

# Summary of Compliance Guidelines for Meat and Poultry Jerky Produced by Small and Very Small Plants

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## Background

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Meat or poultry jerky is a ready-to-eat (RTE), dried product that is generally shelf-stable (i.e., it does not require refrigeration after proper processing). In 2003, FSIS found that producers of meat and poultry jerky may not be processing jerky well enough to destroy the pathogens necessary to produce a safe product. FSIS has identified two points in jerky processing where producers might need to do a better job:

**Lethality treatment:**

A process that gets rid of or reduces the number of pathogens on or in a product to make the product safe for humans to eat.

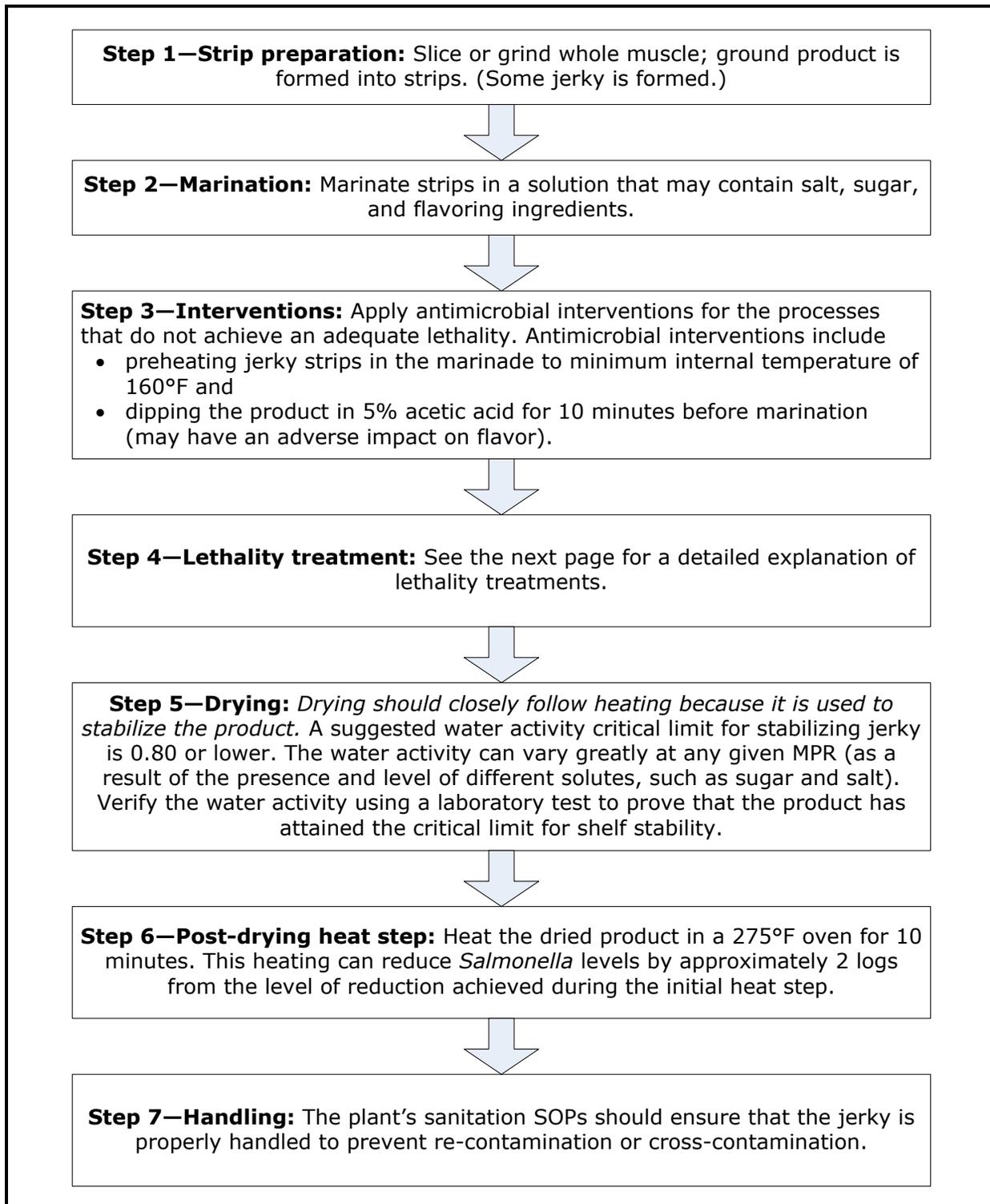
Examples of lethality treatments are cooking or applying an antimicrobial agent or process that gets rid of or reduces pathogenic microorganisms.

1. **Jerky may not be adequately heat treated** to meet the lethality performance standards if the requirement for moist cooking is not achieved. Some processors use dry heat to both heat and dry their product and, thus, do not achieve adequate lethality during the heating process because the product dries prematurely, and the lethality process stops.

2. **Some manufacturers rely only on the maximum moisture-protein-ratio (MPR), rather than water activity, for determining whether their process adequately dries the jerky to produce a shelf-stable product.** While an MPR of 0.75:1 or less remains part of the standard of identity for jerky, plants should verify that the jerky is properly dried by measuring water activity using a laboratory test. Water activity is a better measure of available water for microbial growth than MPR. Minimizing available water (e.g., achieving a water activity of 0.80 or less) is critical for controlling the growth of pathogens.

For meat and poultry jerky, biological hazards will most likely include the microbiological hazards from *Salmonella* spp., *Listeria monocytogenes*, and *Staphylococcus aureus*. For beef jerky, *Escherichia coli* O157:H7 may also be a hazard reasonably likely to occur.

## General Processing Steps Used in Jerky Production



\*\*\*Although a plant’s process may not include all these steps, the **lethality treatment (heating) and drying are required to produce a safe product**. Some processors combine the heating and drying procedures into one step. However, *it is critical that the heating accompanied by adequate humidity happen before the drying.* \*\*\*

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## Lethality Treatment

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The plant must apply a treatment to control, reduce, or get rid of the biological hazards identified in the hazard analysis. The time-temperature combinations in the lethality compliance guidelines should produce safe products with both salt and sugar additives as long as the humidity criteria are followed closely during the cooking/heating (lethality) steps. **Humidity during heating is a critical factor.**

For meat jerky, use of the time-temperature combinations provided in the lethality compliance guidelines should help to ensure the safety of the product. For poultry jerky, an internal temperature of 160°F for uncured poultry or 155°F for cured poultry will ensure a safe product. **For both meat and poultry, the humidity restrictions must be followed if the lethality compliance guidelines are used as supporting documentation.** The time-temperature tables are based on wet heat. Without humidity, the product will dry, and the bacteria will become more heat resistant.

If the lethality compliance guidelines are used, the **relative humidity must be maintained above 90% throughout the cooking or thermal heating process** by using a sealed oven or steam injection.<sup>1</sup> This level of humidity is not required if a plant can provide documentation that its process can achieve an adequate lethality with less humidity.

The heating temperature and humidity (e.g., steam) are critical for achieving adequate lethality. As the water activity is reduced, the heat resistance (D value) of the bacteria increases. Therefore, if the humidity is not kept at a certain level during heating, the time needed at higher temperatures to get rid of *Salmonella* will be greatly increased. It is important that the processor prevent drying of the product until a lethal time-temperature combination is reached. *The humidity requirement must be applied during the first part of the heating process before any drying and an increase in solution concentration occurs.*

The process should be monitored using wet and dry bulb thermometers to determine the relative humidity. Wet and dry bulb temperatures should not differ by more than 4.5°F. A temperature difference greater than 4.5°F indicates a relative humidity of approximately 86% and shows that the minimum relative humidity (90%) is not being maintained at the correct level. Here are some simple and practical steps to meet the humidity limits in the lethality compliance guidelines:

- **Seal the oven.** Close the oven dampers to provide a closed system and prevent moisture loss. Steam may be seen venting when the dampers are closed.
- **Add humidity.** Place a wide, shallow pan of hot water in the oven to provide humidity in the system. Conduct a test run to determine whether the water evaporates. Injecting steam or a fine water mist in the oven can also add humidity.

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<sup>1</sup> At high altitudes, the amount of humidity in the chamber may need to be increased.

Using a wet bulb thermometer, in addition to the dry bulb thermometer, also helps to determine if the humidity is adequate.

- **Monitor humidity.** Use a wet bulb thermometer in addition to a dry bulb thermometer. A wet bulb thermometer can be prepared by fitting a wet, moisture-wicking cloth around a dry bulb thermometer. To maintain a wet cloth during the process, submerge an end of the cloth in some water. The cloth must stay wet during the entire cooking step and should be changed daily, especially if smoke is applied. Using a wet bulb thermometer is especially important when the facility is located at a high altitude or areas of low humidity with high evaporation rates.

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## **Validating Custom Processes**

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Plants may develop customized processes that achieve an appropriate reduction of pathogens throughout the product. Customized processes should be based on science, supported by experimental data. They may be developed by using information obtained from the literature, from unpublished studies that are scientifically valid, or by comparing the methods used by the plant with established procedures that have been validated to achieve the required log<sub>10</sub> reduction of the pathogen. *Alternative or custom processes must be validated (i.e., their effectiveness must be proven).*

At a minimum, a validation study for a microbiological food safety hazard should

- identify the hazard,
- indicate the log<sub>10</sub> reduction achieved for the specified pathogen,
- describe how the log<sub>10</sub> reduction of the pathogen was achieved or determined,
- specify the actual processing conditions (e.g., time, temperature, and humidity),
- list critical ingredients (e.g., salt, sugar, and cure), and
- list the critical product characteristics (e.g., pH, water activity, and fat content).

The processing procedures, ingredients, and product characteristics may determine the range of products to which the study applies.

Challenge studies are excellent ways to validate processes. Validation by a challenge study is based on science and provides the necessary data to determine the log<sub>10</sub> reduction of the target pathogen. *Pathogen challenge studies should be conducted in a testing laboratory and not in the processing plant environment.* Product sampling results based on historical data alone should not be used to validate these procedures.

See the Compliance Guidelines for a complete list of references: <a href="http://www.fsis.usda.gov/PDF/Compliance_Guideline_Jerky.pdf">http://www.fsis.usda.gov/PDF/Compliance_Guideline_Jerky.pdf</a> .
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