

May 7, 2004

Dennis Buege, Ph.D., Superintendent  
Muscle Biology Lab  
1805 Linden Drive West  
Madison, WI 53706

Dear Dr. Buege:

This letter addresses the issues raised in your email to Larry Holterman of April 7, 2004, and provides some simple measures that a small or very small plant can take to help meet the humidity and lethality levels in Appendix A.

In a key passage in your email, you asked why humidity requirements are being emphasized now and who is responsible for emphasizing the humidity requirements. You also stated that most products other than jerky are high in moisture and of sufficient size so that drying is not a factor. You questioned whether there is evidence that the lack of process humidity results in foodborne illness, and you recommended research on the impact of heat and drying on pathogen survival in jerky.

The compliance guidelines in Appendix A are intended as guidelines for the production of ready-to-eat meat and poultry products, not as regulatory requirements. An establishment can apply a process that is validated to achieve the appropriate level of pathogen reduction throughout the product. In the event an establishment uses Appendix A as supporting documentation, all the conditions of Appendix A (i.e., time, temperature, and humidity) must be addressed. Humidity is to be maintained by injecting steam, controlling the relative humidity at 90% for the times listed in the guidelines, or sealing the oven for 50% of the processing time but not less than one hour, unless the establishment can provide documentation that the process can achieve an adequate lethality with less humidity or less time at 90% relative humidity.

As you are undoubtedly aware, the compliance guidelines in Appendix A for roast beef, cooked beef, and corned beef were originally the regulatory requirements in 9 CFR 318.17. In the preamble to the 1999 final rule, "Performance Standards for the Production of Certain Meat and Poultry Products," FSIS noted that research showed that surface lethality may not always be greater than lethality attained in the product core. The preamble cited additional research demonstrating that, without adequate conditions of humidity, *Salmonella* may not be eliminated. Thus, if humidity is not controlled in the initial stages of the process, the product will dry and the *Salmonella* will become resistant to the heat and may survive in the finished product. Time and temperature alone are not sufficient for an adequate lethal process.

The recent outbreak, in New Mexico, of *Salmonella* associated with beef jerky emphasizes the need to maintain humidity during heating, especially where the ambient air humidity is low, or the product is produced at high elevations. *Salmonella* survived

the process, even though the oven temperature exceeded that in Appendix A because an adequate level of humidity was not maintained.

There are some simple and practical measures that small and very small establishments can use to help ensure that a lethal process is delivered. An establishment could employ one or more of these actions:

1. Close the oven dampers to provide a closed system and prevent moisture loss. This would meet the requirements of Appendix A provided that the oven remains sealed for 50% of the cooking time and no less than 1 hour.
2. Place a shallow and wide pan of hot water in the oven to provide humidity in the system. A dry run to determine if the water evaporated should be performed. If no evaporation occurred, this would indicate that a relatively high humidity was not maintained in the oven. Use of a wet bulb thermometer in addition to the dry bulb thermometer also would enable the operator to determine if adequate humidity is being applied.
3. Use a wet bulb thermometer in combination with a dry bulb thermometer. A wet bulb thermometer can be prepared by wrapping a wet sock or cloth around a dry bulb thermometer. The cloth must remain wet during the entire cooking step. The use of a wet bulb thermometer is especially important for production at high altitudes or areas of low humidity.
4. Preheat the jerky to 160°F (71°C) in the marinade or other solution, such as water, before racking in the oven to provide an immediate reduction of greater than 5-log<sub>10</sub> of *Salmonella* and *E. coli* O157:H7. The times and temperatures in Appendix A could also be used for preheating.
5. Heat the dried product in a 275°F oven for 10 minutes. This has the potential to further reduce *Salmonella* levels by approximately 2 logs from the level of reduction achieved during initial heat step.

FSIS agrees that more research should be conducted on the impact of heat, drying, and additives that increase bacterial heat resistance in jerky processing. FSIS posted a request for research proposals on the New Technology Staff website (<http://www.fsis.usda.gov/OA/topics/newtech.htm>). Several of the proposals the Agency received are for jerky processing. The purpose of the research (cooperative agreements between state, academic, and research institutions and FSIS) is to identify, develop, and validate new technologies that are economically viable for small and very small establishments. FSIS will provide up to \$75,000 of funding per cooperative agreement. This research presents an opportunity for FSIS to provide small and very small plants producing jerky products with validated and economically feasible processing procedures.

A copy of this letter will be provided to the District Offices and Enforcement, Investigations and Analysis Officers. It also will be posted on the FSIS website as an attachment to the compliance guidelines for meat and poultry jerky.

If you have any questions, please do not hesitate to contact me at (202) 205-0210.

Sincerely yours,

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Paul M. Uhler  
Technical Analysis Staff  
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