Are Consumers Really Confused by Plant-Based Food Labels? An Empirical Study

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An increasing amount of legislation and litigation, including four current federal cases, addresses how states can and should regulate plant-based food labeling. Plant-based foods contain no animal ingredients but replicate the taste, texture, and function of animal products such as beef, chicken, milk, and butter. Companies typically use the terms "plant-based" or "vegan" on their labels alongside terms like "beef" or "milk" (e.g., "plant-based beef" or "almond milk") to describe their products to consumers.

Eleven states, thus far, have passed legislation and initiated enforcement actions against plant-based food companies to prohibit this labeling practice. Congress and the FDA are also considering such regulations at the federal level. The states claim that, when companies use terms that people traditionally associate with animal products—terms like "beef" and "milk"—on plant-based food labels, consumers become confused about whether they are buying animal products.

In response to legislation and enforcement actions, the companies seeking to bring plant-based foods to the market insist that the "consumer confusion" argument is pretextual, and that agricultural lobbies simply want to suppress the message that consumers can enjoy the experience of eating "meat" or "dairy" without killing animals. They argue that using words like "beef" and "milk" on plant-based foods does not confuse consumers about the ingredients; rather, these words are necessary to accurately convey the taste and uses of new products. Plant-based food companies have therefore challenged state laws, claiming that the laws violate their First Amendment right to free speech.

This is the first study to address the two empirical questions at the heart of the ongoing, constitutional litigation between companies marketing plant-based foods and the states restricting their labeling practices. First, when companies use words like "beef" and "milk" on products made without animal ingredients, are consumers confused about whether these products come from animals? Second, if companies do not use these words, are consumers more *likely to be confused about the taste and function of the plant-based products?*

The study surveyed 155 participants. After answering a series of distractor questions, participants answered questions about various plant-based meat and dairy products, including whether they believed these foods were made from animals/animal products, how well they could imagine what the products taste like, and whether they believed the products could be used for various purposes. The study employed a between-subjects design. One group of participants answered questions about products whose names included terms like "beef," "butter," or "bologna"—terms traditionally associated with animal products. The control group answered questions about products that omitted these terms and replaced them with terms such as "veggie" or "spread."

The results demonstrate that: (1) consumers are no more likely to think that plant-based products come from an animal if the product's name incorporates words traditionally associated with animal products than if it does not. (2) Omitting words that are traditionally associated with animal products from the names of plant-based products actually causes consumers to be significantly more *confused about the taste and uses of these products. Together, the findings imply that legislation prohibiting companies from using words like "beef" and "butter" on their labels does not advance the government's interest in preventing consumer confusion.*

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I. Background:

A. Legislation Addressing Plant-Based Foods

In 2019, retail sales of plant-based foods reached $5 billion in the United States.[1] These foods contain no animal ingredients but replicate the taste, texture, and function of animal products such as beef, chicken, milk, and butter. As new plant-based products infiltrate the market, the major legal question has become how the government can and should regulate their labeling and marketing.

In response to these developments, animal-agriculture lobbies have initiated the widespread passage of legislation, at both the federal and state levels, prohibiting plant-based meat and dairy companies from using words like "meat," "milk," "butter," or "beef" on product labels.[2] Supporters of such legislation argue that people have traditionally associated terms like "beef" and "milk" with animal products and that these words, when appearing on plant-based products, therefore mislead consumers about the products' ingredients. Opponents of the legislation, companies seeking to bring plant-based foods to the market, argue that the "consumer confusion" argument is pretextual.[3] Plant-based food companies contend that the animal-agriculture lobbies simply want to suppress the message that consumers can enjoy the experience of eating "meat" or "dairy" without killing animals; suppressing this message in turn

[1] Russel Redman, *Plant-Based Food Retail Sales Reach $5 Billion*, SUPERMARKET NEWS (Mar. 3, 2020) https://www.supermarketnews.com/consumer-trends/plant-based-food-retail-sales-reach-5-billion.

[2] The alternative, regulatory suggestion was for plant-based products to use words like "meat" and "milk" preceded by the term "imitation." However, this regulatory strategy was largely abandoned following the Ninth Circuit's decision in *Painter v. Blue Diamond Growers*, No. 17-55901, 2018 WL 6720560 at *2 (9th Cir. Dec. 20, 2018). In *Painter*, the court explained that "imitation" is a term of art. It identifies products that imitate an established product in every respect, but "substitute" inferior ingredients, creating cheaper, "nutritionally inferior" alternatives. Substituting sugar for fruit in jam therefore creates "imitation jam." *See 62 Cases, More or Less, Each Containing Jars of Jam v. U.S.*, 340 U.S. 593 (1951) ("[T]he name 'imitation jam' at once connotes precisely what the product is: a different, an inferior preserve, not meeting the defined specifications."). Plant-based milk and meat are not imitation milk or meat because they do not take an animal product and substitute an inferior ingredient to save cost; they are distinct products.

[3] *See, e.g.*, *Tofurky Mounts Free Speech Challenge Against Arkansas Meat Label Law*, ACLU.ORG (July 22, 2019), aclu.org/press-releases/tofurky-mounts-free-speech-challenge-against-arkansas-meat-label-law.

subdues a potential replacement for animal products by keeping consumers unaware of plant-based alternatives. Companies marketing plant-based foods insist, moreover, that using terms like "beef" and "milk" on their products' labels does not confuse consumers about the ingredients. They maintain, on the contrary, that these terms are necessary to prevent confusion by accurately conveying the taste and uses of their products.

The agricultural lobbies launched their first legislative initiatives at the federal level. In January 2017, Senator Tammy Baldwin proposed the Dairy Pride Act, which would "require enforcement against misbranded milk alternatives."[4] In February of 2018, the U.S. Cattlemen's Association petitioned the United States Department of Agriculture (USDA) to "exclude products not derived directly from animals raised and slaughtered from the definition of 'beef' and 'meat.'"[5] And in September 2018, the FDA requested comments about labeling plant-based products with names of dairy foods.[6] Congress, the USDA, and the FDA have not yet taken any major regulatory action, but the same cannot be said for state legislatures.

In August 2018, Missouri became the first state to pass legislation addressing plant-based products.[7] Several state legislatures followed quickly on Missouri's heels, passing legislation with largely identical prohibitions. Arkansas and Louisiana are two of the additional states that are facing lawsuits for their legislation.[8] Arkansas's statute[9] prohibits, in pertinent part:

> (6) Representing the agricultural product as meat or a meat product when the agricultural product is not derived from harvested livestock, poultry, or cervids;

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[4] Dairy Pride Act, S. 130, 115th Cong. (2017).
[5] See Petition for the U.S. Cattlemen's Association at 8, Beef and Meat Labeling Requirements: To Exclude Products Not Derived Directly from Animals Raised and Slaughtered from the Definition of "Beef" and "Meat", (Pet. 18-01),
[6] Use of the Names of Dairy Foods in the Labeling of Plant-Based Products, 83 Fed. Reg. 49,103, 49,103 (Sept. 28, 2018) (closed for comment Nov. 27, 2018)
[7] MO. ANN. STAT. § 265.494(7) (West 2018), amended by 2018 Mo. Legis. Serv. S.B. 627 & 925.
[8] See infra, Part I.B.
[9] See, e.g., ARK. CODE ANN. § 2-1-305 (2019).

> (10) Utilizing a term that is the same or similar to a term that has been used or defined historically in reference to a specific agricultural product.

Likewise, Louisiana's statute[10] prohibits:

> (4) Representing a food product as meat or a meat product when the food product is not derived from a harvested beef, pork, poultry, alligator, farm-raised deer, turtle, domestic rabbit, crawfish, or shrimp carcass.
>
> (9) Utilizing a term that is the same as or deceptively similar to a term that has been used or defined historically in reference to a specific agricultural product.

Finally, in addition to states passing new legislation, state agencies have initiated enforcement actions against plant-based companies. Specifically, the Milk and Dairy Foods Safety Branch of the California Department of Food and Agriculture issued a letter to Miyoko's Kitchen, stating in part that "[Miyoko's] product cannot bear the name 'Butter' because the product is not butter. 'Butter' is defined in 21 U.S.C. [§] 321a as the food product made exclusively from milk or cream, or both with or without common salt . . . and containing no less than 80 per centum by weight of milk fat."[11]

B. First Amendment Litigation by Plant-Based Food Companies

In four current lawsuits, companies that sell plant-based foods claim that state legislation and enforcement actions targeting their labels violate the First Amendment (as incorporated against the states through the Fourteenth Amendment).[12] Although the litigation in Louisiana is newly underway as of October 1, 2020,[13] the litigation in three states has already reached incongruous results, despite the fact that Tofurky is the plaintiff in both cases in the Eighth Circuit—one in the Eastern District of Arkansas and one in the Western District of Missouri.

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[10] LA REV. STAT. §4744(4)–(9) (2019).
[11] Miyoko's Kitchen v. Ross, 2020 WL 3:20CV00893, at *8 (N.D. Cal., Aug 21, 2020).
[12] U.S. Const. amend. I, XIV § 2.
[13] *Tofurky Files First Amendment Challenge Against Louisiana Label Censorship Law*, ALDF.ORG (Oct. 7, 2020), https://aldf.org/article/tofurky-files-first-amendment-challenge-against-louisiana-label-censorship-law/#:~:text=LOUISIANA%20%E2%80%94%20The%20Good%20Food%20Institute,%E2%80%9Csausage%E2%80%9D%20on%20their%20labels.

The Arkansas court granted Tofurky's motion for preliminary injunction, finding that Arkansas's statute is likely unconstitutional on the merits,[14] whereas the Missouri court rejected the motion for a preliminary injunction.[15] Meanwhile, in Miyoko's lawsuit against the California Department of Food and Agriculture over the agency's enforcement action, the district court granted the preliminary injunction in part and denied it in part.[16]

In all of these cases, the plaintiffs' primary challenge is that their speech is protected commercial speech, and the states' actions fail intermediate scrutiny.[17] In *Central Hudson Gas & Electric Corporation v. Public Service Commission of New York* (Central Hudson), the Supreme Court established the intermediate scrutiny test for commercial speech.[18] As long as the speech in question does not concern unlawful activity and is not inherently misleading, *Central Hudson* requires that: (1) the government has a substantial interest in prohibiting the speech; (2) the government's regulation directly advances the asserted governmental interest; and (3) the regulation is "not more extensive than is necessary to serve that interest."[19]

As applied to the regulations in question, which prohibit plant-based food labels from bearing words like "beef" and "butter," the government asserts that its interest is in "protecting consumers from confusion."[20] Protecting consumers from confusion is a substantial government interest.[21] Nevertheless, the burden is on the government to demonstrate that its regulations

[14] Turtle Island Foods, SPC v. Soman, 2019 WL 7546141, at *10 (E.D. Ark., Dec. 11, 2019).
[15] Turtle Island Foods, SPC v. Richardson, 2019 WL 7546586, at *5 (W.D. Mo., Sept. 30, 2019).
[16] Miyoko's Kitchen v. Ross, 2020 WL 3:20CV00893, at *8 (N.D. Cal., Aug 21, 2020).
[17] I have argued elsewhere that government statutes targeting plant-based food labels should be subject to strict scrutiny because they discriminate based on ideological viewpoints. *See* Jareb A. Gleckel and Sherry F. Colb, *The Meaning of Meat*, 26 Animal L. Rev. 75, 108 (2020). However, since plaintiffs have brought their challenges under the intermediate scrutiny framework, this paper assumes that courts will apply an intermediate scrutiny test.
[18] Central Hudson Gas & Elec. Corp. v. Public Serv. Comm'n of N.Y., 447 U.S. 557, 566 (1980).
[19] Id.
[20] See, e.g., ARK. CODE ANN. § 2-1-301 (2019) ("The purpose of this subchapter is to protect consumers from being misled or confused by false or misleading labeling of agricultural products that are edible by humans.")
[21] See Zauderer v. Office of Disciplinary Coun. of Sup. Ct. of Ohio, 471 U.S. 626, 651(1985) (finding that "preventing deception of customers" is a substantial interest).

directly advance its interest and that the regulations are narrowly tailored.[22] This study examines whether, as an empirical matter, state governments will be able to meet that burden and hypothesizes that they will not.

C. Prior Studies

i. Plant-Based Dairy Literature

To the researcher's knowledge, only one published academic study has examined similar questions.[23] The Feltz study evaluated how accurately consumers identify images of plant-based and animal-based milk and cheese products as being plant or animal-based, respectively, and how accurately they identify nutritional differences between the plant-based and animal-based products. The researchers conducted two preliminary studies about product identification. In the first identification study, they asked 125 participants to distinguish commercially available images of cow's milk from commercially available images of plant-based milks like almond milk, coconut milk, rice milk and soy milk. In the second, they asked a new set of 125 participants to distinguish commercially available images of animal-based cheeses (cheddar cheese, cheese dip, cream cheese, and swiss cheese) from commercially available plant-based cheeses (vegan cheddar cheese, vegan cream cheese, vegan nacho sauce, and vegan cheese slices). The researchers also conducted two preliminary studies about consumers' ability to identify nutritional differences between plant-based and animal-based dairy. In the first "nutrition" study, researchers asked 125 participants to assess the nutritional differences between cow's milk and almond milk by answering questions about which product has more calories, fat, cholesterol, sodium, protein, fiber and sugars. The second nutritional survey asked 134

[22] See Ibanez v. Fla. Dep't of Bus. & Prof'l Regulation, 512 U.S. 136, 146 (1994); see also BellSouth Telecommunications, Inc. v. Farris, 542 F.3d 499, 505 (6th Cir. 2008).
[23] Adam Feltz & Silke Feltz, *Consumer Accuracy at Identifying Plant-based and Animal-based Milk Items*, 4 FOOD ETHICS 85 (2019).

participants to compare the nutritional value of Daiya plant-based cheese and animal-based cheese. Finally, the researchers submitted all of the above questions to a national sample of 1,054 participants. By combining the data for a meta-analysis, the researchers found that consumers could accurately identify plant-based and animal-based milk and cheese products as being plant or animal-based (74%–84% of the time). They also found that consumers were generally accurate at identifying nutritional differences between plant-based and animal-based milk and cheese products (50%–62% accuracy).

The Feltz study provides valuable data. Asking participants to compare images of commercially available products replicates how consumers shop in the real world and therefore suggests high external validity. The replication of findings on a large, national sample also speaks to the strength of the findings. However, there are several limitations to the Feltz study. First, the Feltz study only addressed plant-based milk and cheese; it is silent regarding plant-based meat and even other plant-based dairy such as butter and sour cream. Second, participants knew the purpose of the study as they completed it; this allows for potential bias because participants who support the animal-agriculture industry might feign confusion. Third, by presenting consumers with images, the study does not home in on whether *terms* associated with animal products such as "milk" and "cheese" are a source of consumer confusion, even if consumers can generally distinguish plant-based and animal-based dairy. This question is of primary importance because state statutes explicitly prohibit "[u]tilizing a term that is the same or similar to a term that has been used or defined historically in reference to a specific agricultural product."[24] Fourth, because researchers used images of commercially available products, it is unclear how accurately the results would map onto products with which consumers

[24] ARK. CODE ANN. § 2-1-305(10) (2019); see also, e.g., LA REV. STAT. §4744(9) (2019).

have no familiarity. Finally, the study does not address the impact that omitting terms like "milk" and "cheese" might have on consumer confusion about the taste and uses of plant-based foods.

The present study expands on the existing literature by: (1) asking participants about additional plant-based products, namely plant-based meat products and plant-based butter; (2) concealing the purpose of the study to prevent bias; (3) focusing on the narrow claim that terms like "milk" or "beef"—terms that are traditionally associated with animal products—are a source of consumer confusion about whether products are made from animals and; (4) analyzing whether prohibiting these terms on plant-based food labels would, contrary to the reasoning behind state statutes, actually *increase* consumer confusion about the taste and use of plant-based products.

ii. Plant-Based Meat Literature

To the researcher's knowledge, this is the first academic study addressing consumer confusion about plant-based meat. However, it is worth noting that the National Cattlemen's Beef Association (NCBA) surveyed "over 1800 respondents" and purported to find that "[l]ess than half of consumers understand 'plant-based beef' is entirely vegan."[25] This survey was not part of a controlled study—the NCBA does not present details about its methodology and sample—nor was it published in an academic journal. Nevertheless, taking the study's findings at face value, the headlines mischaracterize its results.

The NCBA gave consumers four survey options about plant-based meat:

1. Is completely vegan, containing no meat or animal byproducts (eggs, dairy)

[25] Meat Substitute Brand Understanding, WWW.NCBA.ORG, https://www.ncba.org/CMDocs/BeefUSA/Media/NCBA%20Meat%20Substitutes%20Survey.pdf (last visited Oct 12, 2020); see also National Cattelmen's Beef Association, *Consumer Research Shows Widespread Confusion About Contents of Plant-Based Fake Meat*, SOUTHEAST AG NET (Feb. 7, 2020), https://southeastagnet.com/2020/02/07/consumer-research-widespread-confusion-contents-plant-based-fake-meat/.

2. Does not contain meat but may contain animal byproducts
3. Can contain small amounts of meat, but is primarily plant-based
4. Contains meat and there are no restrictions on the amount

Forty-five percent (45%) of consumers—the largest percentage associated with any of the four choices—selected the first option. They believed that plant-based beef "is completely vegan, containing no meat or animal byproducts (eggs, dairy)." According to the NCBA, these are the only consumers who were "not confused." The NCBA purported that the thirty-one percent (31%) of consumers who chose the second option, and the seventeen percent (17%) of consumers who chose the third option were confused because they believed, respectively, that plant-based meat "does not contain meat but may contain animal byproducts" or "can contain small amounts of meat, but is primarily plant-based." Characterizing these consumers as confused is misleading. Consumers who chose the second or third options may well have been acknowledging the possibility of cross-contamination with meat or other animal products, such as foods that cooks have prepared on the same grill or that manufacturers have handled on the same equipment as plant-based beef. To provide an analogy, consumers may heed an allergy warning that reads, "May contain peanuts," recognizing that a product may contain small quantities of peanuts, but this does not mean those consumers are confused about whether peanuts are an ingredient in the product. The most revealing finding of the NCBA's survey was that only seven percent (7%) of consumers chose the fourth option: only this small percentage of consumers reported that they believed plant-based meat "contains meat and there are no restrictions on the amount." Therefore, taking the NCBA's data at face value, 93% of consumers were not confused.

One goal of the present study is to address the same question as the NCBA's survey—whether consumers think that "plant-based beef" contains cow meat—using the neutral, unbiased questions and scientifically grounded methodologies described below.

II. Methodology

A. Participants

The researcher conducted this study using SurveyMonkey and aimed to recruit 150 participants. A total of 308 participants responded to the survey. SurveyMonkey's algorithms estimated that an average participant would need 9 minutes to complete the questionnaire and recommended automatically filtering out all participants who completed the survey in less than 5 minutes. This left a total of 155 participants. Of these participants, ninety-six (96) had been randomly assigned to Group A, whereas fifty-nine (59) had been randomly assigned to Group B.

The sample of participants was largely representative of the United States population: the study included a diverse range of ages, education levels, regions of the country, and neighborhood types. The mean age of participants was fifty-two (52) years old, with a range of twenty-one (21) to seventy-six (76). Approximately two-thirds of participants were female (67.7%) and one-third male (32.3%). Approximately one-third of participants (33.6%) completed high school, approximately forty-one percent (41.3%) completed college, and approximately a quarter (24.5%) completed graduate school. The remainder (0.65%) had not finished high school. Twenty-seven percent (27%) of participants were from urban areas, while forty-eight percent (48%) were from suburban areas and twenty-five percent (25%) were from rural areas. Regarding geographic distribution, nineteen percent (19%) lived in the Western United States, nineteen percent (19%) lived in the Midwest, twenty-five percent (25%) lived in the Southeast, twenty-three percent (23%) lived in the Northeast, and thirteen percent (13%)

lived in the Southwest. Most importantly, only a small percentage of participants (9.7%) were vegetarian, and an even smaller percentage were vegan (3.9%). Moreover, the percentage of vegans and vegetarians in Group A (11.9%) was very similar to that in Group B (14.6%).

B. Survey Overview

After Cornell University's Institutional Review Board approved the study, the researcher recruited participants through SurveyMonkey to complete an online questionnaire.[26] The questionnaire concealed the actual purpose of the study from participants to prevent bias. The consent form instructed participants that they were answering questions about their grocery preferences for the purpose of informing grocery stores about how they should stock products. After consenting to complete the study, participants answered eight pages of questions for a total of 45 questions.

The first page presented a series of demographic questions including queries about age, gender, education level, and living environment. The second page included a series of general grocery and food preferences, such as what time of day people prefer to shop, what meal they prefer, and whether they have dietary restrictions or preferences. These questions served as distractors to sell the purported purpose of the study.

Following these two introductory pages, participants answered questions about six different products they might find at a grocery store (one product per page). The first two of these products served as further distractors: (1) Orange-Mango Juice: Fresh Squeezed; and (2) All Natural Peanut and Cashew Granola. They were irrelevant to the data analysis but were incorporated to prevent participants from figuring out that the research was specifically targeting plant-based foods. All participants answered questions about these same two distractor products

[26] The entire questionnaire is attached infra as Appendix A.

before answering any questions about plant-based meat or dairy products, and questions about the distractor products focused on the same issues as questions about all other products in the study, namely their ingredients (e.g., "Do you think this product has added sugar?") and their taste (e.g., "Do you think that drinking this juice tastes like eating a mango?"). Participants also indicated how likely they were to use these products.

All participants also answered one page of experimental questions about a new Tyson product, "Raised and Rooted: Plant-Based Nuggets."[27] Despite using the qualifier "plant-based," Tyson's product differs from typical plant-based foods because it is not made entirely without animal ingredients; one of the ingredients is chicken eggs. The survey asked participants questions about whether they expected Tyson's product to contain specific ingredients, namely plants, chicken meat, and chicken eggs, to collect preliminary data about whether using animal products in a product labeled "plant-based" misleads consumers. With respect to this product, the researcher hypothesized that, because the product name uses "plant-based" as a qualifier, a majority of participants would correctly assume that it does not contain chicken meat. The researcher also predicted that, because the product uses "plant-based" as a qualifier, a majority of participants would *incorrectly* believe that it does not contain chicken eggs.

The remaining three pages of experimental questions addressed the primary focus of the study using a between-subjects design.

C. Between-Subjects Design: Experimental and Control Conditions

For the remaining three pages of questions, the study implemented a between-subjects design. Participants were randomly assigned to either Group A or Group B. Both Group A and Group B participants answered questions about three products (one per page). Group A

[27] Raised & Rooted, https://www.raisedandrooted.com (last visited Oct. 12, 2020).

participants answered questions about: (i) Next-Generation Meat: Plant-Based Beef Burger; (ii) Cultured Vegan Spread; and (iii) Plant-Based Deli Slices: Bologna Style. Group B participants answered questions about (i) Next-Generation Vegetables: Plant-Based Veggie Patty; (ii) Cultured Vegan Butter; and (iii) Sandwich Slices. All product names were imaginary to ensure that brand recognition would not influence the outcome of the study.

Three of these six names ("experimental names") asked about plant-based products that use words such as "meat," "beef," "bologna," "burger," and "butter" in the product name—words that are traditionally associated with animal products. The remaining three names ("control names") asked about the same products but replaced the key terms—the words traditionally associated with animal products—with terms like "spread," "vegetable," "veggie" and "patty." Group A participants answered two pages of questions about products with "experimental" names and one page of questions about a product with a "control" name. Correspondingly, Group B participants answered one page of questions about a product with an "experimental" name and two pages of questions about products with "experimental" names. Participants in Group A and Group B answered the exact same questions, in the exact same order, for corresponding product names. Dividing the "experimental" and "control" questions between the groups helped ensure that any differences between the two groups would not influence the outcome of the study.

The between-subjects questions target two broad issues: (1) When companies use words that are traditionally associated with animal products—words like "beef" and "butter"—on products made without animal ingredients, are consumers confused about whether these products come from animals? (2) If companies do not use these words to help describe their plant-based

products, are consumers more likely to be confused about either (a) the taste or (b) the function of the plant-based products?

The researcher hypothesized broadly that: (1) participants will not be any more likely to think that plant-based foods contain animal products if the names of foods include words that are traditionally associated with animal products than if the names omit these words. (2) If companies do not use these words to help describe their plant-based products, consumers are more likely to be confused about both (a) the taste and (b) the function of the plant-based products.

The following subsections break down the narrow issues that each between-subjects question set addresses, and they present specific hypotheses for each question. In addition to the specific experimental questions discussed below, the questionnaire asked all participants how likely they were to eat or use each product.

i. Plant-Based Beef Burger vs. Plant-Based Vegetable Patty

Participants in Group A answered questions about "Next-Generation Meat: Plant-Based Beef Burger," whereas Group B participants answered questions about "Next-Generation Vegetables: Plant-Based Veggie Patty." Both names used the exact same number of words. Whereas Group A's product used three words traditionally associated with animal products—meat, beef, and burger—Group B's control replaced those words with "vegetable," "veggie" and "patty." Participants answered three questions about the nature of these products: (1) Do you think this product is made from a cow? (2) Do you think that eating this product tastes like eating vegetables? (3) Do you think this product is a good source of protein? The researcher predicted that use of the words "meat," "beef," and "burger" would not make participants any more likely to think that a plant-based product was made from a cow. In addition, the researcher predicted

that using these words would help inform consumers that the products were meant to replicate the taste and nutritional characteristics of beef; therefore, consumers would be less likely to think that eating a "plant-based beef burger" tastes like eating vegetables than a "plant-based veggie patty," and they would be more likely to think that the former is a good source of protein.

ii. Cultured Vegan Butter vs. Cultured Vegan Spread

Participants in Group A answered questions about "Cultured Vegan Spread," whereas Group B participants answered questions about "Cultured Vegan Butter." Both names used the exact same number of words, but the experimental condition used the word "butter," which is traditionally associated with animal products, whereas the control condition used the neutral word "spread." To assess whether the word "butter" confused participants about whether the product came from an animal, the survey asked the participants: (1) "Do you think this product contains dairy from cows?" To assess whether the word butter helped to inform consumers about the taste of the product, the survey asked: (2) "How well can you imagine what this product tastes like?" To assess if the word butter helped to inform consumers about the function of the product, the survey asked: (3) "Do you think this product would be used for baking biscuits?" (4) "Do you think this product would be used on toast?" (5) "Do you think this product would be used on pasta?"

The researcher predicted that use of the word "butter" would not make participants any more likely to think that a plant-based product was made using dairy from a cow. In addition, the researcher predicted that using the word butter would help inform consumers about the taste and function of the product. Therefore, the researcher hypothesized that participants would be significantly more likely to say they could imagine what "Cultured Vegan Butter" tastes like than that they could imagine what "Cultured Vegan Spread" tastes like. The researcher also

hypothesized that participants would be significantly more likely to think that "Cultured Vegan Butter" could be used on pasta and for baking biscuits than that "Cultured Vegan Spread" could be used for the same. The researcher did not predict any difference for how likely participants were to think that these products could be used on toast.

iii. Plant-Based Deli Slices: Bologna Style vs. Sandwich Slices

Participants in Group A answered questions about "Plant-Based Deli Slices: Bologna Style," whereas Group B participants answered questions about "Sandwich Slices." Several state statutes would prohibit the product name "Plant-Based Deli Slices: Bologna Style" because it uses the word "bologna" (and, arguably, because it uses "deli"). These same states would not prohibit the name "Sandwich Slices" because it does not incorporate words traditionally associated with animal products. The researcher hypothesized that, contrary to the stated purpose of state statutes—preventing consumer confusion—the acceptable name "Sandwich Slices" would be more confusing to consumers than the name "Plant-Based Deli Slices: Bologna Style" because the former provides consumers with less information.

The survey asked two experimental questions: (1) "Do you think this product is made from an animal?" (2) "How well can you imagine what this product tastes like?" The researcher hypothesized that: (1) participants would be significantly more likely to think that "Sandwich Slices" are made from an animal than they are to think that "Plant-Based Deli Slices: Bologna Style" are made from an animal. (2) Participants would be significantly more likely to say that they could imagine what "Plant-Based Deli Slices: Bologna Style" taste like than that they could imagine what "Sandwich Slices" taste like.

D. Statistics

Participants answered all questions on a scale of 1–5. For questions about the products' ingredients (e.g., "Do you think that this product comes from a cow?"), the scale was: (1) Very Unlikely, (2) Unlikely, (3) Neither Likely or Unlikely, (4) Likely, (5) Very Likely. For questions pertaining to taste (e.g., How well can you imagine what this product tastes like?"), the scale was: (1) Not at all clearly, (2) Not so clearly, (3) Somewhat clearly, (4) Very Clearly, (5) Extremely Clearly. For questions pertaining to nutrition (e.g. "Do you think this product is a good source of protein?") the scale was: (1) Far Below Average, (2) Below Average, (3) Average, (4) Above Average, (5) Far Above Average. Finally, for one question, ("Do you think this product tastes like eating vegetables?"), the scale was: (1) Not at all, (2) A little, (3) A moderate amount, (4) A lot, (5) A great deal. For each question, the researcher used t-tests to compare the means in the experimental and control conditions.

III. Results

A. Plant-Based Beef Burger vs. Plant-Based Vegetable Patty

As hypothesized, participants were no more likely to think that "Next-Generation Meat: Plant-Based Beef Burger" was made from a cow ($M = 0.49$, $SD = 0.67$) than to think that "Next-Generation Vegetables: Plant-Based Veggie Patty" was made from a cow ($M = 0.51$, $SD = 0.57$), $t(153) = 0.15$, $p = .88$. The vast majority of participants thought it was either very unlikely (66.1%) or unlikely (22%) that "Next Generation Meat: Plant-Based Beef Burger" came from a cow. Only one participant (1.69%) thought that it was either likely or very likely. The same was true for "Next Generation Vegetables: Plant-Based Veggie Patty." The vast majority of participants thought it was either very unlikely (61.5%) or unlikely (29%) that this product was made from a cow.

Also as hypothesized, significantly fewer participants thought that eating "Next-Generation Meat: Plant-Based Beef Burger" would taste like eating vegetables (M = 1.05, SD = 1.05) than that eating "Next Generation Vegetables: Plant-Based Veggie Patty" would taste like eating vegetables (M = 1.542, SD = 1.09), $t(153) = 2.86$, p = .005. Approximately thirty-nine percent (38.98%) of participants thought that eating "Next-Generation Meat: Plant-Based Beef Burger" would taste "Not at All" like eating vegetables, whereas under seventeen percent (16.67%) thought that eating "Next-Generation Vegetables: Plant-Based Veggie Patty" would not taste at all like eating vegetables.

Unexpectedly, there was no significant difference between the percentage of participants who thought that "Next-Generation Meat: Plant-Based Beef Burger" would be a good source of protein (M = 2.85, SD = 0.76) and those who thought that "Next-Generation Vegetables: Plant-Based Veggie Patty" would be a good source of protein (M = 2.75, SD = 0.55), $t(153) = 0.79$, p = 0.43. A majority of participants thought that both "Plant-Based Beef Burgers" and "Plant-Based Veggie Patties" would be "Average" to "Above Average" sources of protein.

Finally, there was a fairly even distribution of how likely participants were to eat this product (Very Likely = 13.56%; Likely = 20.34%; Neither Likely nor Unlikely = 16.95%; Unlikely = 22.03%; Very Unlikely = 27.12%).

B. Cultured Vegan Butter vs. Cultured Vegan Spread

As predicted, there was no significant difference between the percentage of participants who thought that "Cultured Vegan Butter" contained dairy from a cow (Mean = 0.71, SD = 0.99) and the percentage that thought "Cultured Vegan Spread" contained dairy from a cow (Mean = 0.92, SD = 1.49), $t(153) = 1.15$, p = 0.25. Participants, on average, thought that it was "Unlikely" or "Very Unlikely" that either product contained dairy from a cow. The only

unexpected twist was that, although this difference was not statistically significant, an even higher percentage of participants understood that "Cultured Vegan Butter" did not have dairy from a cow than understood that "Cultured Vegan Spread" did not have dairy from a cow.

Also as hypothesized, significantly more participants could imagine the taste of "Cultured Vegan Butter" ($M = 4.14$, $SD = 0.98$) than could imagine the taste of "Cultured Vegan Spread" ($M = 3.52$, $SD = 1.26$), $t(153) = 3.46$, $p < .001$. Participants on average ranked how well they could imagine what "Cultured Vegan Butter" tastes like between "Very Clearly" and "Extremely Clearly;" by contrast, participants on average ranked how well they could imagine what "Cultured Vegan Spread" tastes like between "Somewhat Clearly" and "Very Clearly."

Regarding use, three tests assessed how well participants could envision the use of the product based on its name. As hypothesized, significantly more participants understood that "Cultured Vegan Butter" could be used on pasta ($M = 2.98$, $SD = 1.02$) than "Cultured Vegan Spread" ($M = 2.41$, $SD = 1.17$), $t(153) = 3.31$, $p < .001$. Likewise, significantly more participants understood that "Cultured Vegan Butter" could be used for baking biscuits ($M = 2.64$, $SD = 1.20$) than "Cultured Vegan Spread" ($M = 1.89$, $SD = 0.62$), $t(153) = 5.36$, $p < .001$. On average, participants thought it was "Likely" that "Cultured Vegan Butter" could be used on pasta or for baking biscuits, but they thought it was "Neither Likely nor Unlikely" that "Cultured Vegan Spread" could be used on pasta or for baking biscuits. Also as hypothesized, there was no significant difference between the percentage of participants who thought that "Cultured Vegan Butter" ($M = 3$, $SD = 0.58$) and "Cultured Vegan Spread" ($M = 3.11$, $SD = 0.63$) could be used on toast, $t(153) = 0.88$, $p = .38$. On average, participants thought it was "Likely" that both products could be used on toast.

Finally, when asked how likely they were to eat "Cultured Vegan Butter," participants reported the following: Very Likely = 9.38%; Likely = 21.88%; Neither Likely nor Unlikely = 14.58%; Unlikely = 15.63%; Very Unlikely = 38.54%.

C. Plant-Based Deli Slices: Bologna Style vs. Sandwich Slices

As hypothesized, participants were significantly less likely to think that "Plant-Based Deli Slices: Bologna Style" are made from an animal ($M = 0.81$, $SD = 1.33$) than to think that "Sandwich Slices" are made from an animal ($M = 2.72$, $SD = 1.17$), $t(153) = 10.38$, $p < .001$. A majority of participants thought that it was "Very Unlikely" that "Plant-Based Deli Slices: Bologna Style" came from an animal; in stark contrast, the majority of participants thought it was "Likely" that "Sandwich Slices" came from an animal.

Regarding taste, a significantly higher percentage of participants could imagine the taste of "Plant-Based Deli Slices: Bologna Style" ($M = 2.83$, $SD = 0.97$) than could imagine the taste of "Sandwich Slices" ($M = 2.39$, $SD = 0.96$), $t(153) = 2.74$, $p = .003$. A majority of participants could imagine "Somewhat Clearly" what "Plant-Based Deli Slices: Bologna Style" taste like, whereas the majority of participants could "Not So Clearly" imagine what "Sandwich Slices" taste like.

Finally, when asked how likely they were to eat "Plant-Based Deli Slices: Bologna Style," participants reported the following: Very Likely = 6.78%; Likely = 13.56%; Neither Likely nor Unlikely = 13.56%; Unlikely = 22.03%; Very Unlikely = 44.07%.

D. Raised and Rooted: Plant-Based Nuggets

As hypothesized, a majority of participants correctly thought that the product "Raised and Rooted: Plant-Based Nuggets" was "Very Unlikely" or "Unlikely" to contain chicken meat

(78.07%), and a majority of participants *incorrectly* thought that it was "Very Unlikely" or "Unlikely" to contain chicken eggs (67.74%).

IV. Conclusion

State statutes, such as those in Arkansas and Louisiana, prohibit companies from "[u]tilizing a term that is the same or similar to a term that has been used or defined historically in reference to a specific agricultural product."[28] The states argue that using such terms will confuse consumers. This controlled study demonstrates that the opposite is true.

The results show that: (1) consumers are no more likely to think that plant-based products come from an animal if the product names incorporate words traditionally associated with animal products than if they do not. (2) Omitting words that are traditionally associated with animal products from the names of plant-based products actually *increases* consumer confusion about the taste and uses of these products, although it does not impact consumers' understanding of the products' nutritional attributes. Finally, this study provides strong, preliminary evidence that, because consumers expect "plant-based" products will not have any animal products, using chicken eggs in products labeled "plant-based" is misleading to consumers.

A. Consumers Are No More Likely to Think That Plant-Based Products Come from an Animal if the Product's Name Incorporates Terms Traditionally Associated with Animal Products.

Consumers are no more likely to think that plant-based products come from an animal if the products' names incorporate words traditionally associated with animal products. The study first compared "Next Generation Meat: Plant-Based Beef Burger" to "Next-Generation Vegetables: Plant-Based Veggie Patty." Replacing the words "meat," "burger," and "burger," with the words "vegetables," "veggie" and "patty," had no impact on how likely participants

[28] ARK. CODE ANN. § 2-1-305(10) (2019); see also, e.g., LA REV. STAT. §4744(9) (2019).

were to think that the product came from a cow. Comparing "Cultured Vegan Butter" to "Cultured Vegan Spread" (replacing the term "butter" with "spread") replicated this finding. Finally, comparing "Plant-Based Deli Slices: Bologna Style" to the less descriptive name "Sandwich Slices" revealed that using the term "bologna" alongside the descriptors "plant-based" and "style" was significantly *less* confusing to consumers than omitting the term altogether. In this instance, "[u]tilizing a term that is the same or similar to a term that has been used or defined historically in reference to a specific agricultural product" did not create consumer confusion, but rather reduced it.

B. Omitting Terms that are Traditionally Associated with Animal Products from the Names of Plant-Based Products Confuses Consumers about their Taste and Uses, but it Does Not Impact their Perception of the Products' Nutrition.

"Utilizing a term that is the same or similar to a term that has been used or defined historically in reference to a specific agricultural product"[29] also *reduced* consumer confusion with respect to the taste and use of the product. Directly undermining the purported purpose of statutes that prohibit using terms like "beef" or "butter" on plant-based products, the results showed that incorporating these terms *helped* consumers to "imagine what the products taste like" and understand the different uses of the product. Participants imagined that eating a plant-based burger would taste less like eating vegetables when the name of the product was "Plant-Based Beef Burger" than when it was "Plant-Based Veggie Patty." Participants were significantly more likely to say that they could imagine the taste of "Cultured Vegan Butter" than "Cultured Vegan Spread;" they also could imagine the taste of "Plant-Based Deli Slices: Bologna Style" significantly more readily than they could "Sandwich Slices." Finally,

[29] ARK. CODE ANN. § 2-1-305(10) (2019).

participants were significantly more likely to recognize that they could use "Cultured Vegan Butter" on pasta and for baking biscuits as compared to "Cultured Vegan Spread."

Against the researcher's hypothesis, the findings did not show that using the terms "beef" and "meat" had any impact on consumers' perceptions of the amount of protein in a product. The researcher expected that terms like "beef" would convey to consumers that a product was replacing beef and therefore had nutritional attributes similar to those of beef, such as being an above average source of protein. The results, however, suggest that because consumers understood the plant-based products contained no actual beef, the word "beef" was not indicative of the nutritional characteristics of the food product.

C. Consumers Expect that "Plant-Based" Products Will Not Contain Any Animal Products, so Including Eggs in Products Labeled "Plant-Based" is Misleading.

Finally, whereas incorporating words like "beef" or "butter" in the names of plant-based products does not mislead consumers about the products' ingredients, the results demonstrate that labeling products as plant-based *does* give consumers the impression that a food item will not contain any animal products. Participant responses to questions about Tyson's new product, "Raised and Rooted: Plant-Based Nuggets," revealed that a large majority of consumers expect that plant-based products will not contain chicken eggs. Although more extensive research could expand upon this finding, the results provide strong, preliminary evidence that if a company labels a product "plant-based," using animal ingredients such as chicken eggs in the product will be misleading to consumers in the absence of clear disclosures.

D. Strengths and Limitations

This study incorporated several specific measures to prevent bias, and the results confirm the lack of bias in the sample. First, as noted above, the researcher recruited participants through SurveyMonkey rather than through a university to ensure that participants accurately represented

the full adult population of the United States. It is possible that younger participants, specifically college students in more liberal areas like the northeast, would be more aware of new products like plant-based meat and dairy. Therefore, the study ensured that the population included participants from every area of the country, and with a range of educational backgrounds and ages.

Second, every participant in Group A answered two experimental questions and one control question while every participant in Condition B answered one experimental question and two control questions. By assigning both experimental and control questions to participants in each group, the survey further ensured that between-group differences did not dictate the outcome of the study. If, for example, Group A participants were inherently less susceptible to confusion than Group B participants, then the results for "Cultured Vegan Butter vs. Cultured Vegan Spread" (where Group A participants were the control group) would have undermined the findings of "Plant-Based Beef Burger vs. Plant-Based Veggie Patty" (where Group A participants were in the experimental condition). As expected, the results were consistent regardless of whether Group A or Group B served as the control condition.

Third, the study incorporated deception so that participants would not know that it was specific to plant-based foods. In addition to using a consent form that told participants the study was for market research about grocery preferences, the study incorporated distractor questions. The study included full pages of questions about products that were not specifically plant-based, and it also included questions about each plant-based product that were not specific to whether or not the product was plant-based.

Fourth, all products used imaginary names so that name-brand recognition would not impact the findings. If the study had used "Impossible Burger," for example, participants who

might typically be confused about whether the term "burger" indicates that a product has animal ingredients might nonetheless recognize the product name and therefore know that it is a vegan product. The study avoided this confounding variable.

Fifth, the sample had a very low percentage of vegans and vegetarians, and there was an equal distribution of vegans/vegetarians in each between-subjects condition. This demonstrates that the sample did not simply consist of participants who were already familiar with the nature of plant-based products and supportive of such products.

Finally, many participants said that they were very unlikely to eat or use the plant-based products. In fact, a majority of participants said they were either "Unlikely" or "Very Unlikely" to eat any of the plant-based foods. Despite having no interest in the plant-based products, the vast majority of these same participants still understood that these foods were not made using animal products. This finding clarifies that the study was not influenced by a sample of participants who already eat plant-based foods and who thus had preconceived understandings that plant-based foods do not contain animal ingredients.

The main limitation of this study is the sample size. Although the significance values indicate compelling results, replication on larger samples, and in real-world applications, would provide further external validity. Additionally, two-thirds of the sample was female. Although there is no reason to expect that males would perform differently than females, additional studies could aim to replicate findings with a larger male sample. Finally, the last component of the study provides only a preliminary finding that if companies use eggs in products that they label "plant-based," these companies will be misleading consumers. A full, controlled study should address whether all "plant-based" labels are misleading to consumers if the products contain

animal ingredients, or whether some of these product labels contain adequate disclosures to inform consumers about their blended animal and plant ingredients.

E. Legal Implications

For government legislation to survive intermediate scrutiny, the legislation must directly advance an important government interest. States have an important interest in preventing consumer confusion. Nevertheless, the findings of this study show that plant-based food labels such as "Plant-Based Beef" and "Vegan Butter" do not confuse consumers about whether the products contain animal ingredients. On the contrary, removing terms like "beef" and "butter"—terms that people traditionally associate with animal products—from plant-based food labels confuses consumers about the taste and use of plant-based products. Therefore, government regulations prohibiting companies from labeling plant-based foods with terms "that [are] the same or similar to a term that has been used or defined historically in reference to a specific agricultural product"[30] do not advance an important government interest and should be held unconstitutional.

[30] ARK. CODE ANN. § 2-1-305 (2019).