

Antecedents of Alternative Protein Adoption

A U.S. Focus Group Study

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Executive Summary

This focus group study developed insights from a diverse group of consumers across the United States regarding their perceptions of and experiences with new sources of protein. We conducted a total of six focus groups in New York, Atlanta, and Phoenix in February and March 2020. We asked participants to share their perspectives on four key topics: 1) first exposure and trial of plant-based meat, 2) questions about, motivations for, and barriers to trying cultivated meat, 3) desired product types and characteristics of plant-based and cultivated products, and 4) engagement with sustainability as a motivator for dietary shifts toward plant-based products. We conducted a thematic analysis and developed specific recommendations to increase adoption of alternative proteins. We found consumer experiences with currently available products to be positive, though barriers to widespread and repeated purchase are still strong. The detailed analysis of participants' perceptions and experiences provided deep insights for developing new strategies to expand the alternative protein market.

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Objective

The purpose of this research was to better understand consumer perceptions, attitudes and activities around both plant-based and cultivated meat, with a strong focus on establishing first product trials.

Research Questions

- RQ: What are the necessary antecedents for naive consumers to try plant-based meat?
- RQ: What are the necessary antecedents for consumers to try cultivated meat?
- RQ: What are the desired product characteristics for plant-based and cultivated meat?
- RQ: How do preferences differ by meat type, including poultry, seafood, and red meat?
- RQ: To what degree is sustainability a motivating factor for naive consumers to adopt alternative proteins?
- RQ: Which aspects of sustainability are most compelling for naive consumers to adopt alternative proteins?

Methods

Procedures

We conducted six focus groups in New York City, Atlanta, and Phoenix over three weeks in February and March 2020. Prior to the focus group session, participants were screened to fit key psychographics of the target audience of interest. Once selected, participants completed a homework assignment to familiarize themselves with key concepts and share their initial thoughts on particular message elements. Participants were then engaged in a series of discussions as part of the focus group sessions.

The sessions were divided into four parts. Participants were asked about their:

1. First encounter with plant-based meat alternatives (or if they hadn't tried any, what they had heard about them.)
2. Attitudes regarding cultivated meat.
3. Perceptions of the link between alternative protein choices and sustainability as well as what aspects of sustainability were most compelling.
4. Preferences for plant-based and cultivated products in different categories (red meat, poultry, and fish and seafood) as well as desired product characteristics.

The six focus groups were conducted at professional focus group facilities with audio and video recordings for each session. Each session lasted 1 ½ to 2 hours. Participants were compensated \$100 for their time. To view the full focus group interview guide, see [Appendix A](#).

Participants

Participants were recruited by a professional focus group company using an established panel of potential participants in New York, NY, Atlanta, GA, and Phoenix, AZ. Participants were selected after a rigorous screening process that included questions about their diets, previous and intended behavior in regard to trying plant-based products, intended behavior in regard to trying cultivated meat, and levels of food neophobia. Inclusion criteria included: 1) omnivore, 2) household food shopper, 3) at least moderate likelihood to try plant-based and cultivated meat, and 4) openness to trying new foods. Based on previous research assessing levels of food neophobia and willingness to try plant-based and cultivated meat ([Bryant et al., 2019](#)), we estimate that the established criteria would include approximately half of the US population. Participants were also recruited for variety in terms of socioeconomic background and previous trials of plant-based meat.

The final (seated) roster included a total of 41 participants, with 15 participants (seven in the first session and eight in the second session) in New York, 13 participants (seven in the first session and six in the second session) in Atlanta and 13 participants (eight in the first session and five in the second session) in Phoenix. Each group was recruited with the intention of having a mix of sociodemographic traits including age, gender, household income level, education level, employment status, and race/ethnicity.

Materials

Participants engaged with several materials both prior to and during the focus group sessions. Participants were asked to prepare for the session by reading preparatory materials to familiarize themselves with the new food technologies. [Appendix B](#) details the participants' homework, including the stimuli they encountered in advance of the focus group session. We developed an interview guide (see [Appendix A](#)) that allowed us to standardize the flow of questions across all cities and groups. Participants provided written responses to some questions. We based a portion of the focus group guide on materials used in a [pilot study](#) conducted in March of 2019 that included four focus group sessions with college students at Willamette University in Salem, Oregon. See [Appendix C](#) to view the in-session worksheet. All materials are also available on [Open Science Framework](#).

Qualitative Analysis

Our data source for this study was the transcription of each focus group. All six focus groups were audio and video recorded. To create the transcript, we first used a computer-assisted transcription service, which produced transcriptions of limited quality. To increase quality, we then trained four research assistants to edit and transcribe the computer-generated transcripts while listening to the audio recordings. In addition, the research assistants noted potential emerging themes for each research question.

Next, we read the final transcripts, establishing key emerging themes for each research question based on the text. We then met to discuss and further determine the themes for each research question, and then re-read the transcripts to add details and examples to the themes. Finally, we met again to discuss and ensure agreement on the final results.

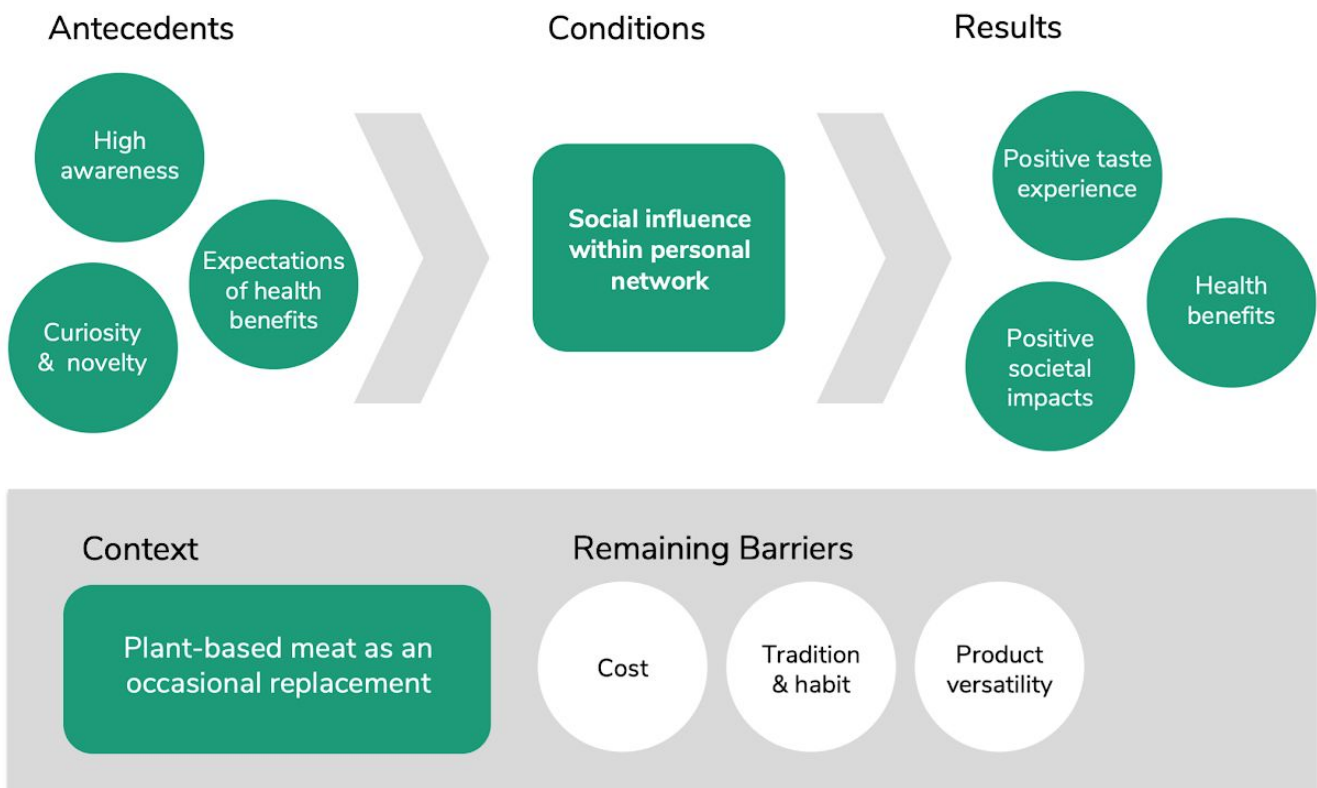
Results: First Trials of Plant-based Meat

Findings—First Trial Triggers and Experiences

After listening to the narrative describing plant-based meat, each participant wrote about their first experience trying plant-based meat, or for those who hadn't tried it, what they had heard about it. The moderator led a discussion about what led to each person's first trial, or what would have prompted a trial.

RQ: What are the necessary antecedents for naive consumers to try plant-based meat?

First Trial



Awareness is high.

Respondents reported learning about these products from a variety of sources, including friends and family, news media, advertisements, product promotion, restaurant menus, and product placement in grocery stores. Several respondents noted that information about plant-based meat alternatives was “everywhere.”

Curiosity is an important factor.

A key reason participants were triggered to try plant-based meat was driven by curiosity and interest in trying a novel product.

Consumers want a healthier option.

Some participants were looking for healthier alternatives to conventional meat. While not perceived as a perfect health option, plant-based meat was perceived as a positive step toward a healthier diet. Consumers also strongly noted the positive benefit of the taste of plant-based products. “Love for animals” and wanting to “save the planet” were also noted as benefits, though these topics were mentioned fewer times than health.

First trials are usually positive.

Most of the time, first trials resulted in positive experiences which many participants noted was surprising. In terms of sensory properties, taste was often perceived as positive; texture and smell were perceived less as less positive. Initial trials led to repeat purchases for some but not all participants.

First trials occur as a result of social influence within a personal network.

The prevailing experience that triggered a new trial of plant-based meat involved social influence within the participant's close network of friends, family, and co-workers. Most often, the person introducing the product was described as a vegan or vegetarian, but sometimes this person was described as a flexitarian. The two primary locations where first trials occurred were restaurants or social gatherings (such as barbecues) at homes. First trial was most often the result of food being offered to participants, rather than participants ordering or preparing it.

Plant-based meat is a product for occasional meat replacement.

Participants framed plant-based meat as an addition to their diet—they use plant-based meat in place of conventional meat on occasion, but not as a full replacement in their diet.

Barriers for repeat purchasing remain.

Despite most participants having positive first experiences, not all reported repeat purchases. Participants identified cost as the predominant factor in this decision. Tradition was a secondary barrier, with some participants noting they found it difficult to include plant-based meat in their diets due to habit, family traditions, and/or culture, and lack of a versatile set of products.

Recommendations to Increase First Trials of Plant-based Meat

- **Role of advocates.** Advocates have strong roles to play within their interpersonal networks and can use their influence to positively share opportunities and their rationale for making dietary changes. In particular, advocates can have conversations with their networks through which they share their reasons for replacing conventional meat with plant-based meat and offer plant-based meat for trial, whether at a home or restaurant.
- **Specials and lower cost.** Restaurants can offer specials or samples as well as plant-based meals at cost parity to other meals.
- **Sensory properties.** Companies can continue to improve sensory properties, especially with regard to texture and smell. A wider range of products for different meal occasions may also increase purchasing and incorporation into existing diets. For marketing plant-based meat, consider demonstrating taste and texture qualities through visuals, text, and testimonials.
- **Personal benefits.** There is a need to increase motivations and decrease barriers for the early majority group, as the product alone, while well-received, is not sufficient to trigger long-term dietary change. Participants indicated a desire for products that offer personal benefits, including new eating experiences rooted in familiarity, healthier options as compared to conventional meat, and lower price points that achieve price parity.

Results: Interest in Trying Cultivated Meat

After listening to the narrative describing cultivated meat, participants wrote down any questions they would like to have answered or more information they would need before trying cultivated meat. They also documented their main motivations for purchasing and barriers/hesitations.

RQ: What are the necessary antecedents for consumers to try cultivated meat?

Findings—Desired Information

Participants desired detailed information about the end product.

Participants were mostly interested in knowing more about basic product features with particular interest in sensory properties, nutrition/health, cost, and meal preparation. Participants expressed their enjoyment of conventional meat as an end product, and wanted any new meat products to have the same desirable features—especially taste, but also meal context and cost.

Desired Information

Sensory Qualities



Health Aspects



Context



- **Taste.** Participants wanted cultivated meat to taste as good as or even better than conventional meat. They expressed a desire for naturally-occurring taste that does not require a lot of seasoning to enhance or mask flavor.
- **Texture.** Participants emphasized a desire for a texture similar to that of conventional meat.
- **Appearance.** Appearance was particularly important, with participants noting that a deviation from the appearance of conventional meat would be off-putting.
- **Nutrition.** Participants wanted to know whether cultivated meat would be any healthier than conventional meat. Many expressed a desire to know specific nutritional information such as number of calories, macronutrient content, and micronutrient content.
- **Ingredients.** Participants raised concerns around antibiotics, hormones, and preservatives in the end product.
- **Meal context.** Participants expressed the need for products to fit within their current meal contexts, traditions, and cultures.
- **Affordability.** Participants expressed a concern that the product would be high in cost, given its newness.

Participants desired detailed information about the production process.

Respondents expressed a great deal of uncertainty in regard to understanding the production process for cultivated meat. Participants expressed a deep desire to relieve this uncertainty, and to understand the details of the production process. Some participants were simply very curious about how meat can be cultivated and wanted to learn more in an effort to satisfy their curiosity about a new concept. Many participants expressed concerns regarding safety, with some participants noting that without additional information, their concerns were amplified by their imaginations filling in information deficits. We observed process concern in the following areas:

- **Obtaining healthy cells.** Questions arose around whether the cells were taken from a healthy animal, and whether the process hurt the animal.
- **Growing the cells.** Questions arose around issues of safety of inputs, with mentions of nutrients, hormones, chemicals, and drugs.

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- **Is it cloning?** Several participants raised the issue of cloning, and were concerned that the process would be similar or would have unexpected genetic effects.

Participants expressed a desire for full lifecycle production transparency (certification, regulatory approval, independent investigations in facilities, research materials on safety). Some participants noted that demonstrating the controlled and clean process of cultivating meat would likely be well-received, particularly in contrast to the production process of conventional meat, with which several respondents expressed discomfort in terms of cleanliness, lack of control, and animal welfare concerns.

Findings—Motivations

Participants felt that cultivated meat offers personal and societal benefits.

Participants noted several properties of cultivated meat that appealed to them as personal benefits.

- **Excitement.** Cultivated meat appealed to respondents' curiosity. As something so novel, respondents said "you just have to try it" and make a comparison to conventional meat.
- **Tradition.** Participants noted that this type of meat allows them to maintain their meal traditions and food-based cultural experiences.
- **Feels good.** Participants noted that cultivated meat would allow them to feel better about their dietary choices, particularly in terms of animal welfare.
- **Societal benefits.** Participants readily noted societal benefits and how their motivations were particularly tied to these benefits, especially regarding animal welfare and environmental sustainability, but also regarding food security and solutions to feeding the growing population. Respondents noted their desire to positively impact society, and the difficulty in doing so with current options (plant-based meat or a plant-based diet), in part because some felt that plant-based products do not fully meet their needs for direct replacements. As such, respondents identified cultivated meat as a more realistic and attractive solution.
- **Health.** Participants desired the product to offer parity to conventional meat on nutrition, and some had preferences for cultivated meat to be higher in nutritional value than conventional meat. In addition, some participants noted the importance of obtaining cells from the highest quality animals possible.
- **Safety.** Participants saw cultivated meat as an opportunity to enhance safety due to increased cleanliness in the production process. They asked whether the production would be cleaner and more sterile, and thus free from health safety issues such as E. coli and mad cow disease.

Findings—Barriers

Participants felt that cultivated meat had potential negative personal and societal effects.

Participants raised concerns in several areas including tradition, expense, safety, and economic and social impact on farmers. Such concerns were illustrated by the following questions:

- **Will I be able to maintain my culinary traditions?** Participants expressed concerns that cultivated meat might not exactly replicate conventional meat and the meat experience. Sensory properties—not just taste, but also texture and appearance—were very important; participants noted that sensory properties would be a barrier for them if the new product diverged much from conventional meat. In addition, participants noted that cultivated meat products would need to be versatile and fit within their current meal contexts, traditions, and cultures (e.g., Can I grill it? Can I make carne asada? Will it have bones that provide flavor?).
- **How much will it cost?** Participants consistently noted cost as a concern, assuming that cultivated meat would be much more expensive than conventional meat, at least in the near-term.

- **Will it be high-quality?** Some participants noted potential quality concerns, such as whether the initial cells would be taken from a high-quality, healthy animal, and that the high cost might result in the use of plant-based fillers.
- **I don't know enough about it to understand the benefits.** Participants were generally unfamiliar with the cultivation process and some felt they needed more information to increase their interest.
- **Is this safe?** Participants associated the process with laboratories. Some participants expressed concern around cloning and genetic mutations.
- **What will happen to farmers?** A few participants raised the issue of farmers and ranchers, and the impact that a shift in the production system would have on them. Participants expressed both economic and social concerns, e.g., What happens to farmers and their way of life?

Recommendations for Bringing Cultivated Meat to Market

Product Development

Product Features

Replicate the meat-eating experience

Sensory features

Meal context & versatility

Product quality

Replicate and optimize

Nutrition

Cost

Differentiate from the conventional meat production process

Ingredients & additives

Transparency

- **Sensory properties.** Replicate the full sensory properties of conventional meat, and optimize where possible. The taste should be the same as conventional meat or even more flavorful. Replicating the flavor of bone-in meat is an opportunity. Texture and appearance are also crucial for acceptance.
- **Nutrition.** Replicate the current nutritional profile of conventional meat, as that would be sufficient for most consumers. In terms of optimization, some participants desired a nutritionally superior product, and none were opposed to it. Offering an exact replacement and an optimized product would appeal to different audience segments.
- **Ingredients and additives.** Care should be taken to avoid additives where possible, as participants expressed concern about inputs into the process.
- **Cost.** Aim for a competitive price point. Cost was a large barrier for most, and widespread purchasing will be dependent on a competitive price point.
- **Meal context.** Participants reported enjoyment in eating meat. New products should replicate the meat-eating experience. Produce a product that is versatile within existing and familiar meal contexts. This is crucial for adoption, as consumers enjoy and want to maintain their meat traditions.
- **Quality.** Produce products that communicate quality. Many participants noted the need for the product to be top-quality, as exemplified by the amount of importance they placed on obtaining cells from healthy and high-quality animals. Fillers were expressed as a quality concern.
- **Transparency.** Develop products and scale up with transparency in mind. Consumers will be looking for transparency in the production process, which will be a crucial opportunity for consumer acceptance.

Public Communication

- **Food safety.** Consumers will be looking for stamps of approval from trusted sources. Highlighting USDA/FDA regulatory approval will help to mitigate safety concerns. Experts and scientists were noted as credible sources of information in the food and health spheres. Utilizing spokespeople will also calm concerns. Stamps of approval from social influencers and observable demonstrations of safety through behavior (eating it over time) will also form positive opinions.
- **Availability of information.** Participants had a deep desire to more fully understand the production process. They tended to fill in information deficits with negative-leaning assumptions or concerns. Transparency would calm concerns about production because it would help prevent negative framing and assumptions in the face of unknown information. Explaining or making available detailed information in a familiar and understandable way appropriate for non-technical audiences would likely create neutral or positive beliefs instead of negative beliefs resulting from assumptions.
- **Transparency in production.** Transparency about the production process puts checks into place that build consumer trust. Participants desired full-cycle production transparency including giving independent investigators full access to conduct safety assessments. Many consumers noted this as an opportunity for differentiation from the conventional meat industry, which they viewed as not transparent. In this vein, it could be beneficial to frame public communication in terms of “same product, better process.”
- **Farmers.** It is important to highlight that the transition to new forms of production will be gradual. Farming and ranching are iconic in the United States, and participants raised concerns for farmers and their way of life. Providing relevant assurances is an opportunity to mitigate concerns, though this should be a minor framing.

Marketing

Marketing Opportunities



Curiosity



Enjoyment
of meat



Quality



Food
safety



Sustainability



Love for
animals

- **Curiosity.** Initial marketing could target curiosity. Participants were excited about the opportunity to try the new product type and to “see for themselves” that the product is equivalent to conventional meat.
- **Enjoyment of meat.** As consumers are generally satisfied with the end product of conventional meat, cultivated meat marketing should acknowledge the enjoyment of the meat eating experience. Consumers do not, however, approve of the conventional production process or its effects from personal and societal standpoints. Showcasing people who are “like them” or have social influence eating and enjoying the product will also be helpful in this regard (public events, high profile cooking shows, etc.).
- **Quality.** Participants desired a quality product resulting from quality cell lines and inputs.
- **Food safety.** Participants saw cultivated meat as an opportunity to enhance safety—if the production process is more tightly controlled and sterile than that of conventional meat, participants expected the product to lower their risk for foodborne diseases. Messages about the advantages of a sterile production

environment should be framed carefully, as images of laboratories can be off-putting in a food context. A transparent production process with access to independent investigators is also a marketing opportunity.

- **Sustainability.** Participants expressed an interest in contributing to various aspects of environmental sustainability, which would cause them to feel good about purchasing cultivated meat.
- **Animals.** Many participants noted their love for animals and that this is a motivation for interest in cultivated meat. However, future research should determine what type of messaging is effective in this context.

Results: Product Types

Participants were asked to indicate via a show of hands if they were interested in an alternative (either plant-based or cultivated) in each of the following categories: red meat, poultry and fish/seafood. Then respondents were asked to speak to why they were interested in alternatives for particular categories and to relay desired product characteristics for each category.

RQ: What are the desired product characteristics for plant-based and cultivated meat?

RQ: How do preferences differ by meat type, including poultry, seafood, and red meat?

Findings

Overall, participants expressed the greatest interest in alternatives to red meat and poultry, and moderate interest in seafood.

Many respondents wanted alternatives that closely or exactly replicated red meat across the entire sensory profile including taste, smell, texture, and appearance. Another subset of respondents felt that an exact replica was not necessary, so long as it was a good product. Participants indicated that they desired not the raw product, but the sensory properties of the cooked product.

Across species types, participants had less interest in the products they had difficulty imagining, such as whole cuts, bone-in meat, or complicated species-specific textures of fish. There was a general preference for formed products (patty, links, nuggets), in part due to the perception that replication of whole cuts could require more processing or “weird things.” The current general trend favors simple over complicated end products, but perceptions may change over time as technology advances.

Red Meat

Most participants (35 of 41) expressed interest in alternatives to red meat.

- **Sensory properties.** Participants noted blood and rawness as a disliked part of the red meat experience. Some participants noted that it was important for a product not to be dry and desired a certain level of greasiness. Several respondents had trouble picturing whole pieces of red meat (shape, texture, inclusion of bones) and expressed skepticism about the potential to create whole cut replicas.
- **Product format.** Respondents relayed the importance of versatility and were particularly interested in the broader range of whole cut possibilities with cultivated meat. Consumers saw ground products as more feasible candidates for innovation, especially in achieving desired sensory properties. Some processed red meat products (esp. hot dogs), are known for being composed of “junk” and “unwanted parts,” and participants indicated that a good hot dog substitute would be especially welcome.
- **Product use.** The cooking process should be the same or easier in comparison to that for conventional meat. Participants desired preparation information alongside the product, such as recipes and cooking directions.

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- **Affordability.** Respondents noted the high price of red meat (esp. steak), and expressed a desire for alternatives that offered more affordability.
 - **Health.** Many respondents expressed health concerns associated with red meat and diet-related diseases (obesity, heart disease, etc.). As such, participants had an interest in alternatives that did not present these same health concerns, and some also desired a product with higher nutrient levels.
 - **Safety.** Some participants were interested in alternatives because the product did not feature the same risk of foodborne illnesses and antibiotic/hormone residues.
 - **Sustainability.** Respondents expressed interest in red meat alternatives that are better for the environment, with some citing greenhouse gases and land use as examples of sustainability concerns about conventional red meat.
 - **Animals.** Some respondents expressed their love of animals—this was especially prevalent in the red meat category.

Poultry

Most participants (35 of 41) also expressed interest in alternatives to poultry. Several respondents identified chicken as central to their household dietary patterns. Participants expressed a dislike for the processed nature of many conventional chicken products (e.g., nuggets), despite still purchasing.

- **Sensory properties.** Participants had an easier time conceptualizing whole-cut alternatives to chicken in comparison to red meat. A handful of participants expressed dissatisfaction with reheating poultry due to dryness and wanted alternatives without this problem. Participants desired crunchy coatings for breaded products.
- **Product format and use.** Participants desired equivalent product versatility, including formats such as nuggets, strips and patties (especially for kids) as well as a wide variety of non-breaded options.
- **Affordability.** Some participants noted the affordability of conventional chicken, and felt it would be quite difficult to produce poultry alternatives that were less expensive.
- **Health.** Some parents noted that their children readily ate chicken, and nuggets were a particular favorite. At the same time, participants expressed concerns that nuggets are not very healthy, are overprocessed, and are composed of the lowest quality parts of chicken. As such, participants noted they would be motivated by alternatives that are healthier than the conventional product.
- **Safety.** Participants were interested in alternatives because they do not have the same risk of foodborne illnesses and antibiotic/hormone residues (similar to red meat).
- **Sustainability.** Mentions of sustainability concerns with poultry were scarce.
- **Animals.** Some respondents were interested in alternatives according to concerns regarding production, particularly dirty living conditions.

Seafood

Less than half of the participants (18 of 41) expressed interest in alternatives to seafood, and many of those expressed some hesitation. They offered a wide variety of reasons: rarely or never eating fish (due to taste or safe cooking concerns), only eating fish at restaurants, and familial or cultural ties to fishing. Several participants expressed doubt that fish could be replicated as easily as other product types, particularly noting difficulties of mimicking different tastes, textures, and species.

- **Sensory properties.** Participants expressed skepticism about the successful replication of desired sensory properties of fish in alternatives, given the wide range of species available. Participants were split on the desirability for a “fishy” taste in an alternative product.
- **Product format and use.** Participants had difficulty conceptualizing product formats and uses due to the large number of species and required cooking methods.
- **Affordability.** Participants did not comment on affordability.

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- **Health.** Because most participants generally saw fish as healthy, they expressed less interest in substitutes.
 - **Safety.** A number of participants expressed safety concerns around both farmed and wild-caught conventional seafood. Contamination concerns included bacteria, parasites, plastics, and mercury. For some participants, it was not immediately obvious that alternatives would mitigate these problems. However, some participants did immediately cite this as an opportunity, noting that cultivated seafood, as compared to cultivated red meat and poultry, would benefit in departing from exact replicas. These participants noted cultivated seafood would be safer with less contamination (“You’d be actually eating fish not fish plus other things.”)
 - **Sustainability.** Participants did not raise the issue of sustainability concerns associated with seafood. Factors such as overfishing and ocean health were scarcely mentioned.
 - **Animals.** Participants expressed less concern for welfare issues in the seafood category than for those in red meat and poultry categories. However, several participants noted the dirty living conditions of farmed fish as a reason for seeking alternatives.

Recommendations for Plant-based and Cultivated Meat Product Development

Product Development

- Companies should continue to focus on developing products with desirable sensory properties, versatility, and compatibility with current meal patterns.
- Focusing on highly appealing sensory aspects is critical to driving regular purchase interest from general consumers.
- Versatility of meat types and product formats within each category is important for more frequent dietary replacement. Participants most desired red meat alternatives as conventional red meat is associated with the greatest number of perceived personal barriers (health, cost) and societal issues (animal welfare, environmental degradation). Growing familiarity with plant-based burgers and sausages may also contribute to current acceptance.
- Processed breaded chicken alternatives offered a clear opportunity for improvement over conventional products due to health and quality concerns.
- There were barriers to interest in whole-cut alternatives, as consumers have specific expectations (e.g., flavor profiles are improved by factors such as bone-in and visible marbling).
- Seafood alternatives lack widespread appeal, though acceptance may change once quality products are available (“seeing it is believing it”) and if societal benefits (sustainability) are clearer.

Public Communication and Marketing

- Appeals to personal benefits, including sensory properties, health, and safety, remain the most compelling marketing points. Highlighting the production process differences (more transparent, cleaner, and controlled) is also an opportunity to positively differentiate alternatives from conventional products.
- Conventional meat was associated with underlying safety concerns, though participants noted this was not a sufficient barrier to purchasing conventional products. However, participants were highly interested in appealing alternatives that did not present these safety concerns. Participants associated safety concerns with both the production systems for and the end products of conventional meat and seafood. Concerns included crowded and dirty conditions, antibiotics and hormone use, bacteria such as *E. coli* and salmonella, and in the case of seafood, additional contaminants such as plastic and mercury.
- When participants were aware of environmental issues, they noted this as one of many compelling reasons to seek alternatives. Overall, awareness of the externalities associated with conventional meat production was fairly low. Positively differentiating alternatives from conventional products will be more effective if the environmental frame is tailored for each meat type. For red meat (where awareness was

the highest), it can be useful to highlight the reduction of greenhouse gas emissions (climate change benefits) and more efficient environmental resource use (water, land benefits). For poultry, it can be useful to highlight dirty conditions and resource inefficiency. For farmed seafood, highlighting dirty conditions may also be effective, while when differentiating alternatives from wild seafood, highlighting issues such as overfishing, species extinction, and bycatch may be compelling.

Results: Sustainability and Plant-based Diet Choices

The moderator led participants in a broad discussion of personal choices and their perceptions of impact on sustainability, including dietary choices. The discussion included taking a pulse of the group's beliefs that personal choices can have positive sustainability impacts, the current personal choices of the group including those with sustainability impacts, and the group's perceptions of plant-based diet choices as acts of sustainability.

Next, participants read an infographic about sustainability and dietary choices and offered specific feedback on improvements to the infographic (those findings were used for rapid editing of public communication materials and are not reported here). Finally, participants read four paragraphs on different sustainability topics (climate change, land and deforestation, water use, and water pollution) and offered their feedback on which arguments were compelling and why.

- RQ: To what degree is sustainability a motivating factor for naive consumers to adopt alternative proteins?
RQ: Which aspects of sustainability are most compelling for naive consumers to adopt alternative proteins?

Findings—Sustainability

Personal Choices

The majority of participants were somewhat or moderately in agreement that their personal choices can have positive sustainability impacts, that they are currently making sustainable choices, and that plant-based diet choices are an act of sustainability. Particularly, the majority of participants at least moderately agreed that plant-based diet choices are an act of sustainability.

Sustainability Message Frame Preferences

After reading about the four sustainability topics (climate change, land and deforestation, water use, and water pollution), participants selected their top choice along with their reasons for that choice. Water pollution was the most compelling frame for nearly half of the participants (20 of 41). Land use and deforestation (9 of 41) and climate change (8 of 41) were in a second tier, followed by water use (4 of 41). Notably, when participants were tasked to select their top choice, the majority specifically noted that many, if not all, of the topics were compelling.

- **Water pollution.** Water pollution was very compelling to participants, with many noting the urgency of the problem and the immediate personal-scale effects on human health and safety. Participants also noted that water is a meta issue, as one body of water is connected to other bodies of water and water is a necessary component of our food supply. The word “pollution” was cited as a signal of danger, and the water contamination crisis in Flint, Michigan, was a touchstone for understanding this issue.
- **Land use and deforestation.** Participants felt that the deforestation of the Amazon rainforest was a compelling recent example, and participants noted that tree cutting is a visceral image and that trees serve as a linchpin resource for human life (“that’s like our oxygen.”) The combination of large numbers with a context that was easy to visualize was considered persuasive.

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- **Climate change.** Many participants noted that climate change impacts are critically important on a grander scale, as climate change is a meta issue with impacts on many other areas. Participants noted that vast news coverage makes climate change seem important, and they found the connection between plant-based diets and climate change interesting.
 - **Water use.** Although water use was least cited as the most compelling topic, participants said to some degree it blended into the water pollution topic. The participants who selected water use as the most compelling topic understood water to be a limited resource and the issue to have widespread impact. Recent droughts in California increased the immediacy of this issue.

Recommendations—Sustainability as a Motivator for Plant-based Diets

Regardless of specific aspects of sustainability, participants framed their responses to sustainability topics within the contexts of resource availability and safety. These availability and safety issues were compelling as they had immediate relevance to current humans and future generations. We offer several specific recommendations for sustainability message framing for public communication and marketing:

- **Use sustainability as a motivator for encouraging plant-based diet choices.** This research suggests that many consumers understand there is a connection between dietary choices and sustainability impacts. In addition, many consumers express openness to further understanding this connection and the argument for dietary change on the basis of sustainability. Because sustainability is a widespread topic that is valued by key consumer segments, using a sustainability frame in promotional materials is likely to increase reception and consideration of the message. Framing sustainability in terms of impacts on human safety and resource availability, and connecting to current events, make sustainability messaging more salient.
- **Connect to personal impacts, even for sustainability issues.** When providing a rationale for selecting their top sustainability frame, the majority of participants cited reasons that were close at hand and had easy-to-see immediate and long-term impacts. For example, participants readily framed available and clean water as a personal health and safety issue, and deforestation as a resource issue, noting “that’s our oxygen.”
- **Frame messages in narrative form to help consumers recall and connect information.** Participants connected elements of each topic to their pre-existing knowledge. Existence of current or recent events helped cue importance. For example, participants noted events such as the water crisis in Flint, Michigan, the Amazon burning in Brazil, and droughts in California. These events helped elevate the importance of water use/pollution and land use/deforestation.
- **Use imagery to convey immediacy.** Visuals and text that convey imagery are effective at demonstrating the tangibility of an issue that may be hard to grasp as well as illuminating actions that take place far from public view. For example, participants noted that images of cutting down trees were very visceral.

Conclusions

This focus group study sought insights from diverse groups of consumers across the United States regarding their perceptions of and experiences with new sources of protein. We framed the focus group questions to uncover strategies for expanding product and dietary adoption among new and larger consumer segments.

When consumers encounter a new food technology, they desire accessible and understandable information to help them make choices. They also seek validation from their social network of product desirability and safety. First trial predominantly occurs in the context of a friend or family member offering a product as part of a meal in a home setting or making a recommendation in a restaurant setting.

Upon first trial, consumers are often surprised by positive experiences, though only some reach for repeated trials. When participants like a product and engage in repeat purchasing, the product serves as an occasional replacement for a specific meal component. Participants noted the need for a wide range of versatile product types and formats for more broad dietary replacement. Participants noted less desire for products that they had difficulty imagining with good sensory properties (e.g., whole cuts or seafood), but this perception may shift with demonstrated technological capabilities.

In general, consumers linked alternative proteins to societal benefits (sustainability, animal welfare). Even within these categories, personal and immediate benefits resulting from societal improvements were more compelling. For example, concerns over water pollution were compelling in the context of a safe water supply, and concerns for mistreatment of animals were framed as a desire to be consistent with participants' identities as "animal lovers." However, even these personal benefits of societal improvements may be insufficient to influence consumers, as food purchasing decisions typically fall under System 1 thinking, in which decisions are made based on unconscious associations rather than through deliberate and rational processes (see [Szejda, Urbanovich, & Wilks, 2020](#)). In addition, removing barriers, as opposed to offering compelling benefits, was generally seen as more impactful. In particular, increasing access and lowering costs are essential for reaching new market segments, especially to prompt repeat trials.

Consumer experiences with currently available products were positive, though barriers to widespread repeated adoption are still strong. The detailed analysis of participants' perceptions and experiences provide deep insights for developing new strategies to expand the alternative protein market.

Appendix A: Focus Group Guide

Introduction (3-5 minutes)

Let's start with introductions. Please just say your first name and your favorite thing about FILL IN SPECIFIC CITY in one sentence. I will start, and then we can go around the group.

Please take out your homework so we can reference it as we go. Make sure to include it in the materials you turn in.

Part 1 – Plant-based meat: First encounters (25 minutes)

RQ: What are the necessary antecedents for naive consumers to try plant-based meat?

Set up

As you might recall from your homework, plant-based meat is... [read aloud]

Pulse

How many of you have eaten plant-based meat?

Worksheet 1

1. For those of you who've tried it:
I'd like you to think back on your first experience. Take a few moments to describe that experience on your worksheet.
2. For those of you who haven't tried it: Please write down anything that you know about these types of products and anything regarding your attitude and likeliness to try them.

Discussion

1. For those of you who've tried it: tell me what got you to try it. (probes if necessary: where & when - friends and family, news media, advertisements, situation/context: grocery store, restaurant, party)
 - a. Optional: Probe into any primary/repeating motivations.
2. For those of you who haven't tried it: Why haven't you tried it yet? What would get you to try it?

Part 2 – Cultivated Meat: What's needed for initial purchase? (25 minutes)

RQ: What are the necessary antecedents for consumers to try cultivated meat?

Set up

Let's review the homework. As you may recall, cultivated meat is.... (read aloud)

Cultivated meat is yet to be available for purchase. It's estimated that it will be widely on the market in 2 to 4 years from now.

Worksheet 2

1. In thinking about cultivated meat as a product that will likely be on the market in the next few years, I'd like you to write down any questions you would like to have answered or more information you would need before trying a product like this.
2. Next, I would like you to write down your main motivations for trying such a product.
3. Finally, please write down the types of things that might cause you to hesitate in or prevent you from purchasing this type of product.

Discussion

Let's talk about what factors would influence your decision to initially try it.

1. What further information would you need in order to try cultivated meat? Are there lingering questions?
2. Let's first talk about motivations. What would make you want to try cultivated meat?
3. Next, let's talk about barriers. What would make you hesitant to try it?

If needed, probes for motivations and barriers: price, taste, safety and optimized nutrition (less saturated fat, more omegas, more protein or nutrients)

Part 3 – Alternative proteins: Motivators to purchase with focus on sustainability (35 minutes)

RQ: To what degree is sustainability a motivating factor for naive consumers to adopt alternative proteins?

RQ: Which aspects of sustainability are most compelling for naive consumers to adopt alternative proteins?

Set up

Now I want to talk a little bit about plant-based diet options and sustainability. As you know, there are many personal choices that one can make to be more sustainable like driving less, taking shorter showers, consuming less plastic, etc..

Pulse

I'm going to ask you three questions. First, please write down your answers at the top of worksheet 2 and then I'll check in with you verbally.

1. To what extent do you feel your own personal choices can positively impact sustainability?
 - a. Show of fingers 1-5 with 5 being the greatest extent
2. To what extent are you currently making personal choices with an eye towards sustainability?
 - a. Show of fingers 1-5 with 5 being the greatest extent
3. To what extent do you see making plant-based diet choices as an act of sustainability?
 - a. Show of fingers 1-5 with 5 being the greatest extent

Worksheet 3a

1. To what extent do you feel your own personal choices can positively impact sustainability? (1-5)

-
2. To what extent are you currently making personal choices with an eye towards sustainability? (1-5)
 3. To what extent do you see making plant-based diet choices as an act of sustainability? (1-5)

Now I would like you to spend some time looking at the materials I'm handing out. Mark what most resonates with you or you find compelling by circling it. Indicate any aspects you have a negative reaction to with an X. Add any information regarding your choices to Worksheet 3.

Discussion

1. Let's delve a bit more deeply now.
 - a. What specific words, phrases or concepts did you find compelling on the materials?
 - b. What specific words, phrases or concepts did you perhaps have a negative reaction to on the materials?

Worksheet 3b

1. Please read the following short arguments and choose which is most compelling to you by circling it and adding your reasons at the bottom.

Pulse

1. How many people found climate change to be the most compelling?
2. Land use and deforestation?
3. Water use?
4. Water pollution?

Discussion

1. Let's explore more deeply the reasons behind the choices that you made. I'd like to hear a little bit from each person about why a particular topic resonated with you.

Appendix B: Pre-Session Homework

Homework

INTRO: Agricultural innovations now allow meat to be produced in new ways. We'd like your feedback on these innovations.

Step 1 – Read the following statement.

What is Plant-Based Meat?

First, let's take a look at how we produce meat from animals:

- We grow plants.
- We feed those plants to farm animals.
- As these animals grow, they turn those many plants into meat.

But it turns out, we don't have to do it that way. Protein, vitamins, minerals—everything in meat started out in plants and in the soil. We can skip the animal and make meat directly from plants.

Different from black bean burgers and veggie patties, plant-based meat looks, cooks, and tastes just like conventional meat. The benefit, however, is that plant-based meat is far more resource-efficient than conventional meat: A chicken needs nine calories of feed to make just one calorie of meat. Producing plant-based meat typically requires over 90 percent less land and water. It vastly reduces water pollution, environmental degradation, and greenhouse gas emissions. And it completely eliminates the need for antibiotics in animal feed.

Global meat production is at an all-time high and is expected to rise another 70 percent by 2050. We don't need to raise billions of animals in industrialized facilities. With plant-based meat, we can use far fewer resources to produce vastly more food and nourish the world sustainably.

Step 2 – Answer the following question.

Prior to reading this description, how familiar were you with the concept of plant-based meat?

- Not at all familiar
- Somewhat familiar
- Moderately familiar
- Very familiar
- Extremely familiar

Step 3 – Please indicate anything you had a negative reaction to (from the concept discussed to specific phrasing or word choices) below and on the back.

Step 4 – Read the following statement.

We can now diversify and strengthen the protein supply by producing meat in a new, more efficient way. Rather than raising and slaughtering animals, we can cultivate meat directly. This starts with the basic building block of all life—the cell.

From a small sample of animal cells, we can grow the same beef, pork, poultry, and seafood we enjoy eating today. In conventional animal farming, cell growth occurs in an animal. But we can grow the same cells in what is known as a cultivator.

The cultivator facilitates the same biological process that happens inside an animal by providing warmth and the basic elements needed to build muscle: water, proteins, carbohydrates, fats, vitamins, and minerals. Cultivating meat is similar to growing plants from cuttings in a greenhouse, which provides warmth, fertile soil, water, and nutrients.

This new method of meat production enables the natural process of cell growth but in a more efficient environment. The result is an abundance of cultivated meat, identical to conventional meat at the cellular level but free of pathogens and other contaminants. Cultivated meat looks, tastes, and cooks the same. Compared with conventional meat production, meat cultivation is less resource-intensive, decreasing methane emissions, deforestation, biodiversity loss, water use, water pollution, antibiotic resistance, and foodborne illnesses.

Innovators around the world are working to bring cultivated beef, poultry, pork, fish, and seafood to market at a competitive price point. The FDA and the USDA will jointly regulate this new form of meat production in the United States.

Meat cultivation will expand the protein options available to consumers, providing the meat so many people desire, just produced in a new and sustainable way.

Step 5 – Answer the following question.

Prior to reading this description, how familiar were you with the concept of cultivated meat?

- Not at all familiar
- Somewhat familiar
- Moderately familiar
- Very familiar
- Extremely familiar

Step 6 – Please indicate anything you had a negative reaction to (from the concept discussed to specific phrasing or word choices) below and on the back.

Appendix C: Participant Worksheets During Session

Worksheet 1

For those of you who've tried it:

I'd like you to think back on your first experience. Take a few moments to describe that experience here.

For those of you who haven't tried it:

Please write down anything that you know about these types of products and anything regarding your attitude and likeliness to try them.

Worksheet 2

In thinking about cultivated meat as a product that will likely be on the market in the next few years, I'd like you to write down any questions you would like to have answered or more information you would need before trying a product like this.

Next, I would like you to write down your main motivations for trying such a product.

Finally, please write down the types of things that might cause you to hesitate in or prevent you from purchasing this type of product.

Worksheet 3a

To what extent do you feel your own personal choices can positively impact sustainability? (1-5)

To what extent are you currently making personal choices with an eye towards sustainability? (1-5)

To what extent do you see making plant-based diet choices as an act of sustainability? (1-5)

Please provide any additional information regarding your response to the infographic

Please read the following short arguments and choose which is most compelling to you by circling it and noting your reason at the bottom:

Climate change

Animal agriculture is one of the main causes of climate change. In fact, greenhouse gas emissions from meat-eaters are 2x more than those from people who follow a plant-based diet. Plant-based diets can help slow climate change. The Intergovernmental Panel on Climate Change (IPCC) estimates that by 2050, plant based dietary changes could reduce CO2 emissions by up to 8 billion metric tons.

Land use and deforestation

Animal agriculture is one of the main causes of deforestation across the globe; 70% of deforested land in the Amazon is occupied by pastures. Plant-based diets do not require the same land mass as animal pastures and therefore reduce the problem of deforestation. For example, only one beef burger can be produced using the same amount of land needed to produce 15 plant-based burgers like Beyond Burgers.

Water use

Animal agriculture is one of the main drivers of water use across the globe; 7% of global human water use goes into animal feed production. Plant-based diets do not require as much water and therefore use less of this valuable resource. For example, it takes 7.6x more water to produce a calorie of beef than to produce a calorie of vegetables.

Water pollution

Animal agriculture is one of the main causes of water pollution; 40% of US river miles have excessive levels of nitrogen and phosphorus, chemicals associated with fertilizers and runoff from animal waste. Plant-based diets do not include animal products and therefore do not create this type of water pollution. For example, a shift away from meat production in Mississippi Basin crops could reduce total fertilizer demands by over 50%, without any change in total production of human food protein.

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Keri's research advances the plant-based and cultivated meat market sectors by generating effective messaging that helps consumers make sustainable, healthy, and just food choices. She is also a visiting scholar with the School of Social and Behavioral Sciences at Arizona State University (ASU). Keri earned her PhD in communication from ASU's Hugh Downs School of Human Communication and completed postdoctoral work in science communication with ASU's School for the Future of Innovation in Society.

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About GFI

The Good Food Institute is a global nonprofit building a sustainable, healthy, and just food system. With expertise across the scientific, regulatory, industry, and investment landscape, we are accelerating the transition of the world's food system to alternative proteins, using the power of food innovation and markets.