



Meat Messenger

North Dakota State Meat and Poultry Inspection Program

2014 Quarter 1

Jerky processing - Why just drying it isn't enough

By Nathan Kroh

A 1995 outbreak of *Salmonellosis* in New Mexico resulted in 93 confirmed or probable cases, but many more people may have been sickened from eating jerky from a small, local processing plant. From 40 culture-confirmed cases, three types of *Salmonella* serotypes were isolated: *Salmonella Typhimurium* (31 cases), *Salmonella Montevideo* (12 cases) and *Salmonella Kentucky* (11 cases). Samples of leftover jerky from sickened people and the manufacturer revealed that 11 of 12 samples tested positive for the same uncommon phenotypic variants.

The plant owner made the jerky using a process that was common in the area, but did not provide the necessary lethality to eliminate *Salmonella*. The plant closed permanently after the outbreak.

Drying is an acceptable process for preserving meat products, and creates a lightweight, high-protein shelf-stable snack, but drying alone does not guarantee a safe product.

All ready-to-eat meat products must undergo some process, usually during cooking, to ensure elimination of biological hazards. Since jerky has a very large surface area per slice, it would seem that it would cook quickly, but this is not necessarily true. A phenomenon, known as evaporative cooling, prevents the penetration of heat past the surface of the meat. As the meat absorbs heat from the air, moisture at the meat's surface begins to evaporate. During evaporation, the water molecules vibrate so quickly that they propel themselves from the meat's surface as water vapor. The water vapor takes energy in the form of heat with it. This reduction of energy



Attributed to Kusie, Picture from http://en.wikipedia.org/wiki/File:Beef_jerky.jpg

at the meat surface, slows the meat's heat absorption. The extended time at sub-lethal temperatures gives *Salmonella* time to adapt and become more heat resistant.

The greater surface area also allows for case hardening. As the meat surface begins to dry, the proteins and sugars begin to set quickly, restricting migration of the moisture from the center of the meat to the surface. Case hardening may give the appearance of dryness on the surface, before attaining lethality temperature, allowing heat resistant *Salmonella* to survive, posing a foodborne illness risk. After packaging, internal moisture will slowly migrate to the surface, creating a mold issue, as well.

Both evaporative cooling and case hardening can be prevented by increasing humidity during the lethality step of drying jerky. Humidity increases the heat transfer into the meat and prevents the meat surface from drying too quickly. Moisture in the air increases the amount of heat energy needed to evaporate the water from the meat's surface. High humidity means less evaporation

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Regulation Reminder



36-24-03. Access by inspectors - Penalty.

1. The commissioner and any authorized representative of the commissioner have access to:

- Any place where food or any other product, the manufacture, sale, use, or transportation of which is restricted, regulated, or prohibited by a law of this state, is or may be manufactured, prepared, stored, sold, used, transported, offered for sale or transportation, or possessed with intent to use, sell, or transport;
- Any place where an animal is pastured or stabled;
- Any car or other carriage used to transport a meat food product or an animal;
- Any place where food is or may be cooked, prepared, sold, or kept for sale to or for the public or distributed as a part of the compensation of an employee or agent;
- Any place where a meat food product may be manufactured, sold, used, offered for sale or transportation, or possessed with intent to use, sell, or transport.

2. The commissioner and any authorized representative of the commissioner may inspect any container believed to hold food, a food ingredient, or some other product, the manufacture, use, sale, or transportation of which is restricted, regulated, or forbidden by state law, and may take samples from it for analysis.

3. It is a class A misdemeanor for any person to obstruct entry or inspection under this chapter or to fail, upon request, to assist in an inspection authorized by this chapter.

History: Effective August 1, 2000.

General Authority: NDCC 36-24-18, 36-24-24

Law Implemented: NDCC 36-24-03, 36-24-14

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and case hardening before the lethality temperature is reached.

Adding steam directly to the smokehouse is the easiest way to increase the humidity. Another simple method is placing a shallow pan of water on the smokehouse floor and sealing the smokehouse dampers. The extra water will increase the humidity sufficiently to heat the meat.

Appendix A: Compliance Guidelines for Meeting Lethality Performance Standards for Certain Meat and Poultry Products (<http://www.fsis.usda.gov/Oa/fr/95033f-a.htm?redirecthttp=true>), a recognized and commonly cited supporting document, states that a relative humidity of 90 percent should be maintained for 25 percent of the cook cycle, but no less than 1 hour. After at least one hour of 90 percent humidity, the pan of water can be removed, the dampers opened, and the product dried to desired level. The critical water activity for jerky to be considered shelf-stable is 0.85 or lower, if packaged in the presence of oxygen. If the jerky is vacuum sealed, the water activity may be up to 0.88, but must be labeled “refrigerate after opening”. NDSU and other laboratories can perform water activity testing for a small fee to determine the optimal processing drying time.

Other interventions used with heat treatment and drying can increase the lethality of the process. Preheating the prepared strips to 160 degrees F in the marinade prior to drying will immediately reduce *Salmonella*. Flavor development will depend on seasoning blend's reaction with the

Did you Know?

South African jerky made from any type of thick sliced heavily seasoned meat is called biltong. Some retail stores offer mildly seasoned forms of biltong specifically for use as baby teething aides.

Source: “Biltong.” Wikipedia: The Free Encyclopedia. Wikimedia Foundation, Inc., 28 November 2013. Web. 6 Dec. 2013. <http://en.wikipedia.org/wiki/Biltong>



heat, so some experimenting may be needed for an acceptable process and finished product. Dipping beef strips in a calcium sulfate or sodium chlorite solution is an effective pretreatment for jerky making. Using interventions such as preheating or chemical dips can improve the effectiveness of the lethality step, but cannot be used without a proper kill step. During the lethality heating of the jerky, the most reliable way to measure the meat's internal temperature is to slice one piece twice as thick as the others and put a probe in the thicker piece. The probed meat should always be placed in the coldest part of the smokehouse. The thickest slice in the coldest part of the smokehouse will heat the slowest; therefore the lethality target will be reached for the whole lot, once the probed piece reaches the target temperature.

Appendix A provides time and temperature combinations to meet regulations. Poultry products must meet a 7.0 log reduction of *Salmonella ssp*, and beef products must reach at least a 6.5 log reduction of *Salmonella ssp* and a 5.0 log reduction of *E. coli* O157:H7. If an establishment processes jerky by

a different method, it may utilize a journal article as scientific support, but it should ensure that the critical operational parameters used in the study match those used in the actual process. If one or more parameters are not addressed or do not match the level used in the support, then the establishment's process may not achieve the necessary lethality. FSIS published a Compliance Guideline for Meat and Poultry Jerky Produced by Small and Very Small Establishments: 2012 Updated Compliance Guideline. This guideline provides information for procedures, interventions, supporting documents, smokehouse time/temp/humidity combinations and instructions for making a wet bulb thermometer.

Sources:

“FSIS Compliance Guideline for Meat and Poultry Jerky Produced by Small and Very Small Establishments: 2012 Updated Compliance Guideline” Food Safety Inspection Services, USDA. April 2012. Web. 13 Dec. 2013 <www.fsis.usda.gov/shared/PDF/Compliance_Guideline_Jerky_2012.pdf>

“Outbreak of Salmonella Associated with Beef Jerky-New Mexico, 1995.” Morbidity and Mortality Weekly Report (MMWR), Centers for Disease Control and Prevention. 27 October 1995. Web. 13 Dec. 2013 <www.cdc.gov/mmwr/preview/mmwrhtml/00039423.htm>

Basic elements of effective food plant cleaning and sanitizing

By Rory Redemann

It's no secret that when the basic elements of good sanitation practices in the food manufacturing environment are consistently applied over time, all of the company's food safety programs are enhanced. The cleaner the facility and equipment at the outset of every product run, the better the assurance that potential food safety hazards are mitigated or eliminated throughout the entire production cycle.

The key to good sanitation practices is to provide training to all plant employees on the plant floor. It is important for supporting functions to understand how they enable effective sanitation—for example, timely disassembly of equipment by maintenance staff, end of production housekeeping, and quality inspections all impact sanitation effectiveness—fostering a better understanding of the sanitation protocols suited to each plant's operational and food safety requirements. Best practices for plant sanitation, creates a culture of hygiene that can significantly increase the overall effectiveness of the sanitation program. It is not enough to have an educated and dedicated sanitation crew: Their daily efforts to ensure the hygiene of the plant will be to no avail if maintenance personnel are unaware that they should not take tools from raw materials areas into finished product areas, for example, or if plant engineers do not understand the cleaning challenges posed by placement of equipment or drains.

Five basic elements of good sanitation are:

- Assessment of environmental factors to develop effective sanitation procedures
- Commitment to continuous improvement of sanitation practices
- Proper application of daily sanitation procedures
- Use of periodic sanitation, (i.e., tear down and heat)
- Verification of effective sanitation

Factoring In Success

There are two general environmental factors that impinge effective sanitation procedures in the food plant: staffing and room/equipment. Missed work due to scheduled vacations and unscheduled personal days make the necessity for a flexible workforce a must. It is not uncommon to expect employees to rotate into different assignments as needed. This requires that supervisors vigilantly maintain good training and documentation that will help all crew members quickly get up and running on the sanitation procedures.

Second, assessment of the production area and equipment is required to hone in on the specific cleaning and sanitizing methods that will need to be applied in order to achieve effective sanitary conditions.

A good way to ensure sanitation processes are understood is simply stated in the following “continuum of control” formula:

Sanitary Design + Effective Sanitation + Traffic Patterns + GMPS + Dry/Uncracked Flooring

In its assessment of sanitation protocols and policies, the sanitation team will want to look at each of the control areas listed in the continuum formula:

Sanitary design. Does machinery require extensive disassembly? Do construction materials require different cleaning and sanitizing chemicals? Are components of equipment easy to dismantle and reassemble? Design procedures for manageability.

Effectiveness of sanitation procedures. Are limitations known and controls in place? What are the steps included in daily and periodic procedures? Are they being carried out consistently?

Traffic patterns. Is there separation between raw and ready-to-eat areas, and separation between exposed product areas and packaging, etc.?

GMPS. Is it difficult to do the wrong thing? For example, an operation can have the best designed equipment but if it is improperly located, the ability of personnel to comply with GMPs will suffer.

Flooring. Is the infrastructure well maintained?

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Each of these areas are necessary to the development of effective sanitation procedures. Taken together, these areas provide the basis for building a comprehensive approach to ensuring high standards of hygiene and identifying potential sanitation challenges. For example, a typical challenge considered during a sanitary design assessment is the reduced visibility in the production room due to a steam fog, resulting from inadequate exhaust via the HVAC system. A foggy room is not conducive to efforts when the goal is to clean to a microbiological level, but it is difficult to see the equipment and surrounding environment.

Another typical challenge is the inaccessibility of equipment for cleaning and sanitizing. During tear down and reassembly, will the sanitation team be able to get to all the parts, or is the equipment complex and not easily cleanable to a microbiological level? Can the equipment be disassembled without tools? Make tasks easier to empower employees. To maintain equipment that is free of biofilms, the equipment itself must be accessible; in other words, they need to see it and scrub it to clean it.

Among other things that can lead to ineffective sanitation—not all-inclusive—the following should be considered when developing sanitation procedures:

Aerosols. There is concern that aerosols are a source of cross-contamination. Typically, the use of pressure washers for cleaning has some level of risk,



because the velocity of the spray can generate aerosols that may migrate organisms onto product-contact surface. High pressure spraying can drive moisture into or under sealed surfaces, which leads to possible development of niches that could harbor microorganisms. If possible, high pressure water treatments should be avoided, or used only in applications that require its use.

It is important to critically assess when and how to properly use pressure washers. Use them as a cleaning tool in a controlled manner to avoid generating aerosols. Pressure washing is not recommended as a final rinse method, because of the risk of aerosols re-contaminating clean product contact surfaces, essentially negating sanitation efforts.

Spraying drains and drain components. Drains are high-risk areas for harborage of undesirable microorganisms. Good Manufacturing Practices (GMPs) related to drains will help to

minimize impact on the surrounding environment. Prevent water from pooling or backing up. Standing water provides an environment in which bacteria can grow and survive. Prohibit Sanitation personnel from cleaning food-contact surfaces after handling drain components.

Hollow rollers, fixed sleeved assemblies and concave surfaces. These areas may hold moisture, inhibiting the effectiveness of sanitation chemicals and cleaning methods and thus can contribute to the growth microorganisms or the development of biofilms.

Control buttons, screens and bearings. Because these components are often covered during the cleaning process, It is important to specifically identify a cleaning methodology for these items—before and after covering—to prevent the possibility that they become transfer vehicles for bacteria.

NOTE: To be continued in the next issue of the Meat Messenger

This article has been slightly edited for brevity; the entire article is available at <http://www.foodsafety magazine.com/magazine-archive1/aprilmay-2005/basic-elements-of-effective-food-plant-cleaning-and-sanitizing/>

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ND firm recalls beef franks

Source: News release issued Jan. 15, 2014 by the USDA

Class I Recall Health Risk: High

Cloverdale Foods Co., a Mandan, N.D., establishment, is recalling approximately 2,664 pounds of beef franks due to misbranding and an undeclared allergen, the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) announced today. The products were formulated with milk, a known allergen, which is not declared on the product label.

The following products are subject to recall:

- 16-oz. packages of Cloverdale Meats "Seattle Mariners Beef Franks."
- 12 lb. cases containing 12 packages of individual 16-oz. packages of

Cloverdale Meats "Seattle Mariners Beef Franks."

The products were produced on November 23 and December 13, 2013, with use-by dates of February 21 and March 13, 2014 respectively. These products bear the package code Use by 2-21-14 or Use by 3-13-14 and the establishment number "Est. 7603" inside the mark of inspection. The products were sold to retail establishments in Montana, North Dakota and Washington State.

The problem was discovered by the company during an internal label review. Non-fat dry milk is an ingredient used in the product. The problem occurred when the newly designed label included an incorrect ingredient statement. Anyone concerned about a reaction should contact a healthcare provider. FSIS



and the company have received no reports of adverse reactions due to consumption of these products.

FSIS routinely conducts recall effectiveness checks to ensure that steps are taken to make certain that the product is no longer available to consumers. When available, the retail distribution list(s) will be posted on the FSIS website at: <http://www.fsis.usda.gov/recalls>.

Media with questions about the recall should contact T.J. Russell at (701) 663-9511, extension 217. Consumers should contact Scott Russell at (701) 663-9511, extension 224.

Livestock Development Director to retire

The longtime director of the Livestock Development Division of the North Dakota Department of Agriculture (NDDA) is leaving his position. Wayne Carlson announced that he will retire, effective April 11, 2014.

"Wayne's absence will definitely be felt both in the department and throughout the livestock sector in North Dakota," said Agriculture Commissioner Doug Goehring. "His commitment to and his comprehensive knowledge of the livestock industry and his institutional memory are valuable assets that will be difficult to replace."



A Washburn native, Carlson is a graduate of North Dakota State University and earned a master's degree in business from the University of North Dakota.

From 1974 to 1993, he farmed and ranched near Washburn. In 1993 he was named Livestock Director for NDDA.

Livestock Development includes duties and functions related to dairy production, feed registration, livestock sales, meat inspection, animal waste management and animal damage control.

Carlson and his wife, Denise, live in Mandan. They have two grown children.

Olson appointed as inspector

Agriculture Commissioner Doug Goehring has appointed Sherlynn Olson as an inspector in the North Dakota State Meat and Poultry Inspection Program.

A Wilton native, Olson earned a bachelor's degree in animal science with an emphasis on meat science from North Dakota State University. Before joining the NDMPIP last September, she worked as a heating, ventilation and air

conditioning technician in Mandan.

An avid outdoor enthusiast, Olson enjoys trail rides with her husband Matthew, and her family. She also enjoys hunting and fishing.

She will be based in Oakes, conducting inspections in Dickey, Lamoure, Ransom, Richland and Sargent counties.



Classified ads

We are always looking for industry related items to advertise in the Meat Messenger. We post sale and want ads **FREE**. Contact Julie Nilges (701-204-3248) at jnilges@nd.gov or Nathan Kroh (701-328-4767) at nkroh@nd.gov with product description and contact information.

Dean's Meat Market, Dickinson, ND: Turnkey business. Well established, custom-exempt processing with retail meats, cheeses and 30 different homemade sausages, recipes included. Large, fresh, retail meats counter and retail freezers. Includes all the working equipment, mostly stainless steel. Also includes walk-in coolers and freezer. Building not included but possibly negotiable. For more information, call Dean Evenson at 701-483-8461 and see the website at www.deansmeatmarket.com.

Sipromac one truck smokehouse: Smokehouse has a Juno microprocessor and liquid smoke attachment. Included are two trucks and many sticks and screens. \$20,000; **True Brand cooler:** Cooler has two sliding doors and was manufactured in 2001. \$1,000; **New one-quart plastic containers with lids:** \$20 per lot of 50. Please contact Calvin or Alex for more information at 701-743-4451. Located in Parshall.

Prairie Packing Inc.: Slaughter and processing plant in Williston, ND. USDA #7644. 10.43 acres of land with 20,000 sq. ft. building and garage. 15,000 sq. ft. is leased. City sewer and water. Work is divided into 70% rancher/producer and 30% retail sales. 10 employees. Please contact Dave Slais for more information at dslais04@live.com.

Walk-in freezer and components (4 items): (1) Three-phase Copeland compressor Hp p62 Freon, new in 2005. (Model 4RA3-100A-TSK-800, serial 05A66497R). (2) Single-phase Bohn cooling unit (Model 2402B serial DCD4540). (3) Larkin single-phase outside evaporator. (4) Walk-in freezer with shelves/baskets, sharp freeze shelves and cooling unit, has four-glass doors, free standing unit, walls snap together. Please contact Denise for more information at 701-438-2334. Located in Esmond.

Slaughter/processing business: Located in Esmond, ND. Fully operational meat processing facility, all equipment and supplies included. Currently custom-exempt, with option for retail and/or state inspected status, many equipment/facility upgrades last four years. Very strong customer base. Please contact Denise for more information at: 701-438-2334 or 701-351-1231.

Cooler and Freezer Trailers; Pair of Smokehouses; and Sausage Linker: 52-ft semi-trailer converted to refrigerated deer carcass storage room with rail and winch system (diesel); 48 ft semi-trailer converted to three-phase electric freezer storage with shelving on both sides. Also have 12' x 24' walk in combination freezer/cooler (freezer section is 8'x12' and cooler section is 12'x12'); A pair of Model 300 Pro-Smoker Smokehouses; and Famco 5 1/2" sausage linker. For more information, call Ted at 701-640-2940. Located in Wyndmere.

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