Bandura, 2001).

Participants’ social environments also shaped their moral evaluations. Those with exposure to agricultural or scientific education demonstrated higher critical engagement and greater trust in CM technology, suggesting that knowledge can bolster both self-efficacy and

outcomes expectations (Bandura, 1986). Research showed that in Millennial and Gen X populations in New Zealand, trust and willingness to engage with CM were higher among those with a science education or greater exposure to sustainability topics (Giezenaar et al., 2023). Meanwhile, those embedded in communities with strong traditional food norms were more hesitant, highlighting the role of observational learning within culturally relevant contexts. Culturally ingrained eating patterns are key barriers to the adoption of alternative proteins, including CM (Bryant & Dillard, 2019).

Discussions on the potential future of CM brought to light deeper socio-economic hesitations. Participants debated the technology's scalability, its impact on small farmers, and whether it would be accessible across different demographics. These views suggest that long-term acceptance may depend not just on individual preference, but on systemic change that addresses equity, affordability, and sustainability. Thomas and Bryant (2021) emphasized that equity, affordability, and transparency are core conditions for consumer trust in novel food systems. These core concerns reflect SCT's emphasis on reciprocal determinism between personal, behavioral, and environmental factors (Bandura, 1986).

Limitations

This study has demonstrated the complex interplay of personal, social, and systemic influences that shape college students' perceptions of CM. One limitation of the study was the lack of disciplinary diversity and experiential exposure from the participants who consented to participate. Most of the participants came from backgrounds in agricultural, sustainability, or biotechnology, which may have influenced their perceptions due to prior exposure and familiarity with these fields. A second limitation included the inability for participants to see,

touch, or taste any CM, making it conceptual with no tangible product that any of the participants may have interacted with or tried for themselves.

Recommendations

Future research should intentionally recruit participants from a broader range of educational backgrounds, particularly those outside of agriculture, life sciences, or sustainability fields. Doing so would provide a more representative understanding of general student perceptions and help identify disciplinary gaps in awareness or acceptance of CM. Studies have shown that disciplinary context significantly influences food systems knowledge and sustainability values (Borrelli & Andreopoulou, 2015), which can shape openness to food innovations like CM.

Another recommendation is to incorporate direct sensory engagement with CM products in future research designs. Many participants in this study formed their opinions based solely on theoretical or second-hand knowledge. Including actual product samples could allow for more grounded feedback and reveal perceptual shifts based on taste, texture, and appearance, which are key factors influencing food acceptance (Bryant & Barnett, 2018; Siegrist and Hartmann, 2020). Tasting experiences significantly alter consumer attitudes, especially in relations to novel food products where unfamiliarity may fuel skepticism (Alemu & Olsen, 2020).

Practitioners in food systems education, agricultural outreach, and science communication should prioritize accessible, transparent, and culturally resonant messaging about CM. Strategies for better communication should include experiential opportunities, such as taste tests or peer-led discussions to reduce unfamiliarity and foster informed decision making through social learning and trust building. These efforts must go beyond technical descriptions to address emotional, ethical, and cultural concerns that shape food choices. Extension educators, university

programs, and food advocates can play a key role in fostering informed engagement by integrating CM into sustainability curricula, hosting public dialogues, and using relatable examples to increase comfort with the concept. Educational interventions that address effective and normative dimensions have been shown to enhance consumer receptivity to sustainable technologies (Mulder-Nijkamp et al., 2018).

Policymakers should also focus on building institutional trust by supporting clear and concise labeling standards, safety certifications, and regulatory transparency. As participants noted, confidence in government and institutional oversight significantly influenced their openness to CM. Policy action that prioritizes consumer trust and inclusivity, especially for historically marginalized communities, will be essential to equitable adoption of novel food technologies (Thorsøe & Kjeldsen, 2015; Van Der Weele et al., 2019).

For Future Research

Future studies should consider using longitudinal designs to explore how attitudes toward cultivated meat evolve over time with increased exposure, education, or availability. Research that tracks perceptual change as participants engage with real products or targeted communication campaigns could reveal the dynamic nature of food acceptance and the role of social modeling and outcome expectancy over time, as framed by SCT (Bandura, 1986; Bandura, 2001).

There is also a need for comparative research across cultural, regional, and socioeconomic contexts. Studies examining how perceptions vary across different geographic or demographic groups could provide valuable insight into systemic barriers to CM acceptance. This includes understanding how communities with strong traditional foodways or limited access

to emerging technologies respond to CM, and what strategies might bridge the trust and accessibility gaps (Rolland et al., 2020).

Finally, interdisciplinary collaboration between food scientists, behavioral psychologists, sociologists, and ethicists is encouraged to explore the multi-dimensional impact of CM on society, culture, and environment. Such partnerships can ensure that consumer-centered perspectives are embedded in both product development and public discourse (Stephens et al., 2019). By integrating diverse expertise, the cultivated meat sector can foster more inclusive, ethical, and socially responsive innovation.

Conclusions

This study explored college students' perceptions of cultivated meat through the lens of SCT, shedding light on values, experiences, and social contexts that shape their attitudes toward cultivated meat. While cultivated meat remains a relatively new and unfamiliar concept, students demonstrated both curiosity and caution, revealing opportunities for deeper engagement and education. Key themes such as cultural food traditions, trust in institutions, and the importance of peer influence emerged as critical factors influencing perception and openness. These insights highlight the need for science communication that goes beyond fact and includes emotionally and socially resonant narratives. The findings in this intrinsic case study will hopefully encourage future research across broader educational backgrounds and incorporate real product sampling to enhance understanding and reduce skepticism. This topic holds meaningful implications for educators, policymakers, and the cultivated meat industry. By listening closely to young consumers, we gain a clearer picture of how cultivated meat may or may not find a place within evolving food systems. It was an honor to speak with the thoughtful and candid students who participated in this research whose insights were very valuable to this study.

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Appendix

Appendix I: Recruitment Email

I hope this email finds you well! My name is Kara Crudup, and I am conducting research on the factors that influence college students' perceptions of cultivated meat and other emerging food technologies as part of my research for my master's degree in Agricultural, Leadership, and Community Development at Virginia Tech. This research aims to explore students' thoughts, values, and concerns regarding this innovative area, helping shape future discussions and policies.

I'm conducting audio recorded interviews with college students who are at least 18 years of age in the College of Agriculture and Life Sciences and College of Natural Resource and Environment to gain insights into their perspectives. I am looking for participants to take part in a one-on-one interview that will last no more than one hour. Your insights will be valuable in understanding what you think about this evolving field. This research has been approved by Virginia Tech IRB #24-919.

Details of the Interview:

- When: At a time, convenient for you
- Where: In person (Litton Reaves, Library, etc)
- Duration: No more than 60 minutes

Your participation is voluntary, and all responses will be kept confidential. If you are interested, please go to my [Microsoft booking page](#) to schedule a time that works for you. If possible, fill out at least 2 possible dates before the end of February to leave room for overlap. Please reply to this email with any additional questions (Karac19@vt.edu).

Thank you for considering this opportunity to share your perspective—I look forward to hearing from you

Appendix II: Semi-Structured Interview Guide

Pre-session Activities – Introduction

Hello! Welcome. My name is Kara Crudup. Thank you for taking the time to participate in this research study about cultivated meat. I am conducting this study to gather data on college students' perceptions of cultivated meat and how these perceptions may or may not evolve over time.

The purpose of this study is to generate new knowledge about college students' awareness, attitudes, and potential acceptance of cultivated meat as an emerging food technology. This knowledge will contribute to ongoing efforts to better understand public perceptions of alternative proteins and guide effective communication strategies for researchers, educators, and industry professionals. Results from this study will be shared through academic publications, conference presentations, and other professional outlets.

Audio will be recorded using a recording device. All identifying information, like your name, will be removed and your identity will never be revealed. Pseudonyms or participant numbers will be assigned to your audio. I want to reiterate that names and other identifying information will not be used in any final report, publication, presentation, or resource. Do you have any questions?

Interview Questions

I went through questions in order as much as possible to ensure research questions were answered. Additional questions were used as a follow-up to get as much details as possible for the data.

Perceptions of Cultivated Meat

1. What are your initial thoughts or feelings about cultivated meat?
 - a. Can you elaborate on why you feel that way?
 - b. What specific aspects of cultivated meat stand out to you?
 - c. Are there any concerns or positive aspects that come to mind?
2. How do you think cultivated meat compares to traditional meat?
 - a. What are your thoughts on how the taste might compare between the two?
 - b. How do you perceive the quality of cultivated meat versus traditional meat?
 - c. Do you think cultivated meat would be healthier, less healthy, or about the same compared to traditional meat? Why?
 - d. How important is nutritional content to you when comparing cultivated and traditional meat?
 - e. What do you think about the environmental impact of cultivated meat compared to traditional meat?

Socio- Ethical Factors

What social influences or experiences have shaped your perception of cultivated meat?

- a. Have you ever discussed cultivated meat with family or friends? Do their opinions influence yours?
 - b. Can you describe any cultural or traditional beliefs that might affect your perception of cultivated meat?
 - c. How do societal norms or trends, such as the push for sustainability or health-conscious eating, influence your thoughts?
 - d. In what ways do you feel your educational background or field of study affects how you perceive cultivated meat?
 - e. How do you think the views of your peers at Virginia Tech influence your own perspectives?
3. How do you think ethical considerations affect your views on cultivated meat?
- a. What is your stance on technological advancements in food production? Are there specific concerns about biotechnology in agriculture?
 - b. What are your thoughts on the ethics of eating cultivated meat versus traditional meat?
 - c. Does the environmental impact of cultivated meat influence your perception? In what way?
 - d. Do you think cultivated meat aligns with or challenges your personal values regarding food consumption?
 - e. How do you weigh the ethical considerations against other factors like taste, price, or availability?
 - f. Does the concept of “natural” versus “lab grown” play a role in your ethical assessment of cultivated meat?
 - g. How do you think cultured meat addresses these concerns or contributes to technological innovation?

External Influences

4. What external factors (e.g., price, availability, marketing) might influence your decision to try or consume cultivated meat?
- a. How does the price of cultivated meat compare to traditional meat in your mind? Would it affect your willingness to buy it?
 - b. If cultivated meat was widely available at grocery stores or restaurants, how would that impact your decision to purchase it?
 - c. How would having more information affect your comfort level or willingness to try cultivated meat?
5. Do you feel that enough information is available to the public about cultivated meat?
- a. What type of information do you feel is missing or unclear about cultivated meat?

- b. What kind of information would help you feel more comfortable with cultivated meat? (Health data, environmental impact, production methods)
- c. How does the lack of information affect your willingness to try, or support cultivated meat?

Self-Efficacy and Future Outlook

- 6. What do you see as the future of cultivated meat in society?
 - a. How do you envision the market for cultivated meat evolving in the next 5-10 years?
 - b. Do you think cultivated meat will become a mainstream food option? Why or why not?
 - c. What factors do you think will drive or hinder the widespread adoption of cultivated meat?
 - d. How do you think societal attitudes towards cultivated meat will change over time?
 - e. What impacts do you think cultivated meat will have on traditional farming and meat industries?
 - f. Do you think cultivated meat has the potential to impact food security or address global hunger? How?
 - g. What role do you think government regulations or policies will play in the future of cultivated meat?

Background and Demographics

- 7. Tell me a little about yourself
 - a. Major, year of student, and academic background
 - b. Age and any relevant personal or academic experiences with food technology or agriculture
 - c. Did you grow up on a farm

Appendix III: Fact Sheet on Cultivated Meat

What is Cultivated Meat?

- We define cell-cultivated meat as meat that comes from a production method that mirrors the biological process of building muscle outside of the animal and under controlled conditions. No animal is slaughtered. (Stephens et al., 2018).

What is Conventional Meat?

- Meat that comes from animals grown on farms. At a specific age, the animals are slaughtered, processed, and packaged into a variety of meat products.

Production Process

- A small sample of animal cells is collected from a live animal, a fertilized egg, or a cell bank.
- These cells are placed in a bioreactor and supplied with nutrients such as amino acids, sugars, vitamins, and minerals.
- Growth factors and scaffolding materials help the cells multiply and develop into muscle tissue.
- The final product aims to replicate conventional meat in taste, texture, and nutritional profile.

Current Market Status:

- Some cultivated meat products have received regulatory approval and are available for sale and consumption in limited markets.
- Research and investment in the industry are growing, with various companies working on improving efficiency and scalability.
- Governments and regulatory bodies are assessing safety, labeling, and market integration policies.

Appendix IV: A priori table

Research Question	Proposition (Socio-ethical Factors)	Supporting Literature	Interview Questions
What socio-ethical factors shape college students' perceptions of cultivated meat and seafood?	Students who prioritize environmental sustainability may perceive cellular agriculture more positively due to its potentially lower environmental impact compared to traditional animal agriculture.	(Swartz, 2021.; Tuomisto & Teixeira de Mattos, 2011; Welin, 2013	How important is environmental sustainability to you in your food choices? Can you elaborate on any specific environmental concerns you have regarding current food production methods? In what ways do you believe cellular agriculture could address these environmental concerns? How might your perception of cellular agriculture change if you learned more about its potential environmental benefits?
What socio-ethical factors are shaping college students' perception of cellular grown meat and seafood?	Students with strong concerns for animal welfare may view cellular agriculture favorably as it eliminates the need for raising and slaughtering animals for food.	(Melzener et al., 2021, Izmirlı and Phillips, 201, Hopkins, 2015)	Could you describe your views on animal welfare and its significance in your dietary choices? What specific aspects of traditional food production methods do you find concerning in terms of animal welfare? How do you think cultured meat addresses these concerns? Have you come across any information or studies highlighting the welfare benefits of cultured meat?

What socio-ethical factors are shaping college students' perception of cellular grown meat and seafood?	Students who prioritize health may be more inclined to support cellular agriculture if they perceive it as a healthier alternative to conventional meat products.	(Chriki and Hocquette's, 2020, Hansen and Sparleanu, 2021)	How much does your personal health factor into your food choices? What aspects of conventional meat consumption do you perceive as potentially detrimental to health? In what ways do you think cultured meat might offer health benefits compared to traditional meat? Have you encountered any research or information suggesting the health advantages of cultured meat?
What socio-ethical factors are shaping college students' perception of cellular grown meat and seafood?	Students concerned about economic factors may perceive cellular agriculture positively if they believe it can create new job opportunities or contribute to economic growth. Conversely, concerns about job displacement in traditional agriculture sectors may lead to negative perceptions.	(Dilworth & McGregor, 2015, Bhat & Fayaz, 2011; Laestadius, 2015; Verbeke et al., 2015)	What are your thoughts on the economic aspects of food production (price, distribution, cost of production)? How do you believe cultured meat could contribute to job creation or economic growth? Are there concerns about job displacement in traditional agriculture due to cultured meat? Have you encountered any studies on the economic impact of cultured meat?
What socio-ethical	Students from cultures with	(Deliens et al., 2014,	Can you describe any cultural traditions or influences that shape your dietary

factors are shaping college students' perception of cellular grown meat and seafood?	strong traditions around meat consumption may be more hesitant to accept cellular agriculture due to cultural factors. Conversely, students with more open attitudes towards dietary changes may be more receptive.	Oncini and Guetto, 2017, Nestle et al. 2009, Enriquez and Godinez 2021)	preferences? How would you describe the food dynamic in your household? How do you think cultural factors might influence people's acceptance of cultured meat? Are there specific cultural beliefs or practices that hinder or facilitate the adoption of cultured meat?
What socio-ethical factors are shaping college students' perception of cellular grown meat and seafood?	Students with positive views on technological advancements may view cellular agriculture favorably as an innovative solution to address food sustainability challenges. Conversely, concerns about the safety and ethical implications of biotechnology	(Bryant & Dillard, 2019, Bhat & Fayaz, 2011; Hocquette, 2016; Munteanu et al., 2021)	What is your stance on technological advancements in food production? Are there specific concerns about biotechnology in agriculture? How do you think cultured meat addresses these concerns or contributes to technological innovation? Have you encountered any studies discussing the safety and ethics of cultured meat technology? Would learning more affect your perception?

	may lead to skepticism.		
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