Draft Risk Profile: Pathogens and Filth in Spices

Peer Review Report:

External Peer Review Comments and FDA Responses

Center for Food Safety and Applied Nutrition
Food and Drug Administration
U.S. Department of Health and Human Services

2013

INTRODUCTION

Versar, Inc. conducted an external peer review of the March 2013 version of FDA's *Draft Risk Profile: Pathogens and Filth in Spices*. Below we reproduce the charge to reviewers and identify and introduce the independent external reviewers by providing a brief biographical sketch of each reviewer. The final section of the document presents the reviewer comments and FDA's response to each comment. Reviewer comments have been grouped into three sections: (I) General Impressions, (II) Response to Charge Questions, and (III) Specific Observations.

CHARGE TO REVIEWERS

The *Risk Profile on Pathogens and Filth in Spices* was developed to provide information for Food and Drug Administration (FDA) risk managers and others to use in regulatory decision making. The information may also be useful to stakeholders and interested parties such as spice producers and importers, spice and food manufacturers, retail foods establishments, and consumers.

FDA is seeking your expert opinion on the degree to which the risk profile is comprehensive and its analysis is technically sound relative to its objectives and scope.

Charge Questions:

1. Are the objectives and scope of the risk profile clearly described in Section 1.1? If not, what revisions would you suggest to clarify the risk profile's objective and scope?

2. Does the risk profile appropriately consider available data and information to meet the four main objectives presented in Section 1.1? If not, what additional data or information should be considered to adequately meet the risk profile's objectives?

3. Does the risk profile appropriately consider available data and information to answer the four risk management questions posed in Section 1.1? If not, what additional data or information should be considered to adequately address these questions?

4. Are the conclusions presented in Section 9.1 of the risk profile supported by the data presented and evaluated in the risk profile? If not, please identify problems in the logic or analysis and suggest improvements.

5. Is the report written in a transparent and clear manner? If not, what revisions should be made to the report to make it more transparent and clear?

6. Do you have any additional comments or suggestions that might improve the risk profile?

Reviewers were also asked to describe their general impressions of the report and to list specific observations, comments, and questions regarding any aspect of the report.

REVIEWERS

The five independent experts selected by Versar, Inc. to evaluate and provide written comments on the draft included:

Larry R. Beuchat, Ph.D., earned a B.S. degree in Horticulture at Pennsylvania State University. His M.S. and Ph.D. degrees in Food Science, with a minor in Microbiology and Public Health, are from Michigan State University. After working in research and development at Quaker Oats Company, he joined the University of Georgia in 1972, where he is now a Distinguished Research Professor in the Center for Food Safety and Department of Food Science and Technology. Dr. Beuchat's current research interests include the microbiology of fruits, vegetables, and nuts; methodologies for detecting and enumerating pathogenic bacteria, yeasts, and molds in foods; metabolic stress and injury of foodborne microorganisms; relationships of water activity to microbial growth; and efficacy of disinfection and preservation technologies. He has written, edited, or co-edited 5 books and authored or co-authored 86 chapters and monographs, 504 refereed scientific journal articles, 115 miscellaneous scientific publications, and 558 abstracts in the area of microbiological safety and spoilage of foods. He served as an Associate Editor of Journal of Food Science from 1989 to 1994 and coeditor of Journal of Food Protection from 1994 to 2001, and is a member of the editorial boards of International Journal of Food Microbiology and Food Microbiology. Dr. Beuchat is a Fellow of the International Association for Food Protection, Institute of Food Technologists, and American Academy of Microbiology and currently serves as Vice President of the International Committee on Food Microbiology and Hygiene.

Linda J. Harris, Ph.D., is a food microbiologist at the University of California, Davis with extensive experience in the microbial food safety of tree nuts from pre-harvest through fully processed products. Her laboratory has evaluated the behavior of Salmonella, Escherichia coli O157:H7 and Listeria monocytogenes on tree nuts under different storage and processing conditions in addition to evaluating sanitizers and thermal processes for their efficacy in reducing microbial populations on tree nut and equipment surfaces. Dr. Harris has also focused on evaluating the sources, routes of contamination, environmental persistence, and prevalence of foodborne pathogens in low moisture food production and processing environments. The results of these studies have been used to develop quantitative microbial risk assessments for the tree nut industry which have led to implementation of new food safety policies and practices. Dr. Harris holds a Ph.D. in Microbiology from North Carolina State University and a B.S. and M.S. in Food Science from the University of Alberta.

Margaret Hardin, Ph.D., is Vice President of Technical Services with IEH Laboratories and Consulting Group based out of Lake Forest Park, WA. She is based out of Texas and currently works with the food industry on issues related to food safety and food microbiology, process control, process validation, environmental testing, HACCP, shelf-life, sanitation and sanitary design as well as on research efforts in food safety, shelf-life and process validation. Prior to joining IEH, Dr. Hardin was Associate Professor in Food Microbiology at Texas A&M University and was employed in various positions in the meat industry including Director of Food Safety with Sara Lee Foods, Director of Food Safety with Smithfield, and Director of Food Safety and Quality Assurance with Boar's Head. She also worked as Director of Pork Safety with the National Pork Producers Council and as a research scientist and HACCP instructor with the National Food Processors Association. Dr. Hardin received her Ph.D. in Food Microbiology from Texas A&M University and M.S. and B.S. degrees from the Universities of Georgia and Florida, respectively. She is a member of the International Association for Food Protection (IAFP), the Institute of Food Technologists (IFT), and the American Society for Microbiology (ASM), the Society for Applied Microbiology (SFAM), and the American Meat Science Association (AMSA). Dr. Hardin current serves on the National Advisory Committee on Microbiological Criteria for Foods (NACMCF).

Jeffrey Lee Kornacki, Ph.D., has been actively solving practical food microbiology problems since obtaining his B.S. degree in Bacteriology from the University of Wisconsin-Madison (1977). His M.S. and Ph.D. thesis research addressed contamination concerns with dairy product manufacturing. He co-authored a patent on ultra-filtered milk cheese production during the four years he worked for Schreiber Foods as a Research Scientist. Twelve subsequent years were spent microbiological troubleshooting, technical writing/editing, and in laboratory management for Silliker Laboratories. In 2001, he joined the University of Georgia's Department of Food Science faculty before founding Kornacki Microbiology Solutions. He has assisted a number of companies in the midst of FDA and USDA product recalls and made many hundreds of troubleshooting related plant visits in his career. He is adjunct faculty at UGA and an active member of IAFP. In 2010, he received IAFP's Sanitarian award and is Chairman of IAFP's Food Hygiene & Sanitation Professional Development Group. He has published on a wide variety of microbial food safety and quality topics and is Editor and Co-author of Principles of Microbiological Troubleshooting in the Industrial Food Processing Environment (Springer, 2010), and Co-Editor and Co-author of another book entitled, The Microbiological Safety of Low Water Activity Foods and Spices (Springer) scheduled for 2013. Dr. Kornacki is also a member of the National Advisory Committee on the Microbiological Criteria for Foods where he co-chairs the "Subcommittee on the Study of Microbiological Criteria as Indicators of Process Control or Insanitary Conditions."

Christine L. Little, Ph.D., has extensive experience in both public and private sectors of food safety associated with public health, including the food industry, food law, and food policy. Her experience includes provision of expert advice and risk assessments on microbiological food safety, infections and infectious diseases, managing surveillance systems on foodborne and other zoonotic outbreaks, UK-wide microbiological food surveillance programs and public health investigations, foodborne outbreak investigations, and research and development. Dr. Little has published 93 scientific publications (46 as first author). Her international experience includes word within the EU (Med-Vet-Net Network of Excellence, scientific projects), European Food Safety Authority and international work groups and project reviews.

PEER REVIEW COMMENTS AND FDA RESPONSES

We thank the reviewers for their thoughtful and detailed review of the *Draft Risk Profile: Pathogens and Filth in Spices*. We have considered all of the comments in our revision of the *Draft Risk Profile: Pathogens and Filth in Spices* and responded to each below. The revised *Draft Risk Profile* has benefited significantly from this independent peer review.

I. GENERAL IMPRESSIONS		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	My overall impression of the document is that it is thorough, fairly complete, reflects a regulatory-based perspective, and has been presented in a clear and easily understandable manner. However, I am concerned about the consistency of the definition of "spice" and comparing it with outbreaks, recalls and publications from the industry, other countries and agencies, and from the scientific literature. For example, dried broccoli powder, which is used primarily for its nutritional (health) benefits, does not seem to fit into the definition of "spice" (page 15); however, it is defined as a "spice" in this document and is a contributing factor in a major outbreak of foodborne related illnesses. In addition, some of the conclusions seem to exaggerate (inflate) the overall contribution of spice to the risk of outbreaks of foodborne illness and overall impact on public health and are not consistent with the data presented.	We thank the reviewer for these comments. For the purpose of this risk profile, the term "spice" means "any [dried] aromatic vegetable substances in the whole, broken, or ground form, except for those substances which have been traditionally regarded as foods, whose significant function in food is seasoning rather than nutritional, and from which no portion of any volatile oil or other flavoring principle has been removed" (Title 21 Code of Federal Regulations, section 101.22) and includes spices listed in 21 CFR 182.10 and 21 CFR 184 and additional dried plants listed as spices by the Environmental Protection Agency, the American Spice Trade Association and the Seasoning and Spice Association, such as dehydrated onion and garlic. Other dehydrated vegetables used as seasoning are also considered spices for this risk profile. This means that dried broccoli powder, *when used as a seasoning*, is included. We have reviewed the statements about the overall contribution of spice to the risk of outbreaks of foodborne illness and overall impact on public health and find that they are supported by the data.

I. GENERAL IMPRESSIONS		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	The group of individuals that toured spice facilities and visited the growing regions did not seem to be aware of many of the best practices currently used by spice processors, importers and customers of spice ingredients. For instance, many customers that use spice in their further processed products do evaluate the risks associated with their ingredients and how they will be used. If ingredients, such as spice, are applied post-lethality, those ingredients are subjected to a lethality treatment, such as heat, irradiation, EO, or PPO as appropriate, before use. Unfortunately, this does not seem to have been the case for the salami recall. In the section on research needs, additional emphasis should be placed on the need for validations of current processes and technologies and research to identify and validate surrogates appropriate for the different lethality processes and for the different categories and types of spice. There is also a pressing need for standardized protocols to assist companies (large and small) in the validation of critical process operations necessary for the control of foodborne pathogens for these ingredients. The document also seems to be missing the practical application of best practices, many of which are currently in use in the spice industry, and many that have been developed for other food commodities and just need to be more targeted for the spice industry, such as intervention technologies, process validation, sanitation (particularly dry sanitation), and facility and equipment design.	The team that developed the risk profile was aware of the "best practices" recommended by the spice industry and currently used by some spice processors, importers and customers of spice ingredients for some spices and these are mentioned in the text, particularly in the chapter dedicated to current mitigation and control options. To further emphasize industry guidance, we have expanded the section describing industry guidance and added additional text to the chapter providing an overview of the farm-to-table continuum. As noted by the reviewer, these "best practices" are not always followed by the spice/food industry. We have added the research and guidance needs identified by the reviewer that were not already mentioned in the document in Section 8.2.1.2, 8.2.1.7, 9.2.3, and 10.2.4. As mentioned above, we have expanded discussion of the application of best practices in the risk profile.
Reviewer #2	The draft document, "Risk Profile of Pathogens and Filth in Spices," provides a valuable resource of information, bringing together in one document overviews covering: outbreaks attributed to spices; the incidence of pathogens and filth found in spices; the farm-to-table continuum for spices; mitigation and controls; and the identification of data gaps and research needs. The appendices add further useful information on classification of spices and producing countries.	We thank the reviewer for these comments.

I. GENERAL IMPRESSIONS		
REVIEWER	COMMENT	RESPONSE
Reviewer #2	The sequence of the sections/chapters is appropriate. Much of the information gathered as part of the reviews within the Risk Profile are from published sources, government agencies and databases, and appears accurate. No reason is provided, however, for why different review periods were used in the different sections of the Risk Profile. For example, the "outbreak review" covers the period 1973 to 2010, whereas the "type of microbial pathogens found in spices" is from January 1985 to July 2012, etc. This presents an area of inconsistency within the Risk Profile. Some sections of the Risk Profile end with a Conclusions section while others do not. Again, I would prefer the format of sections to be consistent, preferably ending with a short conclusion or recommendations.	Completion of the risk profile involved decisions about cutoffs for data inclusion. Within the constraints of data access, collection and analysis, we provide a review of current data that address the risk management objectives and questions posed. For the review of outbreaks and analysis of FDA and industry sampling data, the availability of data and the complexity of the analyses involved determined upper year cutoffs for these studies. Chapter organization and format has been unified to the extent possible.
	A comment on style – some of the paragraphs within the sections are overly long making the information harder to read and evaluate. It is recommended that the Risk Profile be proofread and paragraphs shortened/split. The use of bullet points appears to be restricted to Section 10 on Data Gaps and Research Needs, but bullet points/other formatting could be usefully employed elsewhere in the report to improve presentation and readability. As the Risk Profile is intended to be useful to all stakeholders, it is important that the information can be easily accessed and utilized.	As suggested, we split or shortened long paragraphs, as appropriate.
	The conclusions (Section 9) of the Risk Profile appear sound; specific comments have been provided as part of Section III. Specific Observations.	We thank the reviewer for the comment.
Reviewer #3	The Risk Profile Team is applauded for assembling a tremendous amount of information concerning a complex array of factors and practices impacting spice safety. They have synthesized what is clearly the most comprehensive report to date on this topic. One has to assume that the information presented in the document accurately reflects the original reports from which it was drawn. Interpretation of data from these reports appears to be reasonable.	We thank the reviewer for these comments. All cited references are either publicly available or available from FDA upon request (e.g., the few "Personal communications" from individual scientists providing additional information about a study or event). We thank the reviewer for the comment.

I. GENERAL IMPRESSIONS		
REVIEWER	COMMENT	RESPONSE
Reviewer #3	With a few exceptions (see comments in Section III. Specific Observations), data are clearly presented and adequately discussed. Chapters dedicated to major spice safety issues are arranged in a logical order with minimal overlap in subject matter among chapters. Cross-references between chapters are appreciated. There is some discontinuity in writing style among chapters, but perhaps this will be less obvious as the draft progresses toward the final version.	We thank the reviewer for these comments. We have made changes to the text to improve uniformity of the writing style.
	Overall, conclusions drawn from what is known or, more often, not known about spice safety are sound. The inclusion of values (e.g., CFU/g or MPN, temperatures, sample size) in several chapters to support conclusions, however, would be helpful in some instances. The document makes painfully clear a long list of unknowns that beg for research attention.	We thank the reviewer for the comment. Conclusions are based on the data presented in the text, tables and figures. We have added values to the text, as suggested.
Reviewer #4	The authors did a very rigorous job of reviewing the literature related to *Salmonella*, *Bacillus spp.,* and filth in spices. Other microbial hazards endemic to spice growing regions were not addressed in detail (see Section III. Specific Observations). An estimate of Salmonellosis cases per annum resulting from direct and indirect spice consumption was not provided and more research may be needed for this to occur. If possible, an attempt should be made to do this. Reconditioning of spices was addressed but specific guidance for this is needed. Perhaps examples of reconditioning approaches acceptable to FDA could be provided, illustrating the key elements of such approaches. Never-the-less, the information provided in the document is extremely useful to provide areas of focus for government, industry and academia to increase efforts toward advancing public health as it relates to spices.	We thank the reviewer for the comment. No estimate of salmonellosis cases per annum resulting from spice consumption was provided because additional research is needed to provide critical data for such an estimate. The need for FDA to develop guidance documents on reconditioning was discussed in 9.2.3, *"FDA develops guidance for industry on the criteria recommended for validation of spice pathogen reduction treatment processes."* We thank the reviewer for the comment.

I. GENERAL IMPRESSIONS		
REVIEWER	COMMENT	RESPONSE
Reviewer #5	I reviewed the document "Risk Profile: Pathogens and Filth in Spices" draft document dated March 1, 2013. This is a well written, thorough document. It is obvious that a tremendous amount of work went into its preparation. Rather than repeat myself, I have provided more detailed comments below.	We thank the reviewer for these comments.

II. RESPONSE TO CHARGE QUESTIONS

CHARGE QUESTION 1: *Are the objectives and scope of the risk profile clearly described in Section 1.1? If not, what revisions would you suggest to clarify the risk profile's objective and scope?*

REVIEWER	COMMENT	RESPONSE
Reviewer #1	The objective and scope seem to be clear; however, the document did reference fertilizers, farm chemicals, and aflatoxins, all generally referred to as chemical hazards. As they do present a potential and unknown risk, should these hazards also be further addressed in the document? Some growers in developing countries have limited resources and tend to reuse whatever resources are available including bags and container that originally held animal feed, pesticides, fertilizers or bird guano, which may also be used as final or intermediary packaging for products destined for human consumption.	We thank the reviewer for these comments. Chemical hazards are outside the scope of this document. The practice by some spice producers of re-using bags/boxes is noted in the discussion of the spice supply chain.
Reviewer #2	The objectives and scope of the risk profile are generally clear and to the point. There are a couple of ambiguous points that require clarification or refining.	We thank the reviewer for the comment.
	Objective 1 aims to "Describe the nature and extent of the public health risk posed by the consumption of spices in the United States by identifying the most commonly occurring microbial hazards and filth in spice." The extent of the public health risk posed by consumption of spices will not be determined by just identifying the most commonly occurring hazards/filth; food consumption (exposure) data would be required to enable this.	The reviewer is correct that a quantitative measure of the public health risk posed by consumption of spices would need an assessment of exposure. However, for the risk profile, FDA risk managers only requested the research team identify the most commonly occurring microbial hazards and filth in spices for this risk profile. As noted in the text and in response to other comments, there is insufficient data available to estimate exposure of the U.S. population to *Salmonella* from consumption of spices at this time.
	Objective 4 needs to be explicit here regarding the reason for identifying data gaps and research, e.g., ''identify data gaps and research needs to reduce and/or prevent human illness from exposure to microbial hazards and filth in spice."	The objectives were set by the FDA risk managers. The risk profile development team interpreted this objective to mean identify the data gaps and research needs associated with addressing the objectives or questions set by the risk managers.

II. RESPONSE TO CHARGE QUESTIONS

CHARGE QUESTION 1: *Are the objectives and scope of the risk profile clearly described in Section 1.1? If not, what revisions would you suggest to clarify the risk profile's objective and scope?*

REVIEWER	COMMENT	RESPONSE
Reviewer #2	The specific microbial hazards considered in the risk profile are stated to include pathogens, yet toxicological agents, i.e., aflatoxins (secondary toxic metabolites produced by certain molds), are also described, albeit very briefly, in the review sections of the Risk Profile document. To avoid any confusion, the scope in Section 1.1 should therefore include toxicological agents, as well as pathogens (if that is the intention).	Toxicological agents are outside the scope of the document and therefore discussion of them has been removed from the document.
Reviewer #3	The objectives and scope of the risk profile are clearly described. Whether the objectives and scope are clearly met can only be judged by the text that follows.	We thank the reviewer for the comment.

II. RESPONSE TO CHARGE QUESTIONS

CHARGE QUESTION 1: *Are the objectives and scope of the risk profile clearly described in Section 1.1? If not, what revisions would you suggest to clarify the risk profile's objective and scope?*

REVIEWER	COMMENT	RESPONSE
Reviewer #4	The objectives and scope are clearly defined but are restrictive to *Salmonella* and *Bacillus spp.* and filth (primarily) which were rigorously reviewed by the authors. Section 1.1. (under Objective No. 1) states, "Describe the nature and extent of the public health risk posed by the consumption of spices in the United States by identifying the most commonly occurring microbial hazards and filth in spice." However, other microbial hazards potentially in spices (other than *Salmonella* and *Bacillus spp.*) were not addressed. For example, aspects related to mycotoxins are given little treatment. The authors also do not address pathogens that may be endemic to various countries that could have a serious health impact (e.g., *Mycobacterium tuberculosis* complex was not covered). Outbreaks associated with chronic illness as a result of *Mycobacteria tuberculosis* complex (e.g., tuberculosis), or mycotoxins (like Aflatoxins – liver cancer) in spices would be very difficult to track; however, the presence of these hazards in spices could be determined by a review of the literature in which these elements may have been examined. Pesticide residues in spices are beyond the scope described in the paper, but would also impact public health. Pesticides are used to control some of the elements that show up in spices as filth, and it would be unfortunate if we traded a reduction in filth due to increased pesticide use for an increase in harmful pesticide residues in spices.	We thank the reviewer for these comments. The objectives and scope of the risk profile was determined by FDA risk managers. We reviewed the literature and were unable to identify any reports of *Mycobacterium tuberculosis* in spice.
Reviewer #5	The objectives and scope of the risk profile are clearly described and appropriate.	We thank the reviewer for the comment.

CHARGE QUESTION 2: *Does the risk profile appropriately consider available data and information to meet the four main objectives presented in Section 1.1? If not, what additional data or information should be considered to adequately meet the risk profile's objectives?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	The profile does seem to consider, in most instances, available data; however, in many instances, the document only refers to an article when it may be useful to have a bit more information from that article included in this document to help support a discussion or conclusion. In that way, the reader is able to more clearly see what the conclusion is based on without having to look up another publication. Specific instances are listed below under Section III. Specific Observations. In the Executive Summary, the document refers to the dose required for illness (from *Salmonella*) as being small but makes it seem as though consumption of a small amount can result in illness. On page 49, however, the data presented here seem to contradict that assumption by stating that the per-person risk from a per-eating occasion is small. Are there other data or information that can help to clarify and more accurately identify the actual risk?	We thank the reviewer for the comment. We have added more information to the document, as suggested by the reviewer (see responses in Section III, Specific Observations). The statements to which you refer are not inconsistent. Models for *Salmonella* dose-response predict that low doses can result in illness and indeed, the spice-associated outbreaks for which enumeration data is available support this prediction, i.e., people became ill after consuming a small dose of *Salmonella* (assuming the enumeration data is representative of the spice consumed). The risk/probability of illness is depends on the relationship between dose and illness. The sections in the text relating to these issues have been revised to improve understanding.

CHARGE QUESTION 2: *Does the risk profile appropriately consider available data and information to meet the four main objectives presented in Section 1.1? If not, what additional data or information should be considered to adequately meet the risk profile's objectives?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #2	The Risk Profile appears to have considered available data and information to address the four main objectives presented in Section 1.1. It is difficult to assess, however, how much unpublished industry and/or other data sources there are (generally described as commercially sensitive) and how much was made available to the Risk Profile.	We thank the reviewer for the comment. As noted above, we have identified all data sources used to prepare the risk profile. These data include prevalence data submitted by the American Spice Trade Association in response to the FDA request for data and information published in the Federal Register.
	What is apparent from the Risk Profile are the significant amount of data gaps identified from carrying out the various reviews and research that make up the Risk Profile. Given the well-established association with, for example, dried spices and *Salmonella*, I anticipated that there could be more information available/documented on growth and survival of *Salmonella* in spices and on efficacy of treatment technologies. The reviews clearly present how they were conducted and what information sources were used/available; I cannot identify or recommend other additional data sources to be used.	We thank the reviewer for these comments.
	Objective 1 requires sound food consumption (exposure) data; the authors of the Risk Profile have already identified the challenges in obtaining appropriate food consumption data for ingredients used in small quantities in foods and identified this as a data gap.	This same comment was made by Reviewer 2 in response to Charge Question 1. See response above.
Reviewer #3	It is not possible to describe with any certainty the nature and extent of the public health risk posed by the consumption of spices without more knowledge about frequency and levels of all microbial hazards and filth in spices. There is simply not enough information available on all foodborne pathogens in all spices. The spice risk profile will only be a "best guestimate" at this point in time. This is not to say that the risk profile will not be valuable when developing more effective strategies to mitigate risks associated with spices. Consideration should be given to including additional statements in Section 9 that will qualify conclusions drawn from currently available data.	We thank the reviewer for these comments. We have reviewed and revised the summary conclusions in Chapter 9, as appropriate.

CHARGE QUESTION 2: *Does the risk profile appropriately consider available data and information to meet the four main objectives presented in Section 1.1? If not, what additional data or information should be considered to adequately meet the risk profile's objectives?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #4	In my view, this is true, given the caveats mentioned above. However, some of the information is not as yet available to the public, as it is represented to be submitted for publication or was the subject of personal communication. However, most of the information was from peer reviewed or otherwise public sources. As this document relates to acute risks caused by *Salmonella* and *Bacillus spp.* and the presence of filth, it was rigorously researched in my opinion.	We thank the reviewer for these comments. All cited references are either publicly available or available from FDA upon request (e.g., the few "Personal communications" from individual scientists providing additional information about a study or event). We thank the reviewer for the comment.
Reviewer #5	The authors have considered available data in preparing the document. The review of the literature was extensive and thorough. I have provided several additional references for consideration. These references are not specific to spices but I believe do complement the information in the document. Some were not published at the time the document was prepared and would not have been available in a literature search.	We thank the reviewer for these comments and for providing a list of additional references to consider.

CHARGE QUESTION 3: *Does the risk profile appropriately consider available data and information to answer the four risk management questions posed in Section 1.1? If not, what additional data or information should be considered to adequately address these questions?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	The authors of the document seem to have missed a lot of the mitigation strategies, control measures, and opportunities that are not researchable in the strictest sense of the word. For example, the authors refer to the implementation of GAPS and work by the United Fresh Produce Association; however, the success for fresh produce has largely been with growers and producers located in the U.S. Most all spice is grown and initially processed in other countries, hundreds of other countries, many of which do not have the technical or financial resources or the education to implement GAPS as we in the U.S. understand them. In addition, a considerable amount of time, effort, and oftentimes significant capital must be invested in learning about the country of origin for many of these products in order to effectively change a current practice or behavior. This includes learning about their current food production practices, methods for distribution, differences in culture and language, available technology and the food safety rules, or lack thereof, and associated resources to adopt and enforce them in their country. We must also acknowledge that different countries have different food safety experiences as well as different levels of acceptable risk. Some countries may perceive a certain food safety risk as totally acceptable while others may place a low priority on addressing the same risk. Understanding these differences will only serve to improve communication and further facilitate behavioral changes if needed.	We have added more discussion of mitigation and control measures undertaken by some in the industry in Chapter 6 and expanded the section on industry guidance in Chapter 8. In addition, we have added mention of initiatives by some in the industry to understand local regulations, practices, and traditions in different spice producing regions.
	As previously mentioned, the importance of validating process and intervention technologies, including the identification of appropriate surrogates, should be more strongly emphasized. This work is imperative to ensure that current processes and new technologies utilized, both here and abroad, are reducing the actual risks associated with these products and ultimately protecting public health.	We agree with the reviewer. The need for appropriate surrogates for *Salmonella* is mentioned several times in the text and is listed as a research need in section 10.2.4 “Identify and characterize appropriate surrogate microorganisms that can produce similar inactivation results as Salmonella for specific technologies in specific spices.”

CHARGE QUESTION 3: *Does the risk profile appropriately consider available data and information to answer the four risk management questions posed in Section 1.1? If not, what additional data or information should be considered to adequately address these questions?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	Additional research seems to be necessary in order to more fully understand the actual versus perceived risks associated with filth in spice. As the review mentioned, the DALs were set many years ago, however they may need to be reassessed based on new data and a new understanding of the actual risk to the product and impact on human health.	DALs are "maximum levels of "natural or unavoidable defects in foods for human use that present no health hazard" (http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/SanitationTransportation/ucm056174.htm#CHPT3). We have identified "a survey to assess consumer tolerance of natural and unavoidable defects in food" in the section on data gaps and research needs (10.2.4).
Reviewer #2	The Risk Profile appears to have considered available data and information to address the four risk management questions presented in Section 1.1. As noted before, it is difficult to assess how much unpublished industry and/or other data sources there are (generally described as commercially sensitive) and how much was made available to the Risk Profile.	We thank the reviewer for the comment. This same comment regarding how much unpublished data was made available to the research team was made in response to Charge question 2. We have identified all data sources used to prepare the risk profile. These data include prevalence data submitted by the American Spice Trade Association in response to the FDA request for data and information published in the Federal Register.
	Again, as noted above, what is apparent from the Risk Profile is the significant amount of data gaps identified from carrying out the various reviews and research that make up the Risk Profile.	We thank the reviewer for the comment.
	For Question 1, taking *Salmonella* as an example, in codes of practice/industry standards, the microbiological criterion has been absence so it is unsurprising that little information is available for the Risk Profile on levels from surveillance or control sampling. Although outbreak investigations do employ enumeration methods when testing for the outbreak pathogens, e.g., *Salmonella*, the information here is limited by the small number of outbreaks attributed to spice and other low moisture foods.	We thank the reviewer for the comment. The risk profile comments on the limited enumeration data available.
	Question 4 asks "What are the highest priority research needs…" Section 10 covers the data gaps and research needs identified by the development of the Risk Profile, but these are not ranked or presented as to which are of the highest priority to take forward.	The risk profile identifies the research needs. It is the responsibility of risk managers within FDA and each stakeholder group to rank these needs.

CHARGE QUESTION 3: *Does the risk profile appropriately consider available data and information to answer the four risk management questions posed in Section 1.1? If not, what additional data or information should be considered to adequately address these questions?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #3	The amount of data and information available to develop a spice risk profile is less than minimal in some instances to enable answering with a high degree of certainty the four risk management questions posed in Section I. This becomes evident in the main text of the report and confirmed by the painfully long list of data gaps and research needs (Section 10). Data and information on pre-harvest contamination and mitigation practices are given little attention; some additional discussion would strengthen the report. Also, data and information on contamination of spices at the food service and home levels are not provided. Maybe there are no data, but this should be stated in the report.	We have added discussion of industry guidance on mitigation practices to the text. We know of no data on the prevalence of contamination pre-harvest or at the food service or home. These data gaps are mentioned in the text.
Reviewer #4	See previous comments and the detailed comments to follow in Section III. Specific Observations. Additionally, a mark-up comment summary of the draft document has been provided to FDA.	We thank the reviewer for the comment. We respond to each specific observation noted below.
Reviewer #5	I believe this has been adequately addressed.	We thank the review for the comment.

CHARGE QUESTION 4: *Are the conclusions presented in Section 9.1 of the risk profile supported by the data presented and evaluated in the risk profile? If not, please identify problems in the logic or analysis and suggest improvements.*		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	As mentioned previously, some of the conclusions seem to exaggerate (inflate) the overall contribution of spice to the risk of outbreaks of foodborne illness and overall impact on public health, and are not consistent with the data presented. The document constantly states and supplies data to support that the prevalence of *Salmonella* in spice is low; however, its conclusions make it seem like spice is a major contributing factor to the burden of illness in this country. With the amount of spice consumed, and the presumed low level required for illness (from *Salmonella*), you would expect to see more outbreaks and recalls than are currently reflected in the data.	The risk profile does not comment on whether consumption of spices is a major contributing factor to the burden of foodborne illness or risk of outbreaks in the United States because there are insufficient data to make such a determination. The risk profile estimates the burden of illness in the United States for the three outbreaks identified using CDC's methodology and discusses some of the reasons that attributing illnesses to a food that is a minor ingredient with a long shelf-life can be difficult. The risk profile compares contamination prevalence for shipments of imported spices as compared with the average for all other FDA regulated foods and finds that the prevalence of *Salmonella* or filth among shipments of imported spice is approximately twice that found for all other imported FDA-regulated foods examined during the same time period. Based on these data, the prevalence for *Salmonella* and filth in spices at this point in the supply chain is not small relative to that for other imported FDA-regulated foods. We state in many places that information on the prevalence of *Salmonella* or filth in spices at the point of consumption is not known. This is an important data gap.
Reviewer #2	The general conclusions in Section 9.1 are supported by the data presented and discussed in the Risk Profile. An important theme that becomes apparent is that current tools are available to mitigate and control the presence of pathogens and filth in spices, but it is the implementation and maintenance of these tools that has been found to be inadequate.	We thank the reviewer for the comment.
Reviewer #3	The conclusions presented in Section 9.1 are largely supported by the data presented and evaluated in the preceding text. The difficulty in drawing conclusions (and this is pointed out several times in various chapters) is that little is known about specific spice safety issues. The availability of only a few data or observations on these issues does in itself, however, lend support to many of the conclusions drawn in Section 9.1 and to the data gaps listed in Section 10.1.	We thank the reviewer for the comment.

CHARGE QUESTION 4: *Are the conclusions presented in Section 9.1 of the risk profile supported by the data presented and evaluated in the risk profile? If not, please identify problems in the logic or analysis and suggest improvements.*		
REVIEWER	COMMENT	RESPONSE
Reviewer #4	Regarding the Beta-Poisson model: As a mathematical construct, is it the model that proves one cell can make one ill ("established that illness can occur following ingestion of as little as one Salmonella organism …"), or does it "support a perspective" derived from the outbreak literature that a single *Salmonella* cell can make one ill?	The reviewer is correct that the beta-Poisson model predicts rather than proves. We have revised the wording to avoid any confusion.
	The authors rely upon the Lemacher et al. paper that references an Aleksic paper (which appears not to have been published and does not appear in the reference section of the document) to support a perspective that 96 serovars were found, although they only report on seven of these. Some of the 96 serovars, which were alleged to have been found, were reported as unusual or non-motile (no H antigen). This causes some doubt as to the identity of these serovars, as *Salmonella* is defined by both its somatic and flagellar antigens. See further comments in text on this and other items in the text and below.	The reviewer correctly notes that the "94" servovars was referenced by Lehmacher et al. (1995) to "Aleksic and colleagues, submitted" and we, too, were not able to find this reference in our literature search. We have replaced "94" with "multiple" which is well supported by the data of Lehmacher et al. (1995).
	APC log reductions from microbicidal treatments cannot be expected to predict *Salmonella* log reductions from the same treatments.	We did not state that APC log reductions would "predict *Salmonella* log reductions" but we did state that they "may provide a relative approximation of expected results for … *Salmonella*." We further state that "specific studies using *Salmonella* or surrogates are needed and highly recommended." To address the comment, wording in 8.2.1.2 was changed to read "While reductions in the overall microbial populations observed in these studies may provide a relative comparison of the efficacy of different treatment types, results cannot be expected to predict actual *Salmonella* reductions. Specific studies using *Salmonella* or surrogates are needed and highly recommended."
	See the details to follow in Section III. Specific Observations. A mark-up of the draft document was provided to FDA.	We respond to comments in Section III below.
Reviewer #5	I believe the conclusions are sound and supported by the evaluation of the data as presented.	We thank the reviewer for the comment.

CHARGE QUESTION 5: *Is the report written in a transparent and clear manner? If not, what revisions should be made to the report to make it more transparent and clear?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	The report, for the most part, is written in a transparent and clear manner. However, there are instances, as mentioned above, where the document only refers to an article when it may be useful to have a bit more information from that article put into this document to help support a discussion or conclusion. That way we can see what the conclusion is based on without having to look up another publication. Please see Section III Specific Observations for additional information.	We thank the reviewer for the comment. We have addressed the concerns noted in our responses to the specific observations identified by this reviewer.
Reviewer #2	I have also commented upon this aspect within comments provided under Section I. General Impressions (see above).	No response needed.
	There are some areas within the report that could be made more transparent. For example, no reason is provided on why different review periods were used in the different sections of the Risk Profile; this presents an area of inconsistency within the Risk Profile. In some sections, such as Section 5 on Characterization of Contaminants and, for example, the subsection on Survivability of *Salmonella* in Spices, laboratory experiments are summarized from work carried out by Keller et al. 2013, with the reader advised that the full results are published in a paper. It is not clear whether this paper is available/open access, allowing the full results and details from the survivability experiments to be accessed.	This same comment was noted in Section I, General Observations. See response above. The Keller *et al.* (2013) paper is published in *Food Microbiology*, which is publicly available. In addition, all cited references are either publicly available or available from FDA upon request (e.g., the few "Personal communications" from individual scientists providing additional information about a study or event).
	The information within the report could be presented more clearly; many paragraphs within the sections are overly long making the information harder to read and evaluate. It is recommended that the Risk Profile be proofread and paragraphs shortened/split. The use of bullet points appears to be restricted to Section 10 on Data Gaps and Research Needs, but bullet points/other formatting could be usefully employed elsewhere in the report to improve presentation and readability (including the Executive Summary).	The document has been reviewed and paragraphs have been shortened, as suggested.

CHARGE QUESTION 5: *Is the report written in a transparent and clear manner? If not, what revisions should be made to the report to make it more transparent and clear?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #3	The report is transparent and, with a few exceptions, written in a clear manner. Comments and questions concerning the need for clarification of a few points are provided in Section III. Specific Observations.	We thank the reviewer for the comment and address each specific observation below.
Reviewer #4	This is true in the main document. Table 3.6 was mentioned in the text but was not shown in the version I reviewed. Less reliance on personal communication (or other documents that are not available to the pubic) is recommended where possible. A number of the government web links did not work that were cited in the text.	We thank the reviewer for the comment. We have corrected the mislabeling of the table in the text. We have relied on refereed published scientific reports wherever possible but have included additional information made available from government sources or authors of scientific reports where necessary. All cited references are either publicly available or available from FDA upon request (e.g., the few "Personal communications" from individual scientists providing additional information about a study or event).
	See specific observations to follow in Section III. Specific Observations.	We respond to comments in Section III below.
Reviewer #5	I found the document very easy to read and a balanced reviewed of the published literature. Significant amounts of additional data were sourced, analyzed and presented in a logical fashion. I have no suggested revisions save the specific observations I outline below.	We thank the reviewer for these comments.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #1	See comments below in Section III. Specific Observations.	We address specific observations below.
Reviewer #2	For Section 9, please include a timeline for when the potential future mitigation and control options are proposed to be taken forward – organizations have been identified as to who would be appropriate/responsible for the listed control options but not when these options could be taken forward. For Section 10, is it feasible to indicate which organization(s) have responsibility (and/or funding) for when these data gaps and research needs are to be taken forward? A number of specific comments have also been provided as part of Section III. Specific Observations.	The potential future mitigation and control options described in Chapter 9 are options developed by the risk profile team based on the data and information analyzed and presented in the report. It is the responsibility of risk managers within FDA and each stakeholder group to decide whether to implement or when to implement options. It is the responsibility of risk managers within FDA and each stakeholder group to decide which data gaps and research needs are most important to fill/meet and when and how they will be filled/met. We address each specific observation below.
Reviewer #3	I would like to have seen more information on pre-harvest mitigation strategies as a major intervention to minimize contamination of spices with foodborne pathogens. Regarding research needs (Section 10.2), the need for evaluating culture methodology for detection/ enumeration of foodborne pathogens in spices is given only passing attention. My concern is that desiccation-stressed cells may not be detected using current culture methodology. This is a research area that needs to be elevated in terms of priority among the numerous other research gaps itemized in this section. A prioritized list of research needs is suggested. A glossary listing acronyms and their meanings would be helpful to the reader. At times, the alphabet soup can become difficult to navigate.	The document discusses GAPs and industry guidance which describe important pre-harvest preventive controls. We have added a new research need "Optimize methods for detection and enumeration of *Salmonella* in spices" in Section 10.2.4. It is the responsibility of risk managers within FDA and each stakeholder group to prioritize research needs. A list of abbreviations and acronyms has been added.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #3	The word "data" is plural. Unfortunately, it is treated otherwise many times throughout the document (lines 114, 126, 183, 991, 1226, 1339, 1720, 1745, 1771, 1894, 1934, 2032, 3502, 4164) and should be corrected.	We respond to each specific observation below.
	Other suggestions to improve the risk profile are listed in Section III. Specific Observations.	We respond to comments in Section III below.
Reviewer #4	The report did not describe the cross contamination risk associated with the use of common processing lines in the processing of multiple spices within some sectors of the industry, which increases the public health risk. Nor did the document describe the lack of effective approaches to disinfection and sanitation of processing lines, given various processing equipment designs (e.g., fillers). Only scant reference is made to the lack of appropriate sanitary design of some pieces of spice processing equipment. Unsanitary designs make some equipment difficult to adequately wet clean and sanitize, and microbiological contamination risk of spices is likely to be increased as a consequence of traditional wet cleaning and sanitization on such equipment. Thus, another area for further research is related to techniques for dry disinfection of equipment. This is further described in the specific comments included in Section III. Specific Observations.	We thank the reviewer for these comments. These potential sources of contamination have been described in Section 6.3. We have expanded this discussion by providing some of the examples the reviewer suggests. We agree with the reviewer. Research to develop new and improved dry cleaning and sanitation methods was added to the list of research needs in Section 10.2.4.
	The document reports that a correlation between filth and pathogens was not established. However, research correlating the presence of DAL animal/insect excreta and the presence of pathogens should be done.	This research is identified in the research needs section 10.2.2 "Determine the relationship between prevalence and level of Salmonella in the spice processing environment and Salmonella in spices."
	If possible, the authors should consider an estimate of the number of Salmonellosis cases resulting from consumption of spices, whether directly or indirectly consumed. Such a number would likely be refined in light of further research, given the low level of most current testing approaches (e.g., 25 g vs. 375 g).	There are insufficient data to estimate the number of salmonellosis cases resulting from consumption of spices at this time.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #5	1) I struggle with all documents that present prevalence without specifying sample size (as the authors point out lines 1711-1712 and elsewhere). There are a number of places where the actual sample size should be mentioned even if it becomes somewhat repetitive. This is particularly important because the sample size used in FDA surveys is 750 g, compared to 25 g to 375 g in most other cases (although, on line 1657, a 1500 g sample size is implied, further confusing matters). It is highly likely that this document will be read in pieces and not from beginning to end. Thus, including sample size every time prevalence data is presented is important to the interpretation of the information.	1) We thank the reviewer for the comment. As the text shows, we are aware that sample size can influence observed prevalence and discuss this in several parts of the document. We have added the appropriate sample mass whenever reporting a prevalence value for *Salmonella* in spice. The test portion size for filth is determined in part by the DAL or food-filth element combination as specified by the FDA methods of analysis. We added reference to the methods to of analysis used to determine adulteration of spice by filth.
	Throughout the document, wherever prevalence is given, I would suggest sample size be specifically included. For example: Line 95: FY2007-FY2009 was 0.066 (750 g; 95%...).	We have added the appropriate sample mass whenever reporting a prevalence value.
	2) Levels of *Salmonella*. It is appropriate to show MPN/g but it may also be helpful for some readers to express these numbers per some other denominator. For some readers, 0.007 MPN/g may be a difficult concept - 7 MPN per 1000 g may be easier to understand. Perhaps one example in the text might be sufficient to communicate.	2) We thank the reviewer for the comment. We added such an explanation after the first level value below 1 is reported. Tables continue to report enumeration data as MPN/g because it is directly relevant to typical spice serving sizes (e.g., 0.15-2 g).

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #5	3) I wonder (and this is me wondering more than a suggested document change) if the lack of spice outbreaks associated with *E. coli* O157:H7 or other EHECs is because they are more clonal than *Salmonella*. Low moisture food outbreaks of salmonellosis are much more likely to be detected with very rare serovars (or PFGE fingerprints) that uniformly contaminate a lot(s), in part, because the outbreaks tend to be spread over many months and common isolates cannot be distinguished from the background cases. It is quite likely that this is the reason we have recognized a relatively small number of spice outbreaks to date. Modern typing techniques and tools like PulseNet make it more likely that this type of outbreak will be discovered. Could this be an issue with pathogenic *E. coli* – outbreaks occur but they aren't detected? I am not arguing that *Salmonella* shouldn't be the focus of the report, it should. Just raising some thoughts.	3) We thank the reviewer for the comment. The research need "Determine the prevalence and level of pathogens other than Salmonella in spices at critical points in the farm-to-table continuum" identified in Section 10.2.2 includes pathogenic *E. coli* strain.
	Although the fenugreek seeds were mentioned (*E. coli* O104) (e.g., Section 2.5), I think the cookie dough outbreak (flour) is also relevant (recent paper by Neil et al., 2012) – not as a spice but as a low moisture food ingredient. Neil, K. P., Biggerstaff, G., MacDonald, J. K., Trees, E., Medus, C., Musser, K. A., et al. (2012). A Novel Vehicle for Transmission of *Escherichia coli* O157:H7 to Humans: Multistate Outbreak of E. coli O157:H7 Infections Associated With Consumption of Ready-to-Bake Commercial Prepackaged Cookie Dough--United States, 2009. Clinical Infectious Diseases, 54(4), 511–518. doi:10.1093/cid/cir831.	We thank the reviewer for the comment. Section 2.5 discusses outbreaks associated with spice ingredients used in non-spice capacities. Flour does not fit in here.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #5	There are a couple of recent papers that demonstrate good survival (I think better than expected) of pathogenic *E. coli* in tree nuts: Kimber, M. A., H. Kaur, L. Wang, M.D. Danyluk, and L.J. Harris. 2012. Survival of *Salmonella*, *Escherichia coli* O157:H7, and *Listeria monocytogenes* on inoculated almonds and pistachios stored at –19, 4, and 24°C. J. Food Prot. 75:1394–1403. Blessington, T., E.J. Mitcham, and L.J. Harris. 2012. Survival of *Salmonella enterica*, *Escherichia coli* O157:H7, and *Listeria monocytogenes* on inoculated walnut kernels during storage. J. Food Prot. 75:245-254.	We thank the reviewer for these references and have included them in the text as suggested.
	On lines 4556 to 4560, the authors suggest that FDA increase surveillance of pathogens other than *Salmonella* with first efforts on *Bacillus* spp. I would also suggest some mention of pathogenic *E. coli* should be made here. I am not sure methods have been adequately validated for detection pathogenic *E. coli* in low moisture foods – perhaps this is an area of needed research. **Lines 1112-1116.** I think it would be challenging to design a retail study that could evaluate the efficacy of risk management practices.	We added text to indicate that surveillance studies in the future could test for *E. coli* because of the data that demonstrates that it can survive in low moisture foods and cite the references provided by the reviewer. Method development for detection of pathogens in spices is also listed as a research need in Section 10.2.4. A comparison of prevalence at retail and prevalence at import would provide a measure of the efficacy of risk management practices currently employed by industry in reducing the prevalence of *Salmonella* contamination post-import. The sentence was removed in this section because determination of Salmonella prevalence in spice at retail was already listed as a research need in Chapter 10.
	Lines 1177 to 1186, 1662-1667, and elsewhere. The assumption of normal distribution of a lot is just an assumption. A positive 750 g or 1500 g sample may not indicate that an entire shipment of thousands of pounds of spice is contaminated - and contaminated at equal levels (and with the same serovar). I believe that one of the research needs is a better understanding of the distribution of *Salmonella* in positive lots (shipments).	The assumption of Poisson-distributed within-shipment contamination was explicitly examined in the study for contamination of capsicum or sesame seed shipments of imported spice offered for entry to the United States and it was found that the data were not inconsistent with the assumption. This information was added to Section 4.1.3.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #5	**Lines 4574 and 4663.** Is there a need for research into the distribution of *Salmonella* and other pathogens in contaminated lots?	Re: research need: This research need was already noted in the Section 10.2.2 "Determine the distribution and level of Salmonella in spices at critical points in the farm-to-table continuum."
	Is it appropriate for this document to specify a suggested sample size for testing of spices rather than to refer to other documents?	No, it is not appropriate for this document to specify a recommend sample size. That would be guidance, which would involve a completely different process than a scientific report. The document does provide a comparison of detection efficiency for of sampling protocols on the basis of sample size in Table C3.
	Lines 1484 to 1488. Is it possible that the pepper involved in the outbreak was not imported during that time period? From the description of the report and mentioned elsewhere in this document, it appeared that contamination in the facility was a significant contributing factor. Isn't it possible that the original contamination came from a lot from a previous timeframe?	Yes, it is possible that the pepper involved in the outbreak was not imported during the period of the surveillance study and this possibility was added.
	Lines 3593 to 3603. There are many more recent references on the heat resistance of *Salmonella* in peanut butter and almonds that might be appropriate to cite. Also D-values are not always appropriate since the reductions are not always linear (significant tailing is often observed). This is really critical in other low moisture foods and may play a role in spices. It should be pointed out. How organisms are cultured prior to inoculation also plays a role in heat resistance. Keller, S. E., Grasso, E. M., Halik, L. A., Fleischman, G. J., Chirtel, S. J., & Grove, S. F. (2012). Effect of growth on the thermal resistance and survival of *Salmonella* Tennessee and Oranienburg in peanut butter, measured by a new thin-layer thermal death time device. Journal of Food Protection, 75(6), 1125–1130. doi:10.4315/0362-028X.JFP-11-477.	We thank the reviewer for these references. We have added most of them to the text in Section 5.1.3 and Section 8.2.1, as appropriate. We were unable to find a place to add the Pan *et al.*, article.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
Reviewer #5	**Calculated z-value of 35 degrees Celsius:** Harris, L.J., A.R. Uesugi, S.J. Abd, and K.L. McCarthy. 2012. Survival of *Salmonella* Enteritidis PT30 on inoculated almond kernels in hot water treatments. Food Res. Int. 45(2):1093–1098. Clearly shows non-linear survival curves and use of Weibull model: Abd, S.J., K.L. McCarthy, and L.J. Harris. 2012. Impact of storage time and temperature on thermal inactivation of *Salmonella* Enteritidis PT 30 on oil-roasted almonds. J. Food Sci. 77(1):M42-M47. This reference may be useful generally in the section on treatments: Pan, Z., G. Bingol, M.T. Brandl, and T.H. McHugh. 2012. Review of Current Technologies for reduction of *Salmonella* populations on almonds. *Food and Bioprocess Technol*. doi:10.1007/s11947-012-0789-6.	We thank the reviewer for these references. We have added most of them to the text in Section 5.1.3 and Section 8.2.1, as appropriate. We were unable to find a place to add the Pan *et al.*, article.
	Line 4503. Some guidance should be provided on how to enumerate pathogens in low moisture foods. Much higher amounts of sample need to be enriched than is normal in MPN analysis. Is it appropriate for this document to provide such guidance? Should it be 100 g, 10 g, 1 g, and 0.1 g? Should it be multitube or single tube? There is a fair amount of data on levels available, so I would think some type of solid guidance could be given here that would significantly improve the data collected.	The research need: "Optimize methods for detection and enumeration of *Salmonella* (and other pathogens) in spices" has been added to Section 10.2.4.

CHARGE QUESTION 6: *Do you have any additional comments or suggestions that might improve the risk profile?*		
REVIEWER	COMMENT	RESPONSE
	Lines 4681 - 4683. I think it is important to understand the impact of inoculum level on survival. It is also important to understand the impact of the experimental design on survival. It is possible that antimicrobials are only effective in the presence of moisture. There is some evidence that in some low moisture foods lower initial inoculum levels may persist for long periods of time. Recovery of cells that have been desiccated for long periods may also present additional challenges that need further study. See these examples: Survival during storage may be non-linear with strong tailing: Beuchat, L. R., & Mann, D. A. (2010). Factors affecting infiltration and survival of *Salmonella* on in-shell pecans and pecan nutmeats. Journal of Food Protection, 73(7), 1257–1268. Blessington, T., E.J. Mitcham, and L.J. Harris. 2012. Survival of *Salmonella enterica*, *Escherichia coli* O157:H7, and *Listeria monocytogenes* on inoculated walnut kernels during storage. J. Food Prot. 75:245-254.	Section 10.2.3 includes the research need: "Determine whether *Salmonella* survival in spice is strongly dependent on the initial level introduced… Data are needed to determine whether at low levels of contamination, other factors, such antimicrobial compounds present in the spice, water activity of the spice, or inoculum matrix lead to different survival rates." Research needs related to recovery of desiccated cells is now mentioned in Section 10.2.4 "Optimize methods for detection and enumeration of *Salmonella* (and other pathogens) in spices." These references have been included in the text.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
Reviewer #1	19	623	Inconsistent use of periods at the end of sentences. Especially when compared with Table 2.2 on page 21.	Periods added where missing.
	19	623	Under the column for Black pepper and red pepper and *Salmonella* Senftenberg (Jul 2009-Apr 2010), in the last block, at the bottom of the page (Comments) there is a sentence fragment: "Strain in." Is there something missing here or should this be removed?	Removed sentence fragment.
	21	632	Inconsistent use of periods at the end of sentences.	Periods added where missing.
	21	632	Inconsistent use of commas in references between the author and year (WHO, 1974). Sometimes they are used and at other times they are not used, even when the citation is an organization such as WHO, FAO, EFSA, etc. This is particularly noticeable in Sections 7, 8 and 10 of the document. Recommend having someone review the entire document for consistency in this area.	Commas added where missing.
	23	642	Under column for Anise seed, in the last block at the bottom of the page (**Comments**) there is a period "." between the word "monitoring" and the words "in 2002" and no period after "2002."	Period moved to correct place.
	24	649	Under column for Fennel seed, in the last block at the bottom of the page (**Comments**) there is a period missing after the word "boiling."	Period added

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	26	699	Was this environmental sampling data collected from the implicated spice processing and packing facility in California? Recommend adding the state for clarification.	"California" added.
	29	857-58	Sprouts are a completely different process. This statement seems to be inappropriate for this assessment.	We believe the statement is appropriate. Some types of seeds are consumed either as spice ingredients in foods or in their sprouted form. Mitigation and control strategies that limit contamination of the seed would reduce outbreaks from consumption of contaminated sprouts in which the seed was contaminated.
	29	864-66	Infants and young children, who comprise the majority of cases of illness in five outbreaks, were also the target consumer for some of these products as well (potato chips and veggie puffs).	We have modified the text to read "…infants and young children, who comprised the majority of cases of illness in five outbreaks and were the apparent target consumer of some of the contaminated foods consumed…"
	30	872	Is there a reference (publication) to support the statement "low levels of contamination in spices can cause illness"?	References have been added.
	43	1098-99	Was the test method used in screening the same in non-U.S. studies as it was for U.S. studies? This could also account for the variability in prevalence based on the sensitivity and specificity of the test used. Actually this holds true for this entire section (Section 4)	We agree that the method of analysis can impact the efficacy of a test in detecting *Salmonella*. We have added a paragraph to the beginning of Chapter 4 to address the challenges associated with comparing prevalence values and the assumptions we make in our analysis.
	43	1118-19	Is this a good place to recommend that such data would be of value for the purposes of risk (hazard) assessment and process validation?	These points are made in the sections discussing process treatments and research needs.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	43	1119	Regarding Table 4.2, it should be emphasized that samples taken at import, retail and from processing plants during outbreaks (and surveillance) may not necessarily reflect actual levels in food at the time of consumption.	We have added this comment to the discussion.
	53	1345-63	This presents some of the inherent issues with prevalence studies and particularly those associated with spice. The authors identify sample size as a contributing factor; however, additional and confounding factors may also come from the fact that spices are grown and initially processed in hundreds of countries then often shipped to intermediate countries for packaging and perhaps additional processing prior to final export to the U.S. This may confound an accurate comparison of the numbers, as these figures can also be influenced by the country of origin, growing conditions, primary harvesting, and processing, the identity of which may be lost by the time the product gets to retail.	Already addressed in responses above.
	54	1373-82	In addition, not all treatments are created equal, as is later discussed in the document and nothing is known about the validation of such treatment processes.	The following sentence was added to the text. "No information was available on whether the treatment processes applied to the spices had been validated and as is discussed in detail in Section 8.2.1, different treatment processes and treatment conditions can result in very different net reductions in microbial populations."
	54	1399-1417	How did FDA account for differences in country of origin in their statistics? The different prevalence values highlighted in this paragraph may not be as much of a difference in type of spice as it is a difference in the growing, harvesting and primary processing.	The differences highlighted in this section are for imported shipments of spice offered for import to the United States, that is, the U.S. imported spice supply.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	56	1463	However it may be related to where it is grown, harvested and initially processed.	See above.
	57	1490	The word "isolates" in the title has an "a" on the end of it. This should likely be a superscript "a"?	"a" formatted as a superscript.
	61	1541-55	How is this paragraph relevant to the discussion of spice unless you are considering some of these animals as potential sources of *Salmonella* contamination?	This paragraph has been substantially shortened while still making the intended point(s). One of the points was, as the reviewer suggests, that our data suggests a diversity of sources contribute to the contamination of spices.
	61	1554	Suggest adding the word "potential" between the words "diversity of" and "contamination sources."	The word "may" provides the caveat already.
	63	1584-1604	This entire paragraph seemed somewhat confusing and out of place in this document. The sentence on line 1587 that begins with: "The antimicrobial resistance profile of *Salmonella* strains isolated from imported spice is characteristically different form the resistance profile isolated from retail meats……" and the rest of the paragraph seems irrelevant and out of place.	The antimicrobial resistance of *Salmonella* strains found in spices can impact health outcome of persons who become ill from consumption of these strains so we believe it is important to discuss the prevalence and character of the strains isolated from spices. We were able to reduce the discussion comparing spices to other products without sacrificing the key points regarding spices.
	63	1604	There should be period "." at the end of the sentence following the word "sources."	Period added.
	63	1612	Providing additional detail from the original publication would help to better support the importance and necessity of this paragraph and the at least two orders of magnitude of the MPN values, such as were the shipments from the same country of origin, from the same country that processed them, with the same treatments and controls?	More detail has been provided.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	68	1655-56	In addition to selecting the sample plan design and sample size, it is also important to consider and account for any variability in methods as well as the variability between differing countries of origin and of processing.	The text is referring to the ability of a test to detect *Salmonella* in a shipment when it is present at small mean levels. We agree that selection of method of analysis is also critical and have added a comment that a validated method of analysis with appropriate sensitivity and selectivity should be used. The origin of the spice or it's processing history are not relevant to this discussion.
	69	1665-67	This seems to be a rather strong statement that is not well supported by outbreak or illness data. Perhaps this may occur if the spice is used in its raw form without further processing such as an intervention or lethality step.	The estimated numbers were provided to illustrate the large number of contaminated servings present in the imported spice supply in the United States at the point of entry. The reviewer is correct in noting that subsequent process treatments and cooking steps, which can be applied to spices post-import, may reduce the contamination level and thereby the number of illnesses from consumption of that spice. This section of the discussion was removed to avoid confusion.
	70	1722	The word "cloves" should also be included (based on Table 4.9) to read … "and that untreated cassia, parsley and cloves are unlikely…"	We have added "and possibly also cloves", based on the reviewer's suggestion (noting the large confidence interval that includes an upper limit of 5%).
	73	1807-08	This sentence seems confusing "…but information from FDA targeted sampling assignment in 2010 FDA study…." Is there something missing here?	We revised the sentence to improve clarity.
	73-74	Section 4.1.6	There is an inconsistent use of commas for the references in parentheses and cited in this section. Sometimes they are used and sometimes they are not.	Commas added where needed.
	74	1866-68	The references Ma et al., 2010 and Ma et al., 2010b are not listed in the reference section (page 188).	The correct reference (Ma, 2013) has replaced these references in the text.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	75	1902	Is this supposed to read "presence of twigs, dirt and field insects" instead of "trigs"?	Yes. Typographical error fixed.
	76	1936-37	Wouldn't the subjectivity of the methods sometimes employed (i.e. visual) to analyze for filth also contribute to the prevalence rates?	All the methods have been validated by multi-lab collaborative studies using spiked samples. The lab studies showed no analyst bias.
	79	2027	Should the semicolon after *E. coli* be a "("?	Semicolon replaced by "(".
	79	2039-48	Or could there be no correlation simply because there is no correlation?	The text has been revised to read "The absence of a correlation for shipments of imported spices offered for entry to the United States may result from a lack of statistical power (data for a small number of shipments are compared) or may signify that spices or the spice supply chain practices prior to import are characteristically different (on average) with regard to contamination with *Salmonella* and filth from those of other imported FDA-regulated products (among those sampled)."
	83	2155	The word "*Salmonella*" in this sentence should be italicized.	"*Salmonella*" was italicized.
	84	2156-67	Suggest using the word *Salmonella* instead of Salmonellae and should be in italics.	The sentence was revised as suggested.
	84	2163	Should the word in this sentence be "desiccated" and not "dedicated" *Salmonella*?	Yes. The typographical error was fixed.
	85	2211-15	This seems interesting; however, it also seems to be a leap of faith to correlate aflatoxin production and growth of *Salmonella* without further data.	Discussion of aflatoxin production was removed because it is outside the scope of the document.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	86	2237-38	What types of food were included in this model? Do any correlate to spice or even present similar risks such as in their production, processing, low water activity, etc.?	Information about the contaminated foods included in the data sets used to develop the models has been added to the text. No data from spice-associated outbreaks were available for use in the models but data from one outbreak attributed to a low-moisture food was included. Despite the absence of data from outbreaks associated with spices, the dose-response function derived by WHO/FAO model is consistent with the dose-response estimate derived by Lehmacher et al. (1995) for the outbreak associated with consumption of paprika-powdered potato chips.
	89	2354-55	Has there been a report of such adulteration in spice? Is there any data to support this conclusion?	The FDA has analyzed spices that were adulterated by all three categories of filth elements at the same time. We have added this comment to the text.
	92	2465	Should this word be "ground" instead of "group"?	Yes. We have corrected the typographical error.
	94	2527	Where is Table 6.2 located?	There is no Table 6.2. We have revised the text accordingly.
	96	2598-2602	This sentence is long and rather confusing. Is it possible to break the sentence up to clarify?	We have revised the text to improve clarity.
	98	Section 7	There seems to be an inconsistent use of commas for the references in parentheses and cited in this section. At first, I thought you were not using them when you were citing agencies such as USDA/ERS and the date but then on page 104, line 2783, and page 105, lines 2808 and 2817, commas are used.	Commas added, as necessary.
	114	3088-91	This is a fairly broad statement and does not seem to be adequately supported by the data (Table 8.4). A significant reduction "may" be realized and, based on Table 8.4, it would be realized only for capsicum and sesame seed and only as it applies to *Salmonella*.	The discussion of efficacy of sampling protocols has been revised to clearly identify the spices for which models of between- and within-shipment *Salmonella* contamination have been developed.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	115	3093	Should the "a" at the end of the word "examined" be superscripted?	We have made the "a" superscripted.
	117	3109-3121	Are the other "FDA foods" offered up for comparison to spice actually comparable – such as, are they raw agricultural products, originating in potentially hundreds of different countries, low water activity products, etc. that present similar risks? Or are you comparing apples to oranges, so to speak?	The "Efficacy" discussion in Section 8.1.2.2 has been substantially revised and no longer includes a discussion of prevalence values. However, such a comparison is provided in Chapter 4, Section 4.1.3.1 in order to place the measured values for spices in context with that for other imported FDA-regulated foods. We provide an overall comparison of average prevalence values and also compare the average *Salmonella* shipment prevalence for imported spices to the average for other imported FDA foods in the same FDA Food Category as spices (II), which would employ the same sampling protocols used were the same to the extent possible (e.g., same mass of spice examined).
	117	3129-35	Is it appropriate to compare data from samples taken at import to samples taken at retail when the product may have, and likely has, undergone further processing prior to retail distribution – unless the imported samples were destined to go directly to retail without further processing?	The "Efficacy" discussion in Section 8.1.2.2 has been substantially revised and no longer includes comparison at issue in the reviewer's comments.
	120	3241	There appears to be an extra space between the words "India" and "was."	Extra space removed.
	122	3331	The words "*Escherichia coli*" should be italicized.	The words "*Escherichia coli*" have been italicized.
	122	3332	Should there be a comma between USFDA and 2013 in the reference citation – there is one used in the following paragraph….just for consistency.	Comma added.
	122	3338	Do they currently "use" or have they actually "adopted" a version of the Food Code?	Adopted. We thank the reviewer for pointing out this wording issue.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	127	3473	Should this be *Salmonella*? Or salmonellae? Please be certain you are using the terms correctly and consistently. *Salmonella* is used in the next two sentences.	We have reviewed and revised, as necessary.
	128	3528	Should this be *Salmonella*? Or salmonellae? Please be certain you are using the terms correctly and consistently.	We have reviewed and revised, as necessary.
	130	3893-3603	Should this be *Salmonella*? Or salmonellae? Please be certain you are using the terms correctly and consistently.	We have reviewed and revised, as necessary.
	134	3643	What are you basing this statement on?	The statement was removed.
	134	3669	There is a comma missing between the authors and year in the publication citation.	Comma added.
	134	3675	There is a comma missing between the authors and year in the publication citation.	Comma added.
	136	3737-45	There are commas missing between the authors and year in the publication citations in this section (lines 3741, 3742 and 3743).	Commas added.
	140	3779	There is a comma missing between the authors and year in the publication citation.	Comma added.
	141	3808	Should this be *Salmonella*? Or salmonellae? Please be certain you are using the terms correctly and consistently.	We have reviewed and revised, as necessary.
	141	Section 8.2.1.5	There are commas missing between the authors and year in the publication citations in this section (lines 3814 and 3831).	Commas added.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	142	3879	There should be parentheses around the year (1984).	Parentheses added.
	143	Section 8.2.1.6	There are commas missing between the authors and year in the publication citations in this section (lines 3898, 3899, and 3901).	Commas added.
	144-45	Section 8.2.1.7	There are commas missing between the authors and year in the publication citations in this section (lines 3924, 3925 and 3857).	Commas added.
	145	3955-3964	There are additional references for process validation including: Two chapters (Chapters 3 and 4) in Microbiological Research and Development for the Food Industry (P. J. Taormina, Ed). CRC Press, Boca Raton, FL. 2012. FDA (Food and Drug Administration) (2011). Guidance for Industry, Process Validation: General Principles and Practices. In: U.S. Department of Health and Human Services, (Ed.): Washington, DC. GHTF (Global Harmonization Task Force) (2004). Quality Management Systems – Process Validation Guidance. SG3/N99 -10:2004 (Edition 2). http://www.ghtf.org/documents/sg3/sg3_fd_n99-10_edition2.pdf	We have included these references into the discussion. We thank the reviewer for pointing them out.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	145	3985	There is a comma missing between the authors and year in the publication citation and there should be a semicolon instead of a comma to separate the citations Koco and Perren to be consistent with other references used in this document.	Comma added and comma replaced by semicolon as suggested.
	146	4012-4040	There are commas missing between the authors and year in the publication citations on this page (lines 4012, 4013, 4027 and 4040).	Commas added.
	146	4017	Should this be *Salmonella*? Or salmonellae? Please be certain you are using the terms correctly and consistently.	We have reviewed and revised, as necessary.
	147	4060	There is a comma missing between the authors and year in the publication citation.	Comma added.
	149	4156	There is a comma missing between the authors and year in the publication citation.	Comma added.
	150	4158, 4161	There is a comma missing between the authors and year in the publication citation.	Comma added.
	151	4188	There is a comma missing between the authors and year in the publication citation.	Comma added.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	151	4206, 4209	What are these statements based on: "…prevalence is likely significantly higher" and "the presence of *Salmonella* is a systematic problem in the spice supply system"? This doesn't seem to be supported by any of the data presented. The meaning here needs to be clarified. Also, what do you mean by a systematic problem?	The prevalence of *Salmonella* contaminated shipments of imported capsicum or sesame seed is predicted to be larger than that observed because the typical level of contamination found in these types of spice shipments is so small that the screening test protocols are inefficient. The FDA 2010 study, which was described in Chapter 4 supports this statement. We have changed the word "systemic" to general and added further clarification to the paragraph: "*Salmonella* was found in shipments of many different types of spices, in a variety of forms (whole, cracked, ground or blended) and from many different countries. As a result, we conclude that the presence of *Salmonella* is a general problem in the spice supply system rather than a problem of a specific type/form of spice or source country.
	152	4256-57 and 4260-61	As previously mentioned, what are you basing this statement on and how do you define a systematic problem? Particularly when the presence/levels of filth in the data presented here did not exceed DALs nor was the prevalence greater than reported for other low moisture foods.	Modified text as described above.
	154	4328, 4329	There is a comma missing between the authors and year in these publication citations.	Comma added.
	155	4373	There is a period "." missing from the end of the sentence ending in the word "systems."	Period added.
	155	4382	There is a comma missing between the authors and year in the publication citation.	Comma added.
	156	4417	There is a comma missing between the authors and year in the publication citation.	Comma added.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	163	Section 10.2.4.2	There should be some reference, possibly in this section or another section, to the selection and validation of appropriate surrogates when it is not feasible or practical to use pathogens for product/process validation. In addition, there is a need for standardized protocols to assist companies (large and small) in the validation of critical process operations and mitigation strategies necessary for the control of foodborne pathogens for these ingredients.	We have added discussion here and in Chapter 8, Section 8.2.1.7, and included an appropriate reference. This need is addressed by the potential mitigation and control option "FDA develops guidance for industry on the criteria recommended for validation of spice pathogen reduction treatment processes" listed in Section 9.2.3.
	167	4855	There is a comma missing between the authors and year in the publication citation.	Comma added.
	199	6299	All of the other references have designated United States by U.S. with the exception of this one. Recommend changing to U.S. to be consistent.	U.S. in reference was changed to United States.
Reviewer #2			Although some proofreading comments have been provided here (extracted from PDF mark-up, which was provided in full to FDA), I would recommend the draft document be proofread to ensure any typographical errors are corrected.	We thank the reviewer for this feedback. We have reviewed and revised, as appropriate.
	2	3/24	Should be spelled "Management."	Spelling corrected.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	3	38	The Executive Summary is probably the most important part of the review document and should be able to be read separately from the main report. The Executive Summary would therefore be better presented with subsections (following the order of the report) allowing the effective communication of information, findings and conclusions.	We thank the reviewer for this suggestion. We have added subsections matching the outline of the report, as appropriate.
			Within the summary section, from paragraph 5 onwards, much of the findings are presented in narrative form, e.g., "a larger proportion," "smaller than," etc. It would be beneficial if data could be included as well to provide a clearer overview of the review findings.	As the reviewer notes, the Executive Summary is supposed to be an overview of information, findings and conclusions so we cannot reproduce the analysis presented in the body of the report. However, we have added specific data/results, where possible throughout this section.
	3	2/65	Undertaken on what? Include a short summary on these assignments and research.	Description of FDA field assignments and laboratory research appear in the sections reviewing and analyzing the data collected from the research. The methods section of the Executive Summary provides a general overview of the methods used to develop the report.
	3	3/69	Aflatoxins are toxic metabolites produced by certain fungi in/on foods and feeds and are not themselves microbiological organisms.	We have removed discussion of aflatoxins from the report because it is outside the scope of the risk profile.
	3	4/76	Delete "the."	"the" was deleted.
	4	1/103	U.S. is written out in full above and below in this paragraph. Consistency required in format/abbreviations in this section and throughout the document.	Text was reviewed and revised for consistency in use of format/abbreviations.
	5	1/146	CGMPS - provide in full at first mention.	We have defined the acronym at first mention.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	6	2/191	As this 10% was primarily post-process contamination, was there any accompanying data on facility design in these firms ie separation of areas to control/prevent spread of spice dust?	Detail information about facility design was not available from the inspection reports.
	6	2/193	Insert "in" between found and firms so it reads "...found in firms..."	The sentence was revised to read "found for firms" ("for" was better than "in" in this context).
	6	4/207	GAPS - provide in full at first mention.	Good Agricultural Practices is spelled out when first mentioned.
	8	243	Table of Contents, List of Tables and List of Figures require proofreading to ensure formatting errors are corrected, e.g., "1.1 Risk Profile objectives and Scope" should be "Risk Profile Objectives and Scope."	Table of Contents, List of Tables and List of Figures were reviewed and revised to agree with headings in the body of the report.
			A list of Abbreviations and a Glossary of some terms would be of use particularly for International readership.	A list of abbreviations and glossary of some terms has been added.
	15	3/499	Identifying the most commonly occurring hazard/filth means the most frequently detected/reported is elucidated not the extent of the public health risk. I would recommend replacing "most commonly" with "most significant" or similar term. Also, to determine the extent of the public health risk posed from consumption of spices, you would also need exposure (food consumption) data.	The text accurately defines the risk profile objectives as determined by FDA risk managers.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	15	3/505	In to what? My assumption here is: "identify data gaps and research needs to reduce &/or prevent exposure to microbial hazards and filth in spice."	The text accurately defines the risk profile objectives as determined by FDA risk managers. The fourth risk management question further defines what the risk profile should include and clarifies that the research needs "related to prevention and reduction of contamination of spices with pathogens or filth."
	16	2/542	Does retail sale/use also cover use by/in food service/restaurants of different cuisines? If not, please include.	Yes.
	17	3/570-572	Provide the reason for the inclusion of outbreaks with only both epidemiological and microbiological evidence. There could be outbreaks reported/published with strong epidemiological or microbiological evidence, but not both.	A sentence explaining our reasoning has been added.
	17	4/577-578	The list of pathogens here listed as keywords used in the review differs to that in Chapter 3, which also includes *Clostridium* and others not listed here in the review of pathogens found in spices, i.e., the same keywords of pathogens should be used in both the reviews covered in Chapters 2 & 3.	We thank the reviewer for pointing this out. The descriptions of our searches and the searches themselves have been expanded to include the same pathogen key words.
	19	Table 2.1/622 (C4, R9)	Incomplete data here, i.e., this sentence is unfinished.	Table entry has been corrected.
	21	Table 2.2/631 (C5, R1)	Correct spelling of "kabob" to "kebab."	Spelling corrected.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	28	3/823	Please expand and describe the many challenges that arise in investigating these outbreaks, i.e., from patients/cases being unaware they have eaten such an ingredient to the complex traceback investigations to determine the root cause.	This section has been expanded.
	28	3/824	Replace "the" with "in" so it reads "...or in other..."	Wording revised as suggested.
	29	827	Although the category used is "herbs and spices," additional detail on the "spice" (name, dried, fresh, etc.) is also requested to be reported using the EFSA reporting tool.	The text has been modified accordingly. We note that the additional information made available to the public on outbreaks attributed to "herbs and spices" did not always distinguish whether the implicated food was fresh or dried.
	29	831	Can you indicate whether this attribution was by analytical or descriptive epidemiology and whether the epidemiological evidence strong or weak?	None of the outbreaks referred to in this sentence were included in our table because each lacked microbiological evidence. The references are provided for readers to review and judge for themselves the level of evidence implicating a spice ingredient.
	29	2/863	And also that large numbers of people may become affected in the outbreaks; a number reported had around 100 or more people reported with illness.	This observation has been added.
	31	2/921-922	This sentence should either be deleted or rephrased to accurately state which of the contaminants may produce toxin in the spice.	This sentence has been removed in connection with changes to this section (i.e., restricting discussion to microbial pathogens that have been found in spices).
	31	2/924	*Halobacterium halobium* – a spoilage organism rather than a pathogen – an extremely halophilic organism associated with poor hygiene practices of salted foods rather than spices.	*Halobacterium halobium* is listed by ASTA as a possible contaminant in spices. Since it is a spoilage organism, it will not be covered in this risk profile and mention of it has been removed.

III. SPECIFIC OBSERVATIONS

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	32	934	The text describes the scope as microbial pathogens yet Table 3.1 includes coliforms, enterobacteriaceae, etc., which are generally used as hygiene parameters. This section/chapter needs to clarified as to what is presented/included, i.e., pathogenic microorganisms in dried spices.	Table 3.1 is now limited to microbial pathogens.
	32	934	This part of the review appears to include information on dried and fresh herbs/spices instead of just dried spices, which is the scope for the risk profile. I have highlighted a couple of references in Table 3.1 that I recognize as fresh herbs. Please check the references & data provided here.	We have reviewed the references and removed those that pertain to fresh herbs (see below).
	32	Table 3.1/934 (C3, R1)	The reference Pezzoli 2008 covers fresh basil not dried basil.	We thank the reviewer for pointing this out. This reference has been removed.
	32	Table 3.1/934 (C3, R5)	The reference Little 2007 covers fresh herbs not dried spices.	We thank the reviewer for pointing this out. This reference has been removed.
	34	1/978-979	This statement indicates there may be unknown errors from data derived from these databases so is there any validation of data collected in these two databases by CDC and FDA respectively? (i.e. I would have thought so).	Yes. "All FDA data submitted to these databases, regardless of the lab in which the data was collected, were first reviewed by a supervisor for accuracy of analysis." This sentence was added for clarification.
	35	1001	Format "a" as superscript.	"a" formatted as superscript.
	42	3/1089	Delete "from."	"from" deleted.
	49	1182-1183	It is suggested that you rephrase: "because spice lots/shipments can be large" to "due to the inherent large size of spice lots/shipment."	This section was reworked in response to other comments and the sentence referred to by the reviewer was removed.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	63	1/1594-1195	This part of the sentence needs rephrasing.	This sentence has been removed.
	63	1/1604	Insert full stop at end of sentence.	Full stop (period) added to the end of the sentence.
	69	1/1670	Insert "of" so it reads "...number of processes..."	"of" inserted.
	73	1/1808	"FDA study" can be deleted from the text, as it is a repetition of the preceding information in this sentence.	"FDA study" removed.
	74	1/1861	Remove the full stop after pepper.	Full stop (period) removed after pepper.
	74	5/1887-1888	Descriptions provided in the EU RASFF Portal database do provide descriptions of the spice, i.e., can distinguish between whether dried or fresh spice. Are the 80% contaminated with *Salmonella* mentioned here from dried spices only?	As stated in the text, the category includes both dried and fresh herbs and spices. We were not able to obtain statistics for (dried) spices only.
	75	1908	Amend title to include the year 2010 as well, as the results presented below also provide data from the 2010 study.	The years were removed from the title of this subsection for consistency with other related sections.
	77	Table 4.13/1971 (C1, R7)	Format all highlighted in this table with Caps so as to be consistent with other entries.	Revised format in table, as suggested.
	77	Table 4.13/1971 (C1, R8)	Format all highlighted in this table with Caps so as to be consistent with other entries.	Revised format in table, as suggested.
	77	Table 4.13/1971 (C1, R9)	Format all highlighted in this table with Caps so as to be consistent with other entries.	Revised format in table, as suggested.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	77	Table 4.13/1971 (C1, R13)	Format all highlighted in this table with Caps so as to be consistent with other entries.	Revised format in table, as suggested.
	78	3/2002	Correct "my" to "may."	"my" changed to "may".
	80 80	2/2064 2068	Correct "comparing" to "compare." Delete ":"	"comparing" changed to "compare". Colon deleted.
	80	4/2075-2076	Delete this highlighted sentence, as it relates more to identification and classification of the organism in the laboratory and appears out of place here.	This sentence was deleted.
	80	5/2079	Found in both wild and farm animals, so add here, "...wild and farm animals..." or just say animals.	"Farm" has been removed.
	81	Figure 5.1/2114	Format degree symbol in all figure legends.	Degree symbol has been added to the figure legends, as appropriate.
	83	1/2134-2140	The increase of survival rate under lower temperatures & RH in these experiments (text highlighted) is most probably related to a slower metabolism of *Salmonella* living under disadvantageous conditions and probably should be mentioned here.	We thank the reviewer for the comment. We have added a short discussion to Section 5.1.3 on the mechanism(s) by which *Salmonella* is able to survive in desiccated environments.
	84	2163	Correct typo – change "dedicated" to "desiccated."	Typographical error corrected.
	84	1/2185	Delete "the."	"the" removed.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	85	2/2225	You're describing techniques of preservation here, i.e., the intrinsic characteristics of the food such as pH, water activity, etc., for its conservation (hurdle technology) and it would be clearer to say this here.	We have revised the description as suggested.
	87	Footnote b/2287	Correct "teh" to "the."	Typographical error corrected.
	89	1/2326	Rather than a long narrative of the three categories, present as bullet points or separate paragraphs so the information is more accessible.	The section has been broken up into shorter paragraphs, as suggested.
	90	Figure 6.1/2361	There is only one figure; correct "Figures" to "Figure."	"Figures" changed to "Figure".
	90	Figure 6.1/2361	Figure 6.1 is farm-to-finished product storage (as described in the figure legend), not farm-to-table.	We thank the reviewer pointing this out. The description of the figure has been revised and the overview section expanded to include the additional steps to "table".
	90	Figure 6.1/2361	Correction provided: change "...spices show…" to "...spices is shown..."	"is" has been added to the sentence.
	91	1/2384	Delete "are" so it reads "...roots can be..."	This sentence has been revised to improve clarity.
	92	1/2430	Correct "capsicum's" to "capsicum."	Typographical error corrected.
	92	3/2444	Include wild animals as well as farmed ones, as a potential transmission route for the introduction of *Salmonella* in to the spice production environment.	"farm" has been removed from "farm animals".
	92	5/2465	Group? Do you mean on the "ground," which makes better sense.	"group" replaced by "ground".

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(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	93	2466	Insert "growth" between mold and becomes so it reads "...mold growth becomes..."	"growth" added to the sentence, as suggested.
	93	2469	Move Table 6.1 to this section (currently sited at end of this chapter).	Table moved to section, as suggested.
	93	5/2504	Rephrase the end of this sentence; aflatoxins do not grow. Aflatoxins are toxic metabolites produced by certain molds.	The sentence has been rephrased.
	94	2/2527	There is no Table 6.2. There is a Figure 6.2, but this presents information for cinnamon only.	Reference to Table 6.2 has been removed.
	94	3/2533	LACF/AF – write out in full at first mention in document.	We have simplified the sentence by using the example of " "canning of low acid foods" instead of "e.g., LACF/AF foods".
	96	5/2598-2602	This sentence needs to be rephrased; it is badly worded. What is meant by adding spice to a cooking spice?	This sentence was revised to improve clarity.
	96	5/2602	Published in 2013, not 2012 as listed in the References section.	Publication year corrected in text.
	97	2612	As this Chapter provides an overview of the spice farm-to-table continuum, it would also be useful to include requirements, issues arising, and discussion on traceability of spices through this continuum. Full and timely information on traceability of a product is a pertinent issue that can often arise during outbreak investigations, food incidents, etc.	Chapter 6 is focused on describing the spice supply chain and potential sources for the introduction of pathogens and filth. Traceability is important is controlling the extent of illnesses in the event of an outbreak or contamination in the event of a discovery of contaminated spice and is addressed by several potential future mitigation and control options described in Chapter 9.
	99	1/2663	Plural – "pound" should be "pounds."	"pound" replaced with "pounds".

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	100	3/2692	Production of these dried spices is small, so is supply only localised/regional in the U.S., or can these be "nationally" distributed? How small is small?	Information on the magnitude of the domestic supply or geographic extent of marketing is not available to our knowledge (e.g., USDA does not currently report food availability for domestic production of these spices or the geographic extent of marketing of these spices). We know some companies market their products domestically, providing the possibility of national and international distribution.
	101	1/2708	Insert "for" between accounted and one so it reads "...accounted for one..."	"for" added to sentence, as suggested.
	101	Table 7.2/2725	Move title of Table 7.2 down to next page.	We have reviewed the final document to make sure that table and figure titles are located on the same page.
	105	2/2818	Insert "a" between of and wide so it reads "...of a wide..."	"a" added to sentence, as suggested.
	106	Table 7.4/2829	2010a - the "a" here should be superscript, as it's a reference to the table footnote.	"a" formatted as superscript.
	106, 107	2844	As part of this data gap, are any associations with types of cuisine and ineffective cooking of spices to kill *Salmonella*? For example, some cuisines may add spice near the end of cooking so do not receive the "full cook/heat treatment," while others will use the spice as a garnish on cold food/meal after cooking.	We thank the reviewer for these comments. These questions are captured in the research needs, Section 10.2.5.
			This also highlights that "heat treatment" by the final consumer is not a reliable method of ensuring that *Salmonella* in spices is destroyed. An effective kill step (an appropriate treatment) for *Salmonella* in spice should be before it reaches the final consumer.	We thank the reviewer for these comments. These issues are addressed in the research needs, Section 10.2.5.

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(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	108	6/2882	Insert comma after (CGMP).	Sentence has been revised.
	115	Table 8.4/3093	Format "a" in superscript.	Table title has been revised.
	115	Table 8.4 (C2, R1)	Resize column.	The table has been revised.
	119	Table 8.6/3201	Format "a" in superscript – currently reads "countriesa."	"a" formatted as superscript.
	122	2/3346-3349	Is this a Recommendation? This point on amending/adding to the Food Code should also be included in Chapter 9 General Conclusions & Potential Future Mitigation and Control Options.	This section was revised and the sentence to which the reviewer refers is no longer included.
	123	4/3394	Although small firms are exempt, will they be required to have at least a food safety management system in place?	At the time of this writing, the prevention standards are contained in a proposed rule. If finalized, the rule will describe the extent of requirements.
	125	3452-3456	35 proposals are listed here, not 36. Dill seeds are missing from the text (listed in Table 8.7).	We changed text to include dill seeds and to include the reconditioning proposal association with Sal/filth (sesame seeds). We deleted "only". There were 37 *Salmonella*-related recalls.
	141	1/3819	Provide a reference for USP and information cited.	Reference provided.
	141	1/3837	Provide a reference for USP and information cited.	Reference provided.
	146	2/4018	Insert "by" so it reads "..., by approximately..."	"by" was inserted.
	152	3/4251	Insert "that" between United States and include so it reads "...United states that includes..."	"that" added to sentence.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	153	2/4291	Maintaining these control measures is important after implementation. Insert "and maintain" after implement so it reads "...implement and maintain them..."	We thank the reviewer for this comment. We have added "and maintain" to the sentence.
	153	3/4299	The use of "may" is somewhat passive/hesitant, I recommend replacing it with "should," as this is understood more as a recommendation than a legal necessity.	The list of potential future risk management options is provided to risk managers to use as they see fit. The list includes options associated with different stages of the spice supply chain and consequently, not every option will be relevant to every risk management group.
	155	2/4373	Insert full stop after "food safety systems."	Full stop (period) added, as suggested.
	155	2/4373	Delete "a."	"a" removed.
	155	2/4374	Add an apostrophe to countries.	Apostrophe added to countries.
	155	3/4389	Replace "or" with "of."	"or" replaced by "of".
	156	2/4423-4424	This would also be useful in relation to controlling the spread of spice dust and microbial contaminants in the processing environment	Yes, that is one of the goals of the hygienic design principles for facilities that process low-moisture foods.
	157	2/4478-4479	One of the difficulties in interviewing patients is that they are often unaware that they have eaten particular ingredients, such as spices, which make up a small constituent of a dish/meal. Developing tools should also consider other novel approaches used in recent outbreaks, e.g., data on purchasing foods from retail loyalty cards (if available) and photo/menu cards of dishes consumed at restaurants (potentially identifying a common source ingredient used in different multiple dishes (used in one of the cohort studies of the O104 investigation).	We thank the reviewer for these suggestions, which have been added to the document.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	158	3/4527-4529	Clarify whether this offers open access to stakeholders and other government agencies outside the U.S. As spice is a global food commodity, there is potential for international outbreaks/illnesses to occur (e.g., sesame seeds/tahini outbreak that affected patients in Australia, Canada and European countries) and sharing of such databases to allow timely identification and investigation is important.	The data deposited in the SRA will be available for public download without geographic and/or political restrictions. The SRA is part of the international partnership of archives (INDSC) at NIH/NCBI, the European Bioinformatics Institute, and the DNA Database of Japan. Data submitted to any of these 3 sites will be shared among them. We have added this information to the text.
	159	1/4542-4544	Is this labelling requirement to be carried out at all parts of the "spice chain," including if it is repacked a number of times? This labelling requirement should be accompanied by documentation by the processor, distributor, retailer/food service detailing from whom they have received the spice and to whom they have supplied it. For example, at food service, the spice could be decanted in to another container with the original packaging/labelling lost.	This is a potential risk mitigation and control option. If FDA risk managers choose to pursue this option, it will be developed into a proposed rule or guidance with full details.
	160	4594	This is an unfinished sentence; text is missing here.	The sentence fragment was removed.
	162	2/4657-4658	And any relationship to the type of cuisine in the way spice is used in cooking.	This research need is addressed in the section on consumption, Section 10.2.5
	162	3/4664	Correct spelling to "pathogens," include aflatoxins here (molds listed under research needs).	Spelling corrected. Aflatoxins are outside the scope of the report.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	163	5/4722	Include here spices that are added near to the end of cooking so they do not receive "proper cooking" (potentially allowing *Salmonella*, *Bacillus* and other pathogens to survive), as well as those spices added to the dish after cooking.	These ideas have been included in the research needs section related to consumption, Section 10.2.5.
	166	1/4806	The public health risk posed by molds in spices relates to their toxicological safety (aflatoxins). A rapid method for detection of molds (and is this for certain molds only capable of producing aflatoxins?) is advocated here, but there is no mention of aflatoxin testing/methods. The presence of aflatoxins when exceeding certain levels can provide serious risks for consumers' health.	The presence of mold is an indicator of insanitation or improper handling/storage and is considered a sign of decomposition which can result in a food being deemed to be adulterated under section 402(a)(3) of the Federal Food, Drug and Cosmetic Act. Aflatoxins are outside the scope of the risk profile.
	166	6/4837	And their type of use in food preparation.	"type of use" has been added to the sentence.
	167	1/4851-4855	Expand this point; the phrases "risk from spices" and "risk from consumption" are used, but the "risk" is not described (e.g., illness). Also what is meant by "risk"? Risk can be mean different things to different people.	This section has been expanded and clarified.
Reviewer #3	3	3/69	In addition to aflatoxins, other mycotoxins (e.g., ochratoxin, fumonisins) should also be considered.	Aflatoxins and other mycotoxins are outside the scope of the risk profile so mention of them has been removed.
	4	2/95	It is generally understood that prevalence values are reported as percentages. However, not all readers of the final document will know this. I suggest that prevalence values be presented as percentages (e.g., 0.066%) throughout the Risk Profile.	The prevalence values in the document reviewed by the external reviewers reported prevalence as a fraction (e.g., number of shipments testing positive for *Salmonella* divided by the number of shipments examined, such as 1/100 = 0.01). Because of the confusion by this reviewer and others on this point, all prevalence values have been converted to percentage values.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	6	2/183	Change to "but data suggest that…"	Sentence changed as suggested.
	19 - 24	Tables 2.1, 2.2	What other information of interest might be available for listing in Tables 2.1 and 2.2? The time and temperature at which processed spices were held preceding outbreaks and estimates of the numbers (MPN or CFU/g) of *Salmonella* (or *Bacillus* species) present in spices implicated in the outbreaks should be included in these tables, if available.	Levels of *Salmonella* found in contaminated spices is described in Chapter 4 and presented in Table 4.2. Information about time and temperature of processing was generally not available from the reports on these outbreaks.
	28	3/805	Delete "bacteria."	Replaced "bacteria" with "cells".
	29	2/838 - 858	I suggest that the large outbreak of *E. coli* O157:H7 infections associated with radish sprouts in Japan also be cited.	Radish seeds are not used as spices so we think it best not to include reference to this particular outbreak.
	31	1/907	See comment above concerning other mycotoxins.	Mycotoxins are outside the scope of the risk profile.
	31	2/919	Change to "diversity of microorganisms has…"	Sentence changed as suggested.
	39	1/1023	The statement that Pharaoh ants carry *L. monocytogenes* needs a cited reference.	A reference has been added.
	40	Table 3.4	Can the spices found positive for insects, hair and "other" be listed in this table? There might be some value in potential correlations between specific types of filth and spice type.	It is not practical to list each spice and the adulterants found in it. We provide prevalence by spice in Chapter 4.
	43	1/1108 - 1113	This sentence is a bit awkward, e.g., "*Salmonella*, shipment contamination for spice shipments." I suggest some rewording.	The sentence has been revised.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	44 - 47	Table 4.1	I suggest entering "(%)" under "Prevalence" heading.	Prevalence was unitless in the original draft (i.e., fraction). In the revised text we have converted all numbers to percentage.
	49	1/1180 - 1181	Change to "dose of 1 *Salmonella* (MPN)."	This section has been revised.
	53	3/1368 - 1369	Change to "compared to those for spices."	Revised as suggested.
	53 - 54	3, 1/1369-1373	The reason for grouping rather than listing treatments separately in Table 4.3 is not evident. Rationale for this decision should be stated.	We have added the reason to the text. More detailed analysis of these data was precluded because some of these classifications do not differentiate among treatment types and the total number of shipments in this group was small.
	54	3/1384 - 1395	Any hypothesis for these observations?	The text suggests several possible hypotheses.
	55	3/1441 - 1454	Any hypothesis for these observations?	There is insufficient data to propose a hypothesis.
	60	1/1497	Change to "Table 4.6 establishes that."	No change made. The grammar was correct as written ("The data…establish that").
	60	1/1497 - 1503	Is serotype frequency correlated with country of origin of *Salmonella*-positive spices?	The data are insufficient in quantity to test this hypothesis.
	61	2/1560-1572	Include percent positive as well as number positive/number tested for various entries.	Serotype and antimicrobial resistance information was not determined for 7 of the contaminated shipments so the statistics the reviewer requests cannot be calculated.
	61	2/1565 - 1566	Change to "None of the isolates was resistant."	Text changed as suggested.
	69	2/1675 - 1676	Change to "facilities provided by the American Spice."	The sentence was revised.
	70	3/1743	Change to "prevalence result from..."	No change required-text already reads as suggested.
	70	3/1745	Change to "data reflect…"	Text changed as suggested.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	72	1/1771	Change to "Table 4.11 provides insights..."	No change made. The grammar was correct as written ("The data…establish that").
	72	1/1785 - 1788	What is the difference between "(1)" and "(2)"? Maybe reason #2 would cover both.	We thank the reviewer for this suggestion and have incorporated it into the text.
	73	2/1807 - 1813	This sentence is awkward. Some rewording is suggested.	We have revised the sentence.
	74	4/1872	It is not necessary to include the name of the company.	We agree and have removed the name of the company from the text.
	75	3/1910 - 1914	Can data on capsicum and sesame seeds be extended to other spices? I suggest that conclusions drawn from observations on these two spices do not necessarily apply to other spices.	The data on filth in shipments of imported capsicum or sesame seed offered for entry to the United States and examined during the 2010 study are only compared to the data for shipments of imported capsicum or sesame seed offered for entry during the period FY2007-FY2009.
	76	1/1934	Change to "Our data indicate…"	Sentence corrected as suggested.
	78	3/2002	"roaches my harbor"?	Typographical error has been corrected.
	78	5/2020	Change to "comparing the microbiota recovered."	Microflora is the term most used by microbiologists. Further, since Wikipedia defines microbiota as "monotypic genus of evergreen….", we believe the suggested change could cause confusion to some readers.
	80 - 89	Chap. 5	Some discussion concerning antimicrobial compounds present in essential oils of spices would strengthen Chapter 5. A table listing spices, pathogen, and anti-pathogen activity could be developed.	We thank the reviewer for the suggestion. We have added a section to Chapter 5 (Section 5.1.2) discussing antimicrobial properties of some spices.
	80	2/2064	Change to "conclusions and compare our results."	Sentence changed as suggested.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	81 - 84	2104 - 2167	Some discussion on persistence of *Salmonella* and other pathogens in spice and low-moisture food processing plants would be appropriate for including in Section 5.1.2.	Some information on persistence is provided in the document. An additional introductory sentence was inserted in 5.2.1 to address persistence.
	84	1/2158	Change Salmonellae enterica to *Salmonella enterica*.	Sentence was revised as suggested by the reviewer.
	84	2/2182	Consider changing to "in which it is transported or stored is not."	We have revised the sentence.
	84	3/2197	I have a problem with presenting water activity at values of ± 0.0001. Exposure of food samples to air with RH not in equilibrium with the samples can result in increase or decrease of more than 0.0001 very quickly (before measurements are recorded). I suggest rounding values off to ± 0.001 or, better yet, ± 0.01.	We have rounded water activity values.
	85	Fig. 5.5	Round off water activity values.	We have rounded water activity values.
	87	2/2263 - 2265	A brief statement on susceptibility of consumers with different levels of immunodefense is suggested.	The text already discusses studies of the dose-response relationship and whether it supports differences for different (susceptible) groups.
	90	2/2371	Change to "plants that have been domesticated..."	We have revised the sentence to read: "Spices are a large, diverse group of plants, some of which have been domesticated... "
	92	3/2436 - 2441	The use (or not) of metal detectors should be mentioned.	Text has been added describing the use of metal detectors.
	92	4/2450	Table 6.1 should appear on page 93, not 97.	Table 6.1 has been moved, as suggested.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	93	5/2494	Instead of "enormous," some dimensions, volumes, or weights would be more informative.	We have revised the sentence.
	94	1/2513	I suggest changing to "maintained, cleaned or sanitized, and spice packaging…"	Sentence revised as suggested.
	94	3/2527	Table 6.2 does not appear in the draft provided to me.	We have fixed the typographical error.
	96	3/2573 - 2577	An example(s) of an ideal facility design would strengthen the document.	The text identifies industry guidance on design principles important for facilities processing low moisture foods.
	98	Table 7.1	The U.S. production of sesame seeds is shown as > 22 million pounds, dry weight. Can a more precise value be given? > 22 is not very meaningful.	The American Sesame Seed Growers Association reported "over 11,000 tons". We have noted the exact quote in the footnote of the table for clarification.
	112	2/3010 - 3022	Citing these reports may be of some value when emphasizing the importance of cleaning and sanitizing spice (and other low-moisture food) processing plants.	We have summarized findings from the inspections of domestic spice firms in Table 8.3.
	114	4/3081 - 3091	Do these observations apply to spices other than capsicum and sesame seeds?	We have revised the discussion to clearly identify results/conclusions associated with capsicum or sesame seeds.
	117	3/3144	I suggest changing to "were refused entry because of *Salmonella* contamination and 238…"	We have revised the sentence for as "were refused entry because of the presence or potential presence of *Salmonella* and 238…"
	118	5/3178	Instead of "current," give the range of dates.	A date has been added and "current" has been reviewed.
	118	Table 8.5	State the time frame (October 2010 to July 2011) for Alerts shown in Table 8.5 (footnote "a"). Also, footnote "b" in the title should be a superscript.	All of the Import Alerts in Table 8.5 are currently active. We have added a column that indicates the year the import alert was initiated.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	120	2/3253	Instead of "every," state the number of shipments.	The number of shipments has been added.
	120	2/3256	Instead of "all," state the number of shipments.	The number of shipments has been added.
	122	2/3329 - 3330	Give the website for the proposed rule.	Reference and link to the website containing the proposed rule has been added.
	124	4/3423	The use of "Salmonellae" is not acceptable. Use *Salmonella* for single serotype and salmonellae or Salmonellae (both plural, not italicized) to refer to more than one serotype. Corrections need to be made through Chapter 8.	The text has been revised.
	127	1/3403	Change "*Microflora*" to "*Microbiota*" and "The microflora of to "The microbiota of…"	Microflora is the appropriate term. See response above.
	127	4/3489	Tables 8.8, 8.9 and 8.10 should immediately follow page 127 rather than appearing on pages 131 - 133, 137 - 140 and 143, respectively.	It is more appropriate to have the tables with their respective sections. To address this comment, the sentence in section 8.2.1.2 (formerly on page 127 as stated by the reviewer) was revised from "Information below in text and in Tables 8.8, 8.9 and 8.10…" to "Information below in text and related tables…"
	129	3/3557	Change to "spice microbiota to steam."	Microflora is the appropriate term. See response above.
	130	3/3616	Change to "native microbiota of…"	Microflora is the appropriate term. See response above.
	1131 - 133	Table 8.8	I wonder if the "Log reduction" column should be the second to last column in the table.	The column arranged was changed, as suggested by the reviewer.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	133	Table 8.8	Data from microwave studies are not mentioned in the text. A general statement concerning the relative effectiveness of microwave treatment would be appropriate.	The sentence "Microbial reductions from dry heat and microwave treatments ranged from 1.3 to 3.9 log cycles and 0.1 to 3.7 log cycles, respectively" was added.
	141	3/3841	Were the relative humidity and EO concentration used in this study measured? If so, it would be useful information to include here.	This was not a research study, but was a general chapter on various technologies used to treat spices. No humidity or gas concentration was provided in the reference.
	142	5, 6/3878 - 3887	The Gilbert et al. (1964) report (lines 3820 - 3821) and the Farkas and Adrassy (1984) report (lines 3878 - 3880) appear to disagree with the Michael and Stumbo (1970) report (lines 3882 - 3887). Some discussion concerning these observations would be appropriate.	We had added text to discuss the differences in these studies and note that the reasons for the disagreement are unknown.
	144	1/3907	Change to "spice microbiota with..."	Microflora is the appropriate term. See response above.
	146	5/4042	Change to "on microbiota of..."	Microflora is the appropriate term. See response above.
	147	2/4047 - 4048	Change to "native microbiota of…"	Microflora is the appropriate term. See response above.
	147	2/4054 - 4055	I assume these D values are minutes. The time should be inserted.	The proper unit is kGy.
	151	1/4179	Change to "Documented human illness"	Sentence revised as suggested.
	151	1/4188 - 4192	Could differences also be due in part to different dietary, food preparation, and food storage practices in the U.S. versus the EU?	We have added these possible reasons for observed differences to the discussion.
	153	2/4283	Should domestic animals also be included? Dog, cat, cow, and sheep hair are listed in Table 4.13.	We agree. "wild animals" has been changed to "animals".

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	154	3/4337 - 4338	Give websites for "tools" developed by Cornell University and DOD.	We have added references. We replaced reference to the DOD graphics tools with the more relevant WHO "Five keys to growing safer fruits and vegetables: promoting health by decreasing microbial contamination" educational tools.
	156	2/4415 - 4417	April 2013 will be history by the time the Risk Profile is released. This sentence needs to be deleted or revised.	Sentence has been revised.
	158	2/4505	Change to "strains identical to…"	Sentence revised as suggested.
	159	1/4544	Change to "Once developed, such…"	Typographical error corrected.
	159	2/4550	Change to "a product that has been recalled."	Sentence revised as suggested.
	159	3/4556 - 4560	I wonder if a priority list of pathogens would be appropriate here?	More research would be needed to rank order other possible pathogens but we highlight a few pathogens other than *Salmonella* for which there is some evidence that illness from consumption of spice has been documented.
	160	2/4603 - 4604	Webinars would also serve as a communication avenue.	We thank the reviewer for the suggestion. We have added webinar to the text.
	162	3/4664	Change to "other pathogens in…"	Sentence revised as suggested.
	162	3/4673	Should this be "shipments of spice"?	Sentence revised as suggested.
	165	3, 4, 5/4776-4787	Some mention should be made concerning research on pathogens other than *Salmonella*.	Research on other pathogens was addressed in this section.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	166	3/4816 - 4820	It should not be assumed that current detection/enumeration methodology for *Salmonella* or other pathogens in spices (or other low-moisture foods) has been optimized. The influence of desiccation-injury and the presence of spice antimicrobials in spices on recovery of pathogens, for example, are not well understood. Some verbiage recommending improvement of culture methodology for detecting/enumerating *Salmonella* and other pathogens in spices is encouraged.	We have expanded the research need description to include optimization of detection and enumeration methods.
	167	1/4851 - 4855	Ideally, risk assessments for specific spices or groups of spices rather than spices as an entire group, will be developed.	The risk assessment would have to address differences among spices or groups of spices. We have added this comment to the text.
	1168 - 205	Ref./4859 - 6545	The format used for references is not consistent (e.g., issue numbers are included in some references but not others, improper abbreviation of journal titles, lack of some website accession dates, genera and species not italicized).	We have edited the report, including the references.
	206 - 232	Appendices/6547 - 6704	I commend the authors for assembling these tables. This information will be very useful to readers.	We thank the reviewer for the comment.
Reviewer #4	3	1/45	The authors should add a note justifying why pesticides and heavy metals and mycotoxins other than aflatoxin are not included in the profile.	The scope of the risk profile was determined by the risk managers.
	3	3/67	The term "microorganism related concerns" should be used instead of "microbial organisms," as aflatoxin is a mold metabolite not a microbe.	Aflatoxin has been removed. The phrase "microbial organisms" has been retained.
	3	3/68	See comment above, "Microbiological organisms".	See response above.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	3	3/70	It is unclear why yeasts are included.	Discussion of yeasts has been eliminated because it is outside the scope of the risk profile.
	4	1/109	Delete the word "small." In regard to *Salmonella*, there would be differing perspectives on this word.	The word "small" has been removed.
	4	1/109	The term small is not appropriate at this level as <0.1 MPN/g would be the same at 100 MPN/1000g which could be considered high in comparison to the median level associated with some outbreaks.	See comment and response above.
	5	129	Is this the median level?	No. As stated, these are the values or range of values reported for retail spice samples.
	5	1/147	The C should be lower case as if it meant to represent the word "current" which can change with time. This change could be made throughout the document.	No change. FDA uses "CGMP".
	5	1/148	A reference to the existing defect action level for spices should be provided.	References are not included in the Executive Summary but are provided in the body of the report.
	5	2/157	"Population reduction" or "Death rates" should be used. "Decay rates" suggests a chemical rather than a population of living organisms.	"Decay rate" changed to "population reduction rate".
	5	2/160	See comment above for "decay" rates.	"decay" replaced with "reduction in population".
	6	2/192	See comment above for CGMPs	No change. FDA uses "CGMP".
	6	2/193	Insert the word "for" between "that found" and "firms."	"for" added.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	6	2/194	See comment above for CGMPs.	No change. FDA uses "CGMP".
	6	3/205	"can be small"	"is small" replaced with "can be small".
	6	4/207	See comment above for CGMPs.	No change. FDA uses "CGMP".
	6	4/207	See comment above for CGMPs	No change. FDA uses "CGMP".
	17	5/588	2.1 and 2.2	1-2 replaced with 2.1 and 2.2
	19	Table 2.1/623	Is this the number of outbreaks, e.g., 3 of 15 referenced to in the text?	The table title has been revised to address this question.
	19	Table 2.1, (C5, R5)	Should this be 69?	No.
	20	Table 2.1, (C2, R10)	Should this be USFDA?	Typographical error corrected.
	21	Table 2.2/632	Is this the number of outbreaks?	The table title has been revised to address this question.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	21	Table 2.2, C4, R11	The paper references seven specific serovars and then refers the author to a paper submitted that documents 94 serovars, many of which apparently have no H-antigen (non-motile). This would call the identity of such strains into question, since *Salmonella* is defined serologically by both O and H antigens. It seems to me that the authors should stick to what was reported by the Lehmacher report only. The paper documenting 94 serovars (Aleksic, et al.) was not referenced in the present FDA document. The authors should cite the Aleksic paper, if it was published. If it was not published, they should consider not stating 94 serovars as this may be speculative. If they are confident that 94 serovars of *Salmonella* were found then then they should indicate that they are citing "Aleksic, et al, unpublished data" and indicate Aleksic's affiliation and location and year.	Text and table have been modified as suggested.
	26	1/708	See comment above for CGMPs	No change. FDA uses "CGMP".
	31	1/906	*Cronobacter* spp. are also known as *Enterobacter sakazakii*. Was *E. sakazakii* included in the search terms? I suspect from the references that it was, but should be so stated herein.	*"sakazakii"* was included in the search terms. We have added this to the description.
	31	2/921	I am not aware of recognized toxins from yeast.	Yeasts have been removed.
	32	Footnote 3/931	This is an incomplete sentence. I think the authors mean dried bay leaves.	"bay leaves" has been added to "dried".

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	32	Table 2.2 (C1, R5)	The Ahene et al., article refers to *Enterobacter sakazakii*. All *E. sakazakii* are in the genus *Cronobacter*. However, all *Cronobacter* are not *C. sakazakii*. Hence, the authors should consider calling this *Cronobacter* spp.	The category has been renamed as "*Cronobacter* spp."
	33	1/955	As an internal communication, it is unclear how this adds to the paper.	All cited references are either publicly available or available from FDA upon request (e.g., the few "Personal communications" from individual scientists providing additional information about a study or event).
	54	2/1406	Risk compared to what? A discussion or reference or risk scale should be provided to the reader of the document.	A definition of relative risk is provided in a footnote to the text.
	56	2/1482	Change the word "in" to be "to."	The sentence was reworded for clarity.
	65	Footnote b/1626	Do the authors mean 100g instead of 375 per 100g, wherein each of three MPN enrichments was at the 100, 10, 1 and 0.1g level? This should be clarified.	No. A screening test examining 375 of spice was followed by a 4-level 3-tube MPN examining 100g, 10g, 1g, and 0.1 g. We have enhanced description of notation in the Table footnote for clarification.
	69	1/1675	"by data provided" can be deleted.	Sentence has been revised.
	72	1/1786	Either	"either" added.
	72	1/1787	and thus	This section has been reworded.
	73	1/1808	A word or punctuation mark, or both, is missing here.	The sentence has been revised.
	76	1/1939	Insert space.	Space inserted.
	77	1/1963	The author should show how the 38% was determined from the table provided.	Method of calculation clarified in the text.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	77	1/1966	See comment above for CGMPs	No change. FDA uses "CGMP".
	77	Table 4.13/1972	The authors should show what percentage of the rodent hair did not have a hair root in the table below.	That data is not available from the FDA FACTS database.
	78	2/1992	This document does not contain Table 3.6. Chapter 3 has tables 3.1-3.5.	We have fixed the typographical error.
	78	2/1993	A reference to the relevant defect action level should be provided in the text.	This reference is provided several places earlier in the text.
	78	2/1993	Defect Action Level Handbook http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/SanitationTransportation/ucm056174.htm	This reference is provided several places earlier in the text.
	83	1/2134	The phase "decay rates" is not appropriate for microbial reduction. "Population reduction rates" would be a better choice of words.	"Population reduction rate" has replaced "decay rate" throughout the document.
	83	1/2138	Replace "decay rates" with "population reduction."	"Population reduction rate" has replaced "decay rate" throughout the document.
	83	1/2142	Replace "decay rates" with "population reduction."	"Population reduction rate" has replaced "decay rate" throughout the document.
	84	2161	"Groepfert" should be Goepfert.	Typographical error corrected.
	85	2/2222	Is that an appropriate reference that can be readily accessed by a reviewer?	Yes. It is a publicly available database available on the web. The reference section provides a link.
	86	1/2238	"…stablished…" is highlighted. Did the model prove that or "support the perspective"?	The reviewer is correct. The model supports the perspective. We have revised this section.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	87	2/2269-2270	Typically. This reference is very general. However an onset time of 6 - 72 h with some illnesses lasting 10-14 days is reported by Hanes, 2003 (reporting on Guthrie, 1992). The reference is Hanes, D. 2003. Nontyphoid Salmonella, Chapter 9. In, M. D. Miliotis and J. W. Bier (Eds.) International Handbook of Foodborne Pathogens. Marcel Dekker, Inc., New York, Pp. 137-149.	We have added "typically" and the Hanes, 2003 reference the reviewer points out.
			Another reference that could be considered is: CDC. 2004. Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians and Other Health Care Professionals. MMWR, April 16, 2004 / 53(RR04); 1-33 (However, they have the typical onset between 1-3 days).	We prefer to cite the most recent CDC reference on *Salmonella* and so have not referenced the 2004 document the reviewer suggests.
	88	1/2309	Is this all believed to be cause and effect? The authors should clarify this. One approach may be to show how this rate differs from the background level of RA in the US population.	Reactive arthritis is considered a sequela of salmonellosis.
	88	1/2310	The math does not seem correct. 1.4/100,000 would translate to 0.0014%, a value much lower than 0.4%. Or perhaps the authors mean that the rate is 0.0004% when adjusted for the background rate of RA not caused by *Salmonella*? This should be clarified.	This section has been revised and the numbers to which the reviewer refers no longer appear.
	89	2/2346	See comment above for CGMPs	No change. FDA uses "CGMP".
	93	5/2504	Why were not mycotoxins included in the risk assessment?	The scope of the risk assessment was determined by the risk managers.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	96	1/2563	See comment above for CGMPs	No change. FDA uses "CGMP".
	96	2/2571	The authors may wish to cite one or more of the June, July and August Food Protection Trends articles by Jeong, et al and Scott, et al which document the dangers associated with water in dry food production facilities, as well as the contamination risk from equipment that is not designed adequately to be wet cleaned. Scott, V, N., Y. Chen, T. A. Freier, J. Kuehm, M. Moorman, J. Meyer, T. Morille-Hinds, L.Post, L. Smoot, S. Hood, J. Shebuski, J. Banks. 2009a. Control of *Salmonella* in low-moisture foods I: Minimizing entry of *Salmonella* into a processing facility. Food Prot. Trends, June 2009. P. 342-354. Y. Chen, Scott, V, N.,T. A. Freier, J. Kuehm, M. Moorman, J. Meyer, T. Morille-Hinds, L. Post, L. Smoot, S. Hood, J. Shebuski, J. Banks. 2009b. Control of *Salmonella* in low-moisture foods II: Hygiene practices to minimize *Salmonella*contamination and growth. Food Prot. Trends, July 2009. P. 435-445. Chen, Y., Scott, V, N., T. A. Freier, J. Kuehm, M. Moorman, J. Meyer, T. Morille-Hinds, L. Post, L. Smoot, S. Hood, J.Shebuski, J. Banks. 2009c. Control of *Salmonella* in low-moisture foods III: Process validation and environmental monitoring. Food Prot. Trends, August, 2009. P. 493-.508.	We have added the three references listed below to the discussion of industry guidance on preventive controls. Additional references added to the text provide evidence of the concerns noted by the reviewer. We were not able to locate/identify a reference with lead author Jeong in *Food Protection Trends*.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	96	3/2577	Other risk conditions in spice processing facilities may include the use of common lines to process a variety of spices without an adequate microbicidal break. This can result in illness and recalls for not only the contaminated spice by also other spices which have been processed on the same production line and thus cross contaminated.	We have added this concern to the section describing potential sources of contamination.
			Unhygienic equipment design that entraps moisture will lead to increased risks and the inability to adequately sanitize a processing line.	We have added this concern to the section describing potential sources of contamination.
	97	Table 6.1 (C2, R8)	I think the risk associated with cross contamination and the practice of using common lines and the reports documents in this report suggest that this risk level is likely to be closer to "medium."	The categorical assignment for relative risk of contamination of spice by filth for the final spice product is supported by the observation that stored product pests were among the most prevalent types of filth found in shipments of imported spice offered for import to the United States during FY2007-FY2009 (Section 4.2.3).
	104	2/2784	Is this referring to the "rate of increase"?	Yes. We have revised the sentence.
	104	2/2785	Increase	We have revised the sentence, as suggested.
	108	6/2879	See earlier comments. The "c" should be lower case.	No change. FDA uses "CGMP".
	108	6/2882	See comment above for CGMPs	No change. FDA uses "CGMP".
	108	6/2883	See comment above for CGMPs	No change. FDA uses "CGMP".
	108	6/2886	http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=110	Citation checked and was found to be correct.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	109	2/2899	See comment above for CGMPs	No change. FDA uses "CGMP".
	109	2/2906	See comment above for CGMPs	No change. FDA uses "CGMP".
	109	2/2907	See comment above for CGMPs	No change. FDA uses "CGMP".
	109	2/2912	See comment above for CGMPs	No change. FDA uses "CGMP".
	110	2/2935	See comment above for CGMPs	No change. FDA uses "CGMP".
	110	2/2956	See comment above for CGMPs	No change. FDA uses "CGMP".
	112	1/3017	I think the author may mean serotyping or other forms of species subtyping as there are only 2 species of *Salmonella* (e.g., *enterica* and *bongori*)?	We have revised the sentence, as suggested.
	112	2/3024	See comment above for CGMPs	No change. FDA uses "CGMP".
	112	2/3025	"CGMP" is highlighted.	No change. FDA uses "CGMP".
	112	2/3027	See comment above for CGMPs	No change. FDA uses "CGMP".
	112	2/3034	See comment above for CGMPs	No change. FDA uses "CGMP".
	112	2/3045	Are these sampling programs or *Salmonella* sampling and testing programs?	*Salmonella* sampling and testing programs. We have revised the text accordingly.
	113	Table 8.3/3054	How many of each type of citation were made?	We have added the range of number of firms receiving each citation to the text which also summarizes the citation statistics by category.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	113	Table 8.3 (C2, R2)	Can the authors define what is meant by the number in this category?	The citation number is an FDA number for the specific observation described in the corresponding long description. Several different observations may be associated with the same section of the CFR, so the CFR reference is not sufficient to identify the observation. This information has been added to the table.
	114	4/3085	The word, "incidence" instead of "level" should be used.	No. We meant level (e.g., MPN) here rather than incidence or prevalence.
	117	1/3120	This information is repeated earlier in the text.	This section was significantly revised and the information that was repetitive was removed.
	117	2/3124	The authors should provide this reference for DALs in the text.	Reference to the Food Defect Action Levels (DALS) is provided in the text.
	118	3151	Given the low level of testing that occurs, what is the anticipated exposure of the US population to filth or *Salmonella*?	Estimates of exposure require knowledge of the prevalence and level of Salmonella and filth at the point of consumption. These data are missing.
	119	Table 8.6/3201	The "a" should be a superscript.	"a" has been changed to a superscript.
	120	3,1/3225	Does this testing approach bar retesting of previously *Salmonella* positive products, as it should?	Once a food has tested positive for *Salmonella* it is adulterated.
	123	2/3383	The link does not get one to the law. It must have been moved. However, one can get there at: http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm247548.htm	We thank the reviewer for pointing this out. We have checked and revised all links, as necessary. (Note the FDA website addresses were changed during the period of this review).

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	124	4/3440	Given findings that treated spices have been shown to be contaminated post-treatment, what is the present status of validation of ETO and PPO?	ETO and PPO are used for spice treatments. Care is needed in handling to prevent cross contamination. It was difficult to find text for revision; however "and post treatment cross contamination" was added in section 9.1. The sentence now reads that FSMA provides tools "to mitigate and control contamination and post treatment cross contamination of spices with *Salmonella*…"
	125	Table 8.7 (C5, R10)	What is this?	"Cold treatment" was apparently used to address filth in chili pepper flakes. I asked Rose Gary for additional information.
	127	4/3491	The phrase "widespread utilization" not "ubiquitous" should be used.	We have revised the sentence as suggested.
	128	2/3520-3526	Highlighted sections in this paragraph should be deleted. APC log reduction comparisons assume commonality of microflora types and their distribution within populations across production lots, types of spices, and producers. In addition, different treatment types are likely to have differing effects on particular microbial subpopulations. Thus comparative values for APC reductions between treatments are not reliable. Additionally, there is no justification for an assumption that an APC reduction would correlate with Salmonella reduction. Furthermore, reductions of various pathogens within a population will be different depending upon the treatment. Microbial reductions based upon quantitative data will be far less sensitive than those validated by enrichment techniques. This treats that reduce APC values to <1 per gram may not but used to assume that lower values. e.g., 1 per 100 grams, are not present.	Sentences were not completely deleted but were altered to indicate that comparison of APC results "cannot be expected to predict actual *Salmonella* reductions." The new paragraph reads: "It was noteworthy that none of the reviewed studies conducted experiments on spices inoculated with a pathogen or pathogen surrogate. While reductions in the overall microbial populations (APCs) observed in these studies may provide a relative comparison of the efficacy of different treatment types, results do not predict expected *Salmonella* reductions. Specific treatment validation studies using *Salmonella* or surrogates are needed and highly recommended."

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	129	3,1/3543	Water activity has a profound environmental impact on microbial heat resistance as is illustrated in the two referenced articles by Geopfert et al, (1968 and 1970.) These factors are also documented in Stumbo. 1965. Thermobacteriology in food processing. Academic Press, New York.	The reviewer's comments are correct in that desiccated *Salmonella* cells are profoundly more heat resistant than cells in a moist environment. However, this section of the document deals with steam as an antimicrobial treatment where the presence of moisture will overcome resistance from desiccation. A number of references have been cited and discussed in other sections of the document regarding the impact of water activity on *Salmonella* heat resistance including Goepfert *et al.* (1970).
	129	3/3571	Never-the-less, a process that delivers a recommended lethality should be mandated. For example, is there a recommendation on what the appropriate log reduction of Salmonella of Bacillus cereus spores that should be used to treat spices? Given that spices are produced in third world countries are we confident that processes will destroy the most heat resistant pathogen that may be present? Have any studies been done to determine if strains of *Mycobacterium bovis* (part of the *M. tuberculosis* complex, cause of tuberculosis) may be present in spices. Is there a target Fo value that should be established for spices. Can the authors provide references to treatments that they consider adequate to protect public health?	FDA does not currently mandate a specific decimal reduction for any pathogen in a spice. Among the potential mitigation and control options identified in this document is "Increase (or mandate) application of validated pathogen reduction treatments for reduction of Salmonella to all spices intended for human consumption in the United States at an appropriate point prior to or after packaging," and among the research needs are "Measure the relative efficacy of Salmonella reduction processes commonly used on spices and validate mitigation treatments" and "Determine the economic and social/consumer costs/concerns associated with requiring all spices receive treatment to remove filth."

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
			I noticed that Hlavsa et al. (2008) indicated that some *M. bovis* infections in the US may be foodborne, as indeed they can and have been. The authors indicate that as many as 25% of human TB in developed countries in the late 19th and 20th centuries were from *M. bovis.* I recall reading about milkborne TB having occurred in the early part of the 1900's in the US; however, the incidence of *M. bovis* compared to other types of TB has dropped to about 1-2 of TB in developed countries as a result of milk pasteurization and testing and culling TB infected cattle in such nations.	We found no reports of *M. bovis* in spices.
			Given that spices are coming from larger underdeveloped regions and that spices originate in outdoor environments, subjected to contamination from animal droppings, as evidenced by a DAL for animal excreta, *M. bovis* contamination of spices may be something FDA should consider looking at down the road. However, there may be other endemic pathogens that we are not considering. I only use this as an example.	We thank the reviewer for the comment.
			M. bovis would be expected to be more heat resistant than *Salmonella*, which may also have some implications for reconditioning of spices, as this was the original organism for which milk pasteurization was designed to destroy (later followed by a more heat resistant organism, namely, *Coxiella burnetti*).	We thank the reviewer for the comment.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
			The Hlavsa reference is: M, Hlavsa, P.K. Moonan, L.S. Cowan, T.R. Navin, J.S. Kammerer, G.P. Morlock, J.T. Crawford, and P.A. LoBue. 2008. Human tuberculosis due to Mycobacterium bovis in the United States, 1995-2005. Clinical Infect. Dis. 47: 168-175.	We thank the reviewer for the reference.
	129	3/3571	Can the authors provide a reference to processes or approaches the agency would accept as valid reconditioning?	The agency is not prepared to provide specific conditions for validated treatments.
	130	3/3617	There is a need to establish an acceptable standard for treatments that destroy acceptable populations of pathogens.	We agree with the reviewer's statement and inserted it into the text in first paragraph of 8.2.1.7.
	134	1/3635	Deleted this highlighted phrase and add "treatments effectively…"	The text has been revised as suggested.
	134	1/3635	Some.	The text has been revised as suggested.
	134	2/3648	e.g., <1 per gram	The text has been revised as suggested.
	135	2/3696	A need for a defined validation protocol is needed for all interventions including irradiation.	We agree with the reviewer and believe this is clearly stated later in the document.
	135	3/709	The authors should clarify if they mean, "not utilized by industry," or some other meaning.	The text has been revised to read: "Although electron beam and x-ray sources are allowed for food treatment under 21 CFR 179 (FDA 2012l), these technologies have to date not been described in proposals submitted for FDA review on reconditioning of violative spices. "
	140	1/3775	Delete the word "size."	The word "size" has been deleted.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	140	2/3783-3785	"D-values were calculated for populations in Table 8.9 based on the kGy doses and log reductions generated from data in publications reviewed. The D-value is the kGy dose needed to reduce the microbial population by 1-log cycle." is highlighted. This was previously stated.	The sentence was deleted.
	140	2/3786	Is this the standard deviation or standard error? If this is the standard deviation then 2 x SE would about 2.4 kGy per d-value to capture 95% of all the D-values for the APC.	It is the standard deviation. Yes, there is large variability among the different spices and studies.
	140	4/3789	This highlights out the need for this type of work with a suitable surrogate or with *Salmonella*.	The sentence "Research on irradiation treatment using *Salmonella* or a suitable surrogate is needed." was added to this section (8.2.1) and research on appropriate surrogates for *Salmonella* was added to Section 10.2.4.
	141	4,1/3804	Authors, provide a reference for this speculation.	The sentence was removed in the revised version of the document.
	141	1/3826	Bulk density should also impact the permeability of the gas into spice blends.	"spice bulk density" has been added to the text.
	141	2/3845	The authors should cite the regulations related to EtO treatment of spices.	The EPA regulation is already provided on the next page. FDA does not regulate the use of ethylene oxide or propylene oxide as antimicrobial food additives. http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/IngredientsAdditivesGRASPackaging/ucm077256.htm
	142	1/3853	product type	"product type" has been added to the list of variables.
	143	1/3898	Selected steam treatments.	"selected" has been added to the phrase "steam treatments"
	146	1/4007	A limit of detection should be used rather than the phrase "all vegetative cells."	The reference was checked and appropriate changes made to the text.

III. SPECIFIC OBSERVATIONS

(Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)

REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	147	1/4052	Can the authors define the term "soft electrons"?	A definition was added to the text.
	151	1/4191	What about test methodology differences?	Test methodology has been added.
	151	3/4206	Replace "significantly" with "to be appreciably…"	The paragraph was revised to improve understanding.
	152	2/4249	There is a vast reservoir of Salmonellosis in the U.S. every year, most of which has not been traced back to particular foods. The significance of spice ingredients to this reservoir should be commented on and, if the authors are able, they should provide an estimate of the number of potential foodborne Salmonellosis cases per year from spices.	Determination of this information from available data is not possible at this time, as noted in previous comment responses.
	153	1/4263	See comment above for CGMPs	No change. FDA uses "CGMP".
	154	2/4344	Authors, please provide references for this comment.	We added references to this comment in the text.
	156	1/4411	See comment above for CGMPs	No change. FDA uses "CGMP".
	156	2/4424	As well as guidance for sanitary equipment design, best approaches for appropriate cleaning and sanitization.	These ideas have been incorporated into the text.
	156	3/4432	Replace "could" with "should."	FDA risk managers decide which of the potential mitigation and control options will be implemented, if any.
	158	1/4500	…or other appropriate subtyping analysis.	Suggested additional phrase added to the sentence.
	158	2/4507	See comment above for CGMPs	No change. FDA uses "CGMP".
	158	3/4529	Can a web link or reference be provided for information on the SRA?	A reference with link has been added.

III. SPECIFIC OBSERVATIONS (Page and paragraph or line # references refer to the March 2013 version of FDA's *Risk Profile: Pathogens and Filth in Spices*.)				
REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	159	2/4549	Do the authors mean the published serving size or the actual amount served, say at a meal?	We think it would be most useful to report recalled foods in terms of standard serving sizes to avoid confusion.
	159	3/4560	Microbes endemic to the country of origin should also be considered, e.g. Mycobacteria, *Shigella*, etc.	We thank the reviewer for the comment. First efforts should focus on pathogens that have been linked to human illness as a result of consumption of contaminated spice. Additional efforts could focus on pathogens endemic of the country of origin for different types of spices, as suggested by the reviewer.
	159	4/4571	Should the word be, "Preventative"?	Food Safety Preventive Control Alliance.
	160	4583	E.g., ICMSF. 2002. Microorganisms in Foods, Vol. 7: Microbiological Testing in Food Safety Management. Springer, New York.	We added reference to the ICMSF report here.
	160	4594	Incomplete sentence.	Incomplete sentence removed.
	162	3/4671	And, if so, why?	Good question. We have added this to the research needs, although the reason for the change, if any, may be difficult to reveal.
	162	3/4674	Change "does" to "do."	"does" changed to "do".
	163	Section 10.2.4/4684	Could other pathogens that are not reportable from foods in the United States, but endemic to some spice producing countries, be found in spices (e.g. *Mycobacterium Avium*)?	We found no reports of *Mycobacterium Avium* in spices in the literature and materials reviewed.
	163	1/4694	See comment above for CGMPs	No change. FDA uses "CGMP".
	163	1/4697	Does this sampling include testing the environment for *Salmonella*?	We thank the reviewer for this comment. We have added this question.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	165	6/4793	…or appropriate surrogates for *Salmonella.*	We have added this phrase to the text.
	165	8/4804	Toxic and non-toxic.	We have revised the sentence to read "The research should include a survey to assess consumer tolerance of natural and unavoidable defects in food." Adulterants that are harmful to human health are prohibited by the Food, Drug and Cosmetic Act under section 402(a)(1).
	166	1/4809	Such approaches should include those molds which can produce mycotoxins in spices.	We thank the reviewer for the comment. Mycotoxins are regulated as chemical contaminants.
	166	8/4849	Based upon consumption data, provide an estimate of the number of cases of Salmonellosis likely to result from consumption of contaminated spices annually. This could also be broken down by population age groups.	This estimate would be a part of a quantitative risk assessment (Section 10.2.6).
	175	3/5183	Add a space.	A space was added.
	181	3/5456	Capitalize the "C" in Clostridia.	The c was capitalized.
	181	12/5490-5492	"Nationwide Outbreak of *Salmonella* Montevideo Infections Associated with Contaminated Imported Black and Red Pepper: Warehouse Membership Cards Provide Critical Clues to Identify the Source" is highlighted. To be consistent with the reference style in this section, most of these words would not be capitalized except *Salmonella* Montevideo and the first word in the title.	The formatting was revised as suggested.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	182	11/5530-5531	"IDSA Guidelines: Practice Guidelines for the Management of Infectious Diarrhea. Clin. Infect. Dis. 32:331-350" is highlighted. To be consistent with the reference style in this section, most of these words would not be capitalized except the first word in the title.	The formatting was revised as suggested.
	182	12/5535-5537	"Application of Bayesian Techniques to Model the Burden of Human Salmonellosis Attributable to U.S. Food Commodities at the Point of Processing: Adaptation of the Danish Model" is highlighted. To be consistent with the reference style in this section, most of these words would not be the first word in the title.	The formatting was revised as suggested.
	184	12/5631	A space is needed before the next line.	Space was added.
	185	2/5641	Delete the number 512 and also 513 later in the reference.	Numbers removed.
	185	5/5654	Italicize *Bacillus* spp. in the reference.	*Bacillus* was italicized.
	186	13/5722	Insert a period.	A period was added.
	192	8/5979	To be consistent with the authors' reference style, only the genus names in the title of the article and the first word need be capitalized.	The formatting was revised as suggested.
	192	10/5984	A period should be located after the M prior to the name "Biggerstaff."	This reference has been removed.
	195	9/6122	Is this document available to the public?	All cited references are either publicly available or available from FDA upon request (e.g., the few "Personal communications" from individual scientists providing additional information about a study or event).

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	197	1/6181	To be consistent with the authors' reference style, only the first word of the article and the word "*Salmonella*" need be capitalized.	The formatting was revised as suggested.
	197	2/6184	Insert a space between "2010" and "antimicrobial."	Space was added.
	197	4/6190	Italicize *Escherichia coli.*	*Escherichia coli* was italicized.
	198	1/6231	Insert a space before the next reference.	Space was added.
	200	5/6343	This is now found at http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/SanitationTransportation/ucm056174.htm	Link was revised.
	204	7/6522	*Bacillus cereus* should be capitalized.	*Bacillus cereus* was capitalized.
Reviewer #5	5	129	From <0.1 to 0.2 MPN/g (0.086 MPN/g for…).	Sentence has been revised as suggested.
	5	152-153	DELETE "Research has shown" (unless you reference specific research. Otherwise, start the sentence with "*Salmonella* can survive…"	"Research has shown" was removed.
	5	154-155	Delete "of time."	"of time" was removed.
	5	156-159	The statement about humidity/temperature is based on one study (I think). The lack of reduction in populations of *Salmonella* at low relative humidity is not broadly observed across low moisture foods. Suggest softening the statement.	The statement has been modified to indicate that the minimal reduction was observed for ground black pepper.
	6	179-180	DELETE "Research has demonstrated that"	"Research has demonstrated that" has been removed.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	6	187-188	The sentence beginning with "Cleaning/garbling" seems to hang – are you suggesting that this practice generates dust? Facilitates cross contamination? Whatever it is it should be stated.	We have re-worked the sentences to clarify our meaning.
	14	449	List of Figures. Check italics for *Salmonella* (452,454) degree symbol (456-459).	Formatting of figure captions have been reviewed and revised, as necessary.
	15	483	Suggest changing "the" to "a large" 2009 outbreak.	Sentence revised as suggested.
	15	485	Delete "even" and change "an" to "a."	Sentence revised as suggested.
	18	610	Add space between "1" and "outbreak."	Space added.
	19-20	Table 2.1	See comments under *Salmonella* Senftenberg. Incomplete sentence starting with "Strain in…"	Sentence fragment removed.
	21-22	Table 2.2	See Other pathogens isolated during investigation under Anise seed. Is it "species"? or serovars?	Serotypes. Revised in text.
	25	662	In the earliest U.S. spice outbreak…	The sentence has been revised to: "In the earliest spice-associated outbreak identified in the United States…"
	27	761	Change "facts" to "fact."	"facts" changed to "fact."
	29	832	Italicize "Clostridium perfringens."	"Clostridium perfringens" was italicized.
	32	934	Lower case "s" in "spices."	S in "spices" was changed to lowercase.
	33	936	Comma after January 1.	Comma added after January 1
	32-33	Table 3.1	*Escherichia coli* –Generic? Pathogenic? Both? Is it worth making a distinction?	Table was revised to include pathogens only. As a result the section on *Escherichia coli* was removed. We did not find any reports in which pathogenic *Escherichia coli* was detected in spice.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	33	952-959	Is it possible that it is rare to test spices for *E. coli* O157:H7? Is this the reason for lack of recalls?	Yes. We have added the sentence "The absence of recalls associated with contamination by pathogens other than *Salmonella* may be related to absence of or infrequent testing of spices for other pathogens."
	42-43	1090, 1092, 1093, 1095	Strongly suggest that the sample size be included with discussion of prevalence. If not in the text then direct the reader at the beginning of this discussion to the sample size given in Table 4.1.	Sample size is addressed frequently in discussions of prevalence and has been included when prevalence values are reported.
	43	1099	Although the sample size for the U.S. study (750 g) is given in the Table 4.1, why not also include it here?	We had added sample size when reporting prevalence for Salmonella in the text, as suggested.
	43	1125	Reference Table or literature for the statement "Salmonella levels ranging from 0.0007 to 11 MPN/g…"	Table 4.2 was added to the sentence.
	50	1228	Salmonella – italics.	*Salmonella* was italicized.
	50	1228-1236 OR line 1254	Maybe overkill, but I think mentioning again that the prevalence is for 750-g samples is important – especially those readers not familiar with FDA sampling methods.	We added sample size when reporting prevalence for Salmonella in the text, as suggested.
	51	Table 4.3	State the sample size AGAIN somewhere in the table. People may refer to this table without looking at the text. Presently you have to search to find the sample size.	We added notes on sample size to the table.
	53	1355	Delete (Sagoo et al., 2009). It is clear you are talking about this paper.	(Sagoo et al., 2009) was deleted.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	53	1359	State that the mass was 25 g.	Mass of samples examined is provided in the text. Note that Sagoo et al., 2009 examined 135 g of spice for each screening test result.
	63	1594-1995	Incomplete sentence. "…while 79% of the 359 isolates recovered from retail meats in China during 2007-8."	This section has been revised.
	63	1604	Add period.	Period was added.
	65	1624	Section 2.2.2 doesn't exist.	We have corrected this reference.
	65	1626	In the MPN – 3 tube? One tube per dilution? Not clear.	The footnote now explains the table nomenclature more fully. The reference provides more detail.
	67-68	Fig 4.1, 4.2	Salmonella in italics (X axis and title).	Figure titles revised.
	68	1657	Now the sample size is 1500 g? All the more reason to specify sample size with each mention of prevalence (see my notes above). Until this point, I thought sample size was 750 g. I shouldn't have to refer to another manuscript, as this is a central point of your discussion.	FDA sampling protocol for spices is generally 750 g total (30 25-g sub samples) but we increased the sample size for this particular assignment exploring the distribution of contamination between- and within-spice shipments. As noted above, we added sample size whenever discussing *Salmonella* prevalence.
	69	1676	Sagoo et al. 135 g samples. Should be mentioned or at least refer me back to Table 4.1 where I can look it up. In addition, the number of samples included in the survey should also be captured. I have seen a published survey where 1 of 4 samples was positive and they reported a 25% prevalence.	As noted above, we added sample size whenever discussing *Salmonella* prevalence.
	69	1691	Salmonella italics.	*Salmonella* was italicized.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	70-71	Table 4.9 and 4.10	Mention somewhere in the table that the sample size ranges from 25 to 375 g.	We have added sample size range to both tables.
	73	1807 -1812	Something is missing. Punctuation? Words? As written, this doesn't make sense. Suggest rewriting the sentences to shorten and clarify.	Sentence was revised.
	73	1835-1837	Font size?	Font sized corrected.
	74	1866 and 1868	You cite Ma et al., 2010b and Ma et al., 2010. I could not find Ma et al. in the reference section at all. Clarify a or b and add to the reference section.	The reference has been changed to Ma, 2013.
	74	1871, 1873	"Recent" becomes dated fast. Insert the year of the recall. Likewise for 1873, insert the year of the "snack puff" outbreak.	Recent has been removed.
	75	1902	"trigs"? twigs?	Typographical error was corrected.
	75-76	1916 and Table 4.12	I am sure many readers will not understand how filth is determined. What is the sample size? Is this standardized around the world? I think it is relevant to mention. I would imagine that filth might also be non-uniform in a lot.	We have added sentences describing detection methods for filth including reference to the FDA Macroanalytical Procedures Manual to Section 4.2.
	76	1929	"Whole" spices?	Yes. Typographical error corrected.
	77	1960-1961	Can you provide a reference about the lack of a hair root is an indication that the hair came from feces?	We have added a reference for this statement (Vazquez, 1977).
	77	1965	All non-rodent hairs?	All hairs found in food are indicative of insanitary conditions and therefore failures in the application of GAPs and CGMPs.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	80	2092-2093	While I believe this document has ample references, I believe the following 2 support this statement especially well: Du, W.-X, M.D. Danyluk, and L.J. Harris. 2010. Efficacy of aqueous and alcohol-based quaternary ammonium sanitizers for reducing *Salmonella* in dusts generated in almond hulling and shelling facilities. J. Food Sci. 75:M7-M13. Danyluk, M. D., M. Nozawa-Inoue, K. R. Hristova, K. M. Scow, B. D. Lampinen, and L. J. Harris. 2008. Survival and growth of *Salmonella* Enteritidis PT 30 in almond orchard soils. J. Appl. Microbiol. 104:1391-1399.	We thank the reviewer for these references and have included them in the text. We thank the reviewer for these references and have included them in the text.
	81-82	Figures 5.1 - 5.4	Degree symbol. Include a line for limit of detection.	Degree symbol was corrected. Limit of detection is now noted in the figure caption.
	84	2158	Italics "Salmonella enterica."	"*Salmonella enterica*" Italicized.
	84	2163-2165	Sentence starting with "Further" is not clear. Restructure.	Sentence was revised to improve clarity.
	86	Figure 5.6	Add axis labels to the insert graph. Or at least indicate the region of the larger graph that the smaller graph represents. On this and other graphs, going to a white background would look better.	Additional text was added to the figure caption to describe the inserted graph.
	90	Figure 6.1	Font is very small and quality of print poor. I suggest that you get a better original and increase the size of this figure so that it is readable.	Figure was revised.
	91	2395	Suggest adding "e.g." – "e.g., black pepper….. e.g., oregano….. e.g., nutmeg.	"e.g.," has been added, as suggested.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	91	2419	"Fertilizers from animal dung from free range cows to a chemical mixture specifically…"	Sentence revised as suggested.
	92	2450	(Table 6.1)	Parentheses added.
	92	2460	Cite original reference as well as Chapter 2.	Original reference was added.
	93	2468	Wouldn't bird droppings on a package strongly indicate that contamination occurred after drying?	We agree. This sentence has been moved to the discussion of storage.
	95	Figure 6.2	Cinnamon rolls for an evening meal? Breakfast where I come from. I understand this figure is from another publication so changing it might not be appropriate.	This figure was removed and replaced with a more general figure.
	96	2564	Is this Rodent and insect "pests"?	All kinds of pests including birds. The CGMP citation does not distinguish (shown in Table 8.3).
	96	2567	"Contamination" doesn't grow. "Contaminants" can grow. This sentence could be structured better.	We have revised the sentence as suggested.
	96	2599	"Adding spice to a cooking spice" – what?	This sentence has been revised to improve clarity.
	96	2598-2602	This is a highly disjointed sentence. Needs complete rewrite.	This sentence has been revised to improve clarity.
			Again, "contaminated spices" do not grow.	The sentence has been revised to clarify that *Salmonella* may grow.
	101	2725	Move table title to next page.	Titles of sections and tables have been moved, as appropriate, throughout the document.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	114-115	3088-3090	What do you suggest is an appropriate sampling protocol?	The FDA study examining within- and between-shipment distribution of *Salmonella* in imported shipments of capsicum or sesame seeds compares the efficacy of several commonly used sampling protocols (Van Doren et al., 2013c). The JEMRA sampling tool allows exploration of a wider variety of sampling protocols (available from http://www.mramodels.org/sampling/).
	115	3093	"a" should be superscript.	The table has been revised.
	115-116	Table 8.4	Widen second column.	The table has been revised.
	117	3106-3108	Everywhere else prevalence is represented as 0.06 (not 6%). I think it is important to be consistent.	We now report all prevalence values in percent.
	118	Table 8.5	Define DWPE within the table.	The definition of DWPE was added to the table.
	119	3201	"a" should be superscript.	"a" changed to superscript
	120	3270	"these data"	Sentence was revised as suggested.
	122	3316-3317	Internationally used to grow spice crops.	Sentence revised as suggested.
	124	3422-3440	These two paragraphs are repetitive. Suggest condensing.	The first paragraph was merged into the last paragraph of section 8.2.1.6. and was deleted from the beginning of section 8.2.1.
	127	3466	Delete "It is important to note that" – Unnecessary verbage.	Sentence was revised as suggested.
	127	3469	Delete "Based on the fact that these are" – Unnecessary verbage.	Sentence was revised as suggested.
	127	3476	Should "CFU" be "MPN"?	Yes. MPN is now used.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	128	3498	Delete "It should be noted that."	Sentence was revised as suggested.
	128	3522	"Validated surrogate", "appropriate surrogate", "surrogate validated for the specific process"?	"Appropriate surrogate" was inserted in the text.
	136	3745	Delete "per log reduction". Already stated these were D-values.	Sentence was revised as suggested.
	140	3786	Delete "It should be noted that."	Sentence was revised as suggested.
	142	3878-3880	One sentence paragraph.	We merged the sentence into following paragraph.
	143	Table 8.10	Is it possible to standardize the gas conditions in some type of similar units? All metric at least?	Units were standardized to metric.
	143	3899	Delete "It should be noted that" Unnecessary verbage	Sentence was revised as suggested.
	144	3939-3945	This reference provides some discussion on setting targets for low moisture foods: Schaffner, D.W., R. L. Buchanan, S. Calhoun, M.D. Danyluk, L.J. Harris, D. Djordjevic, R. C. Whiting, B. Kottapalli, and M. Wiedmann. 2013. Issues to consider when setting intervention targets with limited data for low-moisture food commodities: A peanut case study. J. Food Prot. 76(2):360-369.	The text was revised to include this reference.
	145	3960	Change & to "and."	Sentence was revised as suggested.
	145-146	3986-3999	Is this study one submitted to FDA and unpublished?	This sentence was removed.
	146	4007	Provide a limit of detection for "eradicated all."	The reference was checked and appropriate changes made to the text.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	147	4079-4080	This is a big assumption.	The FDA study examining within- and between-shipment distribution of *Salmonella* in imported shipments of capsicum or sesame seeds provides some support for this assumption (Van Doren et al., 2013c).
	152	4242	Reword to avoid using "small" three times in 9 words.	Sentence was revised.
	160	4594	Part of this sentence is missing.	This sentence fragment has been removed.
	N/A	Throughout	When "Salmonella" appears in a subsection heading that is in italics then the word "Salmonella" should not be italicized.	We have revised, where necessary.
	168-205	References	I did not edit references but there are some errors. For example, Line 4884. Montevideo Line 4888 "short-x"?	We have capitalized Montevideo. "short-x" is correct. We have reviewed and edited references and citations.
			I did not make sure that all citations were included in the reference section or that all references were cited.	We have made sure that all citations were included in the reference section or that all references were cited.
	208	6560	Insert Page break.	Page break inserted.
	216-218	Table A5	Usage of DRIED? Spices?	Spices are, by definition, dried.
	216-218	Table A5	Camomile – raw? Is Camomile tea considered raw use?	Camomile (Chamomile) tea can be cooked or raw (e.g., sun tea). Camomile (Chamomile) flower can be consumed raw as part of another food (e.g., decorative use).
	216-218	Table A5	Dried coriander leaf – should be both.	Entry in table changed, as suggested.
	216-218	Table A5	Dried dill – should be both.	Entry in table changed, as suggested.

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REVIEWER	PAGE	PARAGRAPH OR LINE #	COMMENT	RESPONSE
	216-218	Table A5	Dried parsley – should be both.	Entry in table changed, as suggested.
	219	Table B1	I know these data are from another source, but the significant figures range from 4 to 8.	We have reported the data as reported from the original source to avoid confusion.
	223	Table B6	Improve title "this is fresh garlic production." What does it mean when the data source is blank (question applies to other tables)?	Improved title. We added to each table's footnotes information clarifying that the data reported was official FAO data unless otherwise noted.
	228	Table B11	Vietnam.	Name format changed.
	230	Table B13	Title? Nes?	The title is "Spices, nes". This is the FAO category for spices "not otherwise specified". As with other tables in this section, we give the definition provided by FAO, which notes that some countries report spices under this heading that are classified individually by FAO because of their limited local importance.