EXHIBIT E

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF VERMONT

GROCERY MANUFACTURERS ASSOCIATION, SNACK FOOD ASSOCIATION, INTERNATIONAL DAIRY FOODS ASSOCIATION, and NATIONAL ASSOCIATION OF MANUFACTURERS, Plaintiffs, v. WILLIAM H. SORRELL, in his official capacity as the Attorney General of Vermont; PETER E. SHUMLIN, in his official capacity as Governor of Vermont; TRACY DOLAN, in her official capacity as Commissioner of the Vermont Department of Health; and JAMES B. REARDON, in his official capacity as Commissioner of the Vermont Department of Finance and Management, Defendants.	Case No. 5:14-cv-117

DECLARATION OF DR. JANE KOLODINSKY

1. I am a Professor of Applied Economics at the University of Vermont in Burlington, Vermont. I am Chair of the University's Community Development and Applied Economics Department within the College of Agriculture and Life Sciences. I have held that position since 2000. I am also Co-director of the University's Center for Rural Studies, a position I have held since 1999.

2. I earned my Doctorate in Consumer Economics from Cornell University in 1988, and my Masters of Business Administration from Kent State University in 1983. Prior to that, I graduated *cum laude* from Kent State University in 1981 with a Bachelor's of Science in Dietetics and Nutrition.

3. I have spent many years studying and researching consumer information and behavior, including consumer perception of genetic engineering of food and food ingredients. I have written extensively on consumer perception of foods and food labels, have peer reviewed others' research manuscripts, and have conducted numerous reviews of available literature and consumer surveys on these topics.

4. Attached as Exhibit 1 is a true and correct copy of my current curriculum vitae, detailing my credentials and including a complete list of my publications.

5. I was asked to opine, based on a review of available literature and consumer surveys, on what consumers perceive "natural" to mean when that term is used to describe food products and, more specifically, in relation to genetically engineered food. In particular, I was asked to opine about whether there is evidence that consumers believe "natural" means made without genetic engineering. I was also asked to review the relevant portion of the materials that the Vermont Legislature considered in its evaluation of Act 120.

6. To complete this task, I undertook a literature search and analysis. The steps included:

a) Use of search terms that included various combinations of: "GMO," "genetic engineering," "consumer behavior," "food label," "consumer perception," "GM," and "natural."

b) Several databases were searched using the above terms, including Google, Google Scholar, Econlit, JStor, Lexus-Nexis Academic, and ABI Inform. In some cases there were thousands of hits (Google). In other cases there were no hits (Econlit), depending on the search terms. If the word "natural" appeared in the abstract, the article was kept for further review.

Similarly, words including "labels," "product exposure," and "genetically modified ingredients," also were used to retain articles for further review.

c) In some cases it was easier to discard items as not relevant. For example, research articles about the science of developing genetically engineered organisms were discarded. Articles with titles such as "A genetic engineering solution to the 'arginine conversion problem' in stable isotope labeling by amino acids in cell culture" came up in a search that included the words "genetic engineering" and "labeling," but clearly are not relevant for this review. Websites were discarded. Research articles that focused only on consumer attitudes toward the technology were discarded. Editorials were discarded. To be included for further review, the article or report had to itself be evidence-based or utilize evidence-based research (e.g., articles in Trade Journals). This process resulted in 22 potentially relevant items generated by the searches.

d) I narrowed down this list to 7 peer reviewed articles that appeared to relate most directly to the task I was asked to complete, as well as one trade journal article, two consumer survey executive summaries, and one consumer survey report. This declaration is based on my review of these articles, the information reviewed by the legislature, and my prior research regarding and experience with these issues.

e) One of the executive summaries I reviewed was an overview of a frequently cited study conducted by the for-profit Hartman Group titled *Beyond Natural & Organic 2010*. I understand that the Vermont

Legislature had an overview of that study before it when it was considering Act 120. I was unable to obtain the original report as the cost was prohibitive. I reviewed a relevant frequency table from the 2010 Hartman Group report, reviewed the executive summary, and utilized secondary sources that cited that report. In addition, I reviewed an executive summary of the Hartman Group's updated 2012 report on the same topic, titled *Organic and Natural 2012*. It is my understanding that the Vermont Legislature also had an overview of the 2012 Hartman Group report before it when it was considering Act 120. In an effort to locate the full versions of the Hartman reports, I used search terms including "Hartman Group" with the dates 2010, 2012, and 2014. The search terms "Hartman group questions 2012 natural image" led to one additional item funded by the Food Marketing Institute, with research conducted by the Hartman Group. I include this as an additional item in my review.

7. The literature directly addressing consumer perception of "natural" as it relates to genetic engineering and genetically engineered foods is limited. It spans the years 1996-2014. Available studies vary in their use of qualitative and quantitative methodologies, sample sizes, and study areas, which encompass the United States and several European countries.

8. The following surveys, report summaries and articles that I reviewed most directly address consumer perception of the term "natural" as it relates to genetically engineered foods. Based on these materials, I conclude that there is sound empirical evidence that many consumers believe that the word "natural," when used to refer to a food product, means not genetically engineered.

9. As an initial matter, I conclude that the materials considered by the Vermont Legislature in its evaluation of Act 120 contained evidence that referring to a food product as "natural" gives consumers the impression that it was made without genetic engineering. In *Beyond Natural and Organic 2010*, which the Legislature considered, the Hartman Group reported the results of an online survey of a nationally representative sample of 1,679 U.S. adults. Respondents were asked: "What properties do you think are implied or suggested by the term "natural"? 61% of responders responded that "natural" suggests an "absence of genetically modified foods."

10. The Legislature also had before it a summary of *Beyond Natural and Organic 2012* that reported that 56% of consumers said "natural" foods contain nothing artificial and that 47% of consumers said "natural" foods are "pure." The Legislature likewise considered the results of a 2007 Consumer Reports survey of a nationally representative adult sample (n=1004) that found that over 80% of responders indicated that a "natural" label on a food product should mean "All ingredients included occur naturally or in nature."

11. And, although this precise statistic was not before the Legislature, the summary of the results of *Beyond Natural and Organic 2012* that I independently located reported the results of an online survey of 1,569 adults in the United States (ages 18-69) that indicated that 46% of those interviewed responded that "natural" suggests an "absence of genetically modified foods." I could not locate the original questions used in this survey.

12. The other materials I reviewed provide additional evidence of consumers' perceptions of "natural" and genetic engineering. In 2014, Consumer Reports conducted a survey of a nationally representative adult sample (n= 1004), which asked specific questions about food labels and "natural" as it relates to genetic engineering. The survey revealed that a

majority of consumers look for the term "natural" on food labels (59%). A majority of consumers (64%) reported a belief that the use of the word "natural" on a label for packaged and processed foods means "no GMOs," while 85% indicated the label *should* mean no GMOs.

13. In an overview titled "U.S. Grocery Shopping Trends 2014," The Food Marketing Institute ("FMI") sponsored research that was conducted by the Hartman Group. They fielded a survey to 2,116 U.S. primary shoppers (ages 18-74) using an on-line survey and supplemented that survey with other FMI and U.S. population-based data from the Census and USDA. One slide summarized what consumers look for when shopping for food. 22% of responders indicated that they sought "non-GMO" claims on food. The Hartman Group conducted further factor analysis and concluded that "Seeking 'Non-GMO'" is the single strongest indicator that a consumer has an interest in minimal processing (which I interpret to mean closest to natural), cued by an array of alternative claims such as "Certified organic" or "No preservatives."

14. In 1996, Frewer, Howard, and Shepard published a study called *The Influence of Realistic Product Exposure on Attitudes Towards Genetic Engineering of Food* in the peer-reviewed journal *Food Quality and Preference*. The study sample included 60 adults in the United Kingdom. Products included in the study were yogurt, tomatoes and chicken drumsticks. Respondents were shown realistic photographs of the foods, accompanied by labels that indicated whether the product was genetically engineered or conventionally produced. Perceived "naturalness" was assessed using the question, "To what extent would you describe the product as natural?" A Likert scale was used for responses, with categories ranging from "extremely unnatural" to "extremely natural." Analysis of variance was used to compare ratings. "Genetically engineered products were perceived as significantly less natural than their conventional counterparts ($P<0.001$)" (p. 64).

15. An article by Bredahl (1999) titled *Consumers' Cognitions with Regard to Genetically Modified Foods. Results of a Qualitative Study in Four Countries*, published in the peer-reviewed journal *Appetite*, examined consumer understandings with regard to genetically modified foods. Four hundred consumers were interviewed in Denmark, Germany, the United Kingdom, and Italy. Four yogurts and four beers were included in the study. They had varying characteristics, ranging from "traditionally produced, without additives (both full fat and skim for yogurt)," "produced with additives," "genetically modified" (for yogurt), "traditionally produced at two different price points," "produced using modern technology (not genetically modified)," and "produced by means of genetically modified yeast" (for beer). Data were analyzed using hierarchical value maps, which is a "form of graphic representation of data summarized across a group of respondents" (p. 347). Results showed a direct path between the characteristic "genetically modified" and perceptions of yogurt and beer being perceived as "artificial."

16. A study by Rozin et al. (2004), titled *Preference for Natural: Instrumental and Ideational/moral Motivations, and the Contrast between Food and Medicines*, published in *Appetite* used a sample of undergraduate students at the University of Pennsylvania and the current Philadelphia jury pool. Using four versions of a questionnaire, respondents were asked about preferences for naturalness in four types of substances: "raw foods, medicines, processed foods, and food/medicines" (p. 151). One question is of particular relevance: "Now assume that both the natural and commercial (commercially grown) apples are chemically identical and thus taste the same and have the same health value. Now, which would you prefer to eat?" (p. 151). Consumers were asked, using a 0-2 scale, whether they would prefer to eat the more "processed" food, whether they were "indifferent," or whether they would prefer the more "natural" food.

For both raw foods and processed foods, a majority of both the student and jury pool sample preferred to eat the "natural" option (52-74%). The authors concluded, "there is a tendency for participants to prefer the natural versions averaged across all four types of substances" (p.151). More directly on point to the question at hand, the authors concluded that "a majority of natural preferers do not abandon their preference even when chemical identity is stipulated" (p. 152). This means that even if the end products are substantially equivalent, consumers still perceive the more processed food as less "natural." Thus, even if genetically engineered foods were found to be substantially equivalent to their non-genetically engineered counterparts, this study suggests that consumers would nevertheless view the genetically engineered foods as less "natural" than those counterparts.

17. Another study by Rozin (2004), titled *The Meaning of "Natural" Process More Important than Content*, in the peer reviewed journal *Psychological Science*, used the same sample as Rozin et al. (2004), above to examine consumer perceptions of the meaning of the word "natural." In this study, a six point "natural" scale was used, ranging from 0 = "not natural at all" to 6 = "completely natural." The study explored how "processing" relates to consumers' perception of "naturalness." To do this, the study asked respondents to rate the "naturalness" of paired items, and the author calculated the average percentage reduction in the pairings in perceived "naturalness." The following items were presented: wild versus domesticated organism (e.g., wild strawberry versus organic strawberry); wild versus commercial farming (e.g. wild strawberry versus commercially grown strawberry); and organic versus single-gene-transfer genetic engineering (8 examples of organic plants and animals were paired with 8 examples of genetically modified plants and animals). The items were presented (some in random order/some in systematic order) and respondents rated the "naturalness" of each item. Rozin

then calculated the average reduction in "naturalness." The author found that genetic engineering results in the largest mean percentage reduction in consumer perceptions of naturalness as compared to other transformations (p. 655). In other words, this study shows that consumers view genetically engineered foods as less "natural" than foods subject to other types of processing.

18. Another study by Rozin (2006), titled *Natural Judgments by lay Americans: Process dominates content in Judgment of Food or Water Acceptability and Naturalness*, was published in the peer-reviewed journal *Judgment and Decision Making*. Using a sample of 196 adults, Rozin examined consumer ratings of the "naturalness" of water and tomato paste on a 100 point scale (0 = not natural at all; 100 = completely natural). Several versions of the products were presented, with subtractions and additions (back into) of additives such as minerals (for water) and sugar (for tomato paste). Ratings of naturalness declined in every case as the items became more processed. Depending on the particular transformation, consumers rated the products with one transformation (for example, adding one additive) between 13 and 27 scale points lower on the "naturalness scale" than the product with no transformations. After two transformations (even when the second transformation returned the products to their original form), the product ratings of "naturalness" declined between 2 and 7 scale points further on the "naturalness scale" (p. 94). Rozin concluded that "these results support the process sufficient hypothesis: process changes without content changes produces substantial drops in naturalness" (p. 95). Similar to the 2004 Rozin study, this study indicates that, even where the final product may be deemed substantially equivalent to the original, consumers nevertheless view the more processed food as less "natural" than the original.

19. A 2012 study titled *European and American Perspectives on the Meaning of Natural*, published in the peer reviewed journal *Appetite*, examined European and American perspectives on the meaning of natural (Rozin, Fischler, and Shields-Argeles, 2012). Approximately 180 adults in each of six countries (France, Germany, Italy, Switzerland, the U.K, and the United States) were interviewed by phone. Respondents were asked, as an open-ended question, to define "natural." The top descriptors included:

- "no processing" (687 mentions),
- "no additives" (604 mentions),
- "origin in nature (found or from)" (293 mentions),
- "pure" (105 mentions), and
- "human, not commercial" (105 mentions).

(Rozin, Fischler, and Shields-Argeles, 2012; p. 451). The authors conclude that "given that a major feature of natural is no processing and no additives, GMOs stand as strongly opposed to natural" (p. 453).

20. A study by Kronberger et al., (2014) titled *How Natural is "More Natural"? The Role of Method, Type of Transfer, and Familiarity for Public Perceptions of Cisgenic and Transgenic Modification*, published in the peer-reviewed journal *Science Communication* (2014), included 3 separate studies, the first and third being germane to this review. The first study included 188 randomly assigned Austrian students. The study differentiated between cisgenic and transgenic transformations. Cisgenic alterations involve interventions at the genetic level that do not involve more than one species. Transgenic alterations involve interventions at the genetic level that involve more than one species. Study I was an experiment that varied three factors: type of animal hybrid (familiar = mule/ unfamiliar = geep, zorse), method of gene transfer (sexual procreation versus genetic modification), and reference to natural existence (yes/no). Using MANACOVA analysis (multivariate analysis of co-variance), results showed

that the method of gene transfer mattered and that genetic modification (which does not occur in nature) was perceived as less acceptable than sexual procreation (which does occur in nature) and imagined as more negative (p. 115). These results show that, regardless of whether the genetic modification comes from the same or a different species, consumers perceive the process of genetic engineering as different from a transformation that could occur in nature through sexual procreation.

21. Study III used a survey methodology, and included 13,520 European respondents from the Eurobarometer Biotechnology and the Live Sciences. Respondents were provided a scenario about apple diseases (scab and mildew) that included a cisgenic solution – "artificially introduce a gene that exists naturally in wild/crab apples which provides resistance to mildew and scab (cisgenics)" and "introduce a resistance gene from another species such as a bacterium or animal into an apple tree to make it resistant to mildew and scab (transgenics)" (p 120). Respondents were asked whether they felt each option was "fundamentally unnatural" using a scale of 1 = totally disagree to 4 = totally agree." Seventy-eight percent of respondents rated the transgenic option unnatural and 57% rated the cisgenic option unnatural. This shows a majority of consumers view genetic engineering as unnatural regardless of whether the transfer is cisgenic or transgenic. In other words, a majority of consumers viewed genetic engineering as "unnatural" even when the gene that was introduced was from the same species.

22. One non-peer-reviewed article in the trade journal Dairy Foods provided an industry perspective on natural as it related to genetic engineering. Carper (2014) says "attitudes about what makes a food natural have changed." (Carper, 2014; p. 32). Today, consumers seek "transparency and authenticity about where food comes from and how it is made" (Carper, 2014; p.33). Carper cited the 2010 Hartman report, which found that "Consumers are seeking an ideal

of natural that would mean that the food and beverages they buy are healthy, whole, real, and minimally processed."

23. These studies confirm that consumers have a preference for "natural" foods. They further confirm that the process of how a food is made, not just the content of the food product or the substantial equivalence of the final food product to a less-processed counterpart, is an important component in whether consumers believe a food is "natural."

24. Additionally, the literature reveals that consumers consistently associate genetic engineering with being "less natural" than other forms of food production or processing.

25. Finally, the Hartman Group and Consumer Reports surveys in particular provide direct evidence that consumers believe that a "natural" label on a food product means that the food was not produced with genetic engineering. An even higher number of consumers believe that's what the "natural" label should mean.

26. In addition, recent results from the 2013 Vermonter Poll, which have not been published, confirm that "natural" labels on genetically engineered foods would be misleading to Vermont citizens in particular. The Vermonter Poll is a statistically representative, statewide telephone poll conducted annually by the University of Vermont Center for Rural Studies. As Co-director for the Center for Rural Studies, I have access to the data from that survey. In the 2013 Vermonter Poll, respondents were asked: "Do you think that a bottle of syrup labeled "all natural" contains ingredients that are derived from genetically modified organisms?" A majority of Vermonters (54%) responded "no" to that question, indicating that a majority of Vermont consumers perceive "natural" labels to mean produced without genetic engineering.

27. I was not able to locate any literature or surveys that suggested that consumers believe a "natural" food label includes the likelihood that a food was produced with genetic engineering. Nor do any of these surveys indicate that most consumers believe, as a general matter, that genetically modified foods are natural.

28. Based on the literature discussed herein, as well as my research and general experience with matters related to food labeling and consumer perception, it is my opinion that labeling GE food products as natural is misleading to consumers.

I swear under penalty of perjury that the foregoing statements made by me are true and correct to the best of my knowledge.

Jane Kolodinsky

Dr. Jane Kolodinsky

Dated: November 14, 2014