Building Safety into Pet Treats

The Pet Food Industry

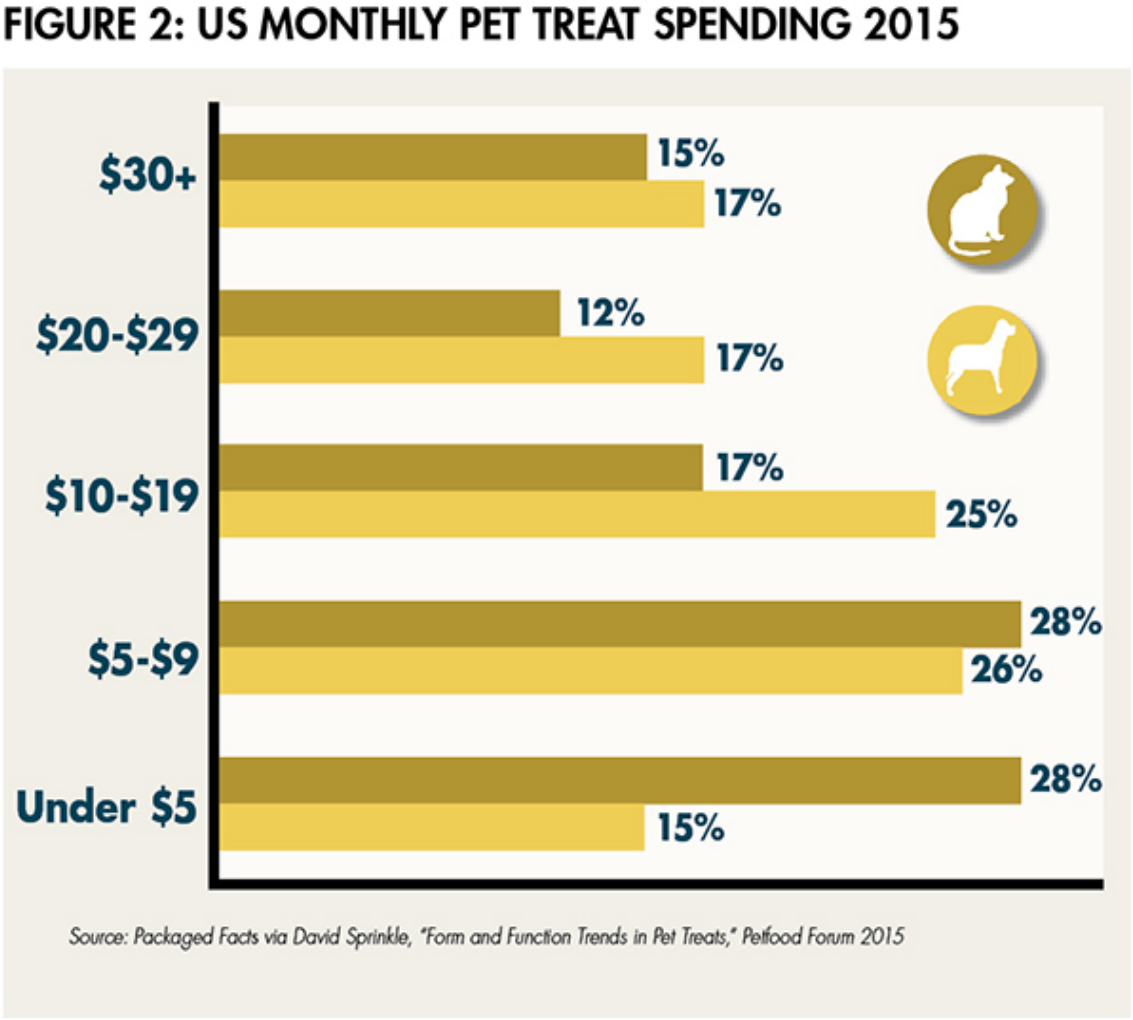
- **In the U.S.**

  70-80 million dogs / 74-96 million cats (ASPCA 2016)

  37-47 % of U.S. households own at least 1 dog, and 30-37% have a cat (ASPCA 2016)

- **In 2014, treats made up 16% of U.S. pet food spending**

How Much are Consumers Spending?

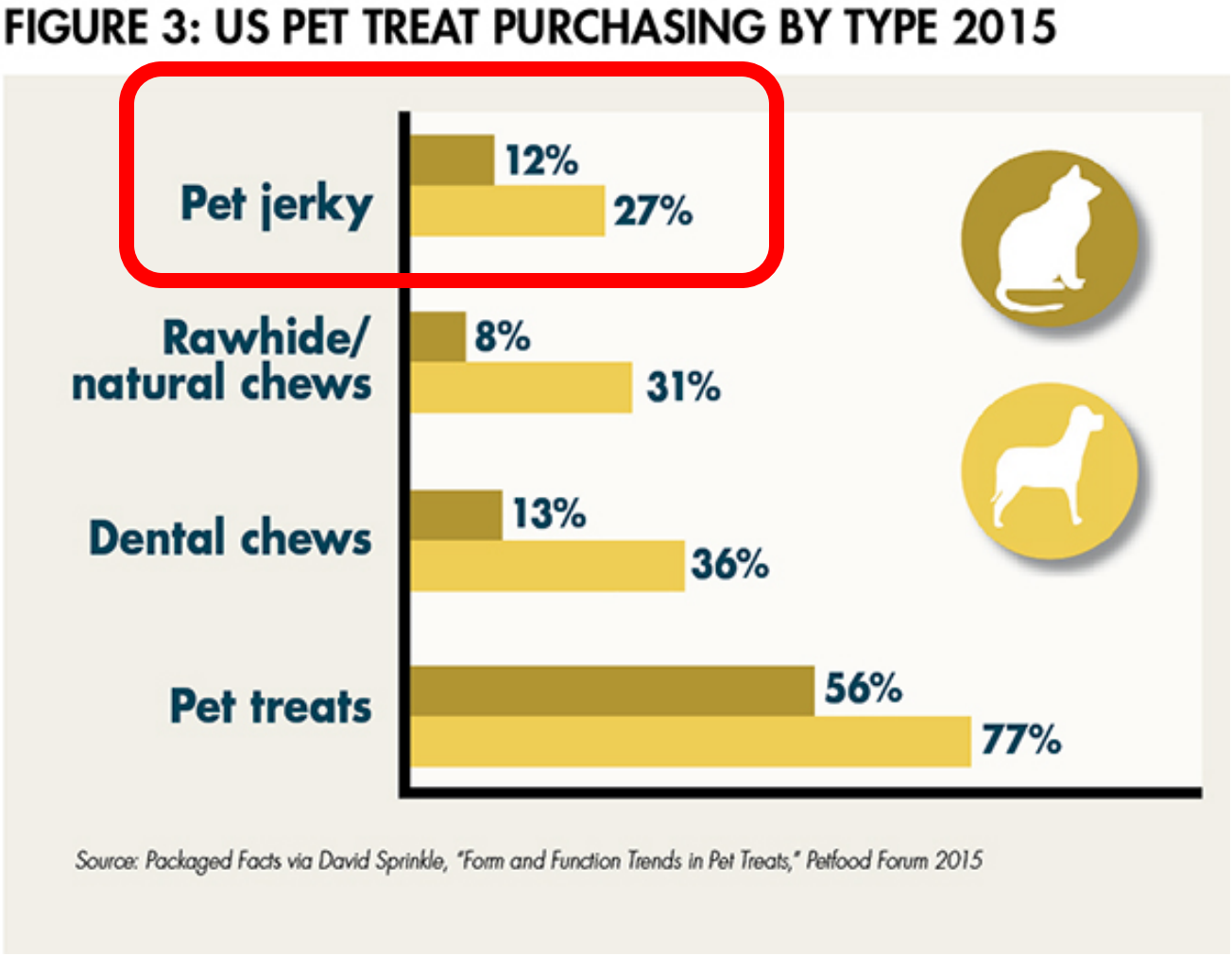


85% spend more than $5/month on dog treats

72% spend more than $5/month on cat treats

http://www.petfoodindustry.com/pet-food-market-data/US-monthly-pet-treat-spending-2015

What are Consumers Purchasing?



Source: http://www.petfoodindustry.com/pet-food-market-data/US-pet-treat-purchasing-by-type-2015

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Why Are Jerky Treats Making Pets Sick?

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- How to Report a Complaint about Jerky Pet Treats

On this page:

If you have a dog or cat that became ill after eating jerky pet treats, the Food and Drug Administration (FDA) would like to hear from you or your veterinarian.

The agency has repeatedly issued alerts to consumers about reports it has received concerning jerky pet treat-related illnesses involving 3,600 dogs and 10 cats in the U.S. since 2007. Approximately 580 of those pets have died.

To date, FDA's Center for Veterinary Medicine (CVM) has conducted more than 1,200 tests, visited jerky pet treat manufacturers in China and collaborated with colleagues in academia, industry, state labs and foreign governments. Yet the exact cause of the illnesses remains elusive.

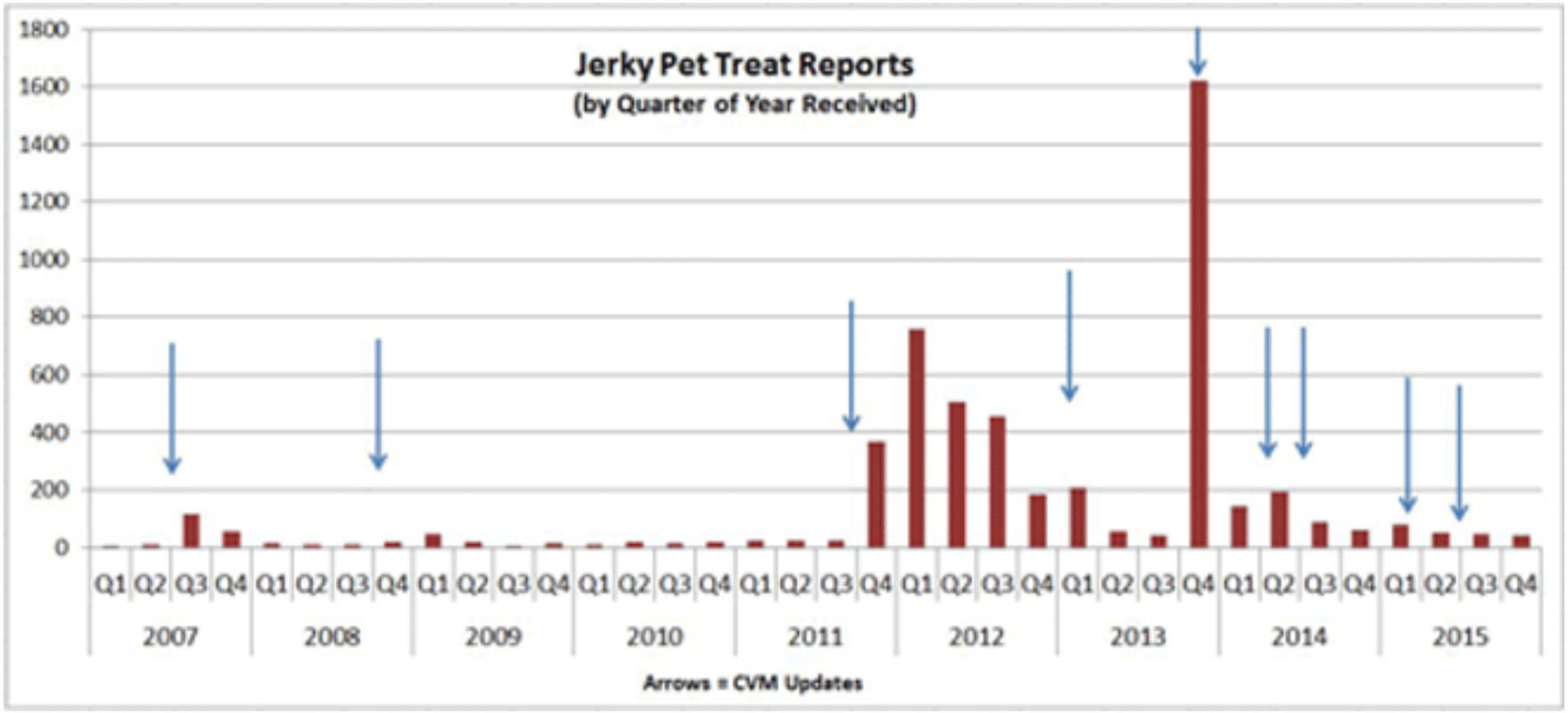
To gather even more information, FDA is reaching out to licensed veterinarians and pet owners across the country. "This is one of the most elusive and mysterious outbreaks we've encountered," says CVM Director Bernadette Dunham, DVM, Ph.D. "Our beloved four-legged companions deserve our best effort, and we are

http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm371413.htm

FDA Highlights: Jerky Pet Treats Sourced Primarily to China (BUT not all!)

- As of December 31, 2015
  - -5,200 complaints of illnesses
  - -6,200 dogs, 26 cats, 3 people
  - -More than 1,140 canine deaths
- Contaminants have included:
  - *Salmonella*, metals, pesticides
- Products involved:
  - -Chicken jerky (treats, tenders, strips), duck, sweet potato, and treats where chicken or duck jerky wrapped around dried fruits, sweet potatoes, yams or rawhide

FDA Jerky Treats Investigation



http://www.fda.gov/AnimalVeterinary/SafetyHealth/ProductSafetyInformation/ucm360951.htm

U.S. Department of Health and Human Services

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Animal & Veterinary

Home > Animal & Veterinary > Safety & Health > Product Safety Information

Product Safety Information

- Adverse Drug Experience (ADE) Reports
- Animal Drug Shortage Information
- Arsenic-based Animal Drugs
- Bovine Somatotropin (BST)
- Dear Doctor Letters
- Letters to Veterinary Professionals
- Risk Minimization Action Plans (RiskMAPs) for Approved Products
- Steroid Hormone Implants Used for Growth in Food-Producing Animals
- Veterinary Medication Errors
- Veterinary Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

FDA Jerky Pet Treats Investigation (video)

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Martine Hartogensis in FDA's Center for Veterinary Medicine discusses the agency's investigation into pet illnesses associated with the consumption of jerky pet treats.

Page Last Updated: 04/29/2015

Note: If you need help accessing information in different file formats, see Instructions for Downloading Viewers and Players.

http://www.fda.gov/AnimalVeterinary/SafetyHealth/ProductSafetyInformation/ucm444926.htm

FDA Requirements

- **Food for animals, like food for people, be:**
  - **-Safe to eat**
  - **-Produced under sanitary conditions**
  - **-Free of harmful substances**
  - **-Truthfully labeled**

http://www.fda.gov/AnimalVeterinary/ResourcesforYou/ucm047111.htm

Dried Treat/Food Enhancer Recalls
Salmonella Contamination

- Jan 2015 –Beef jerky treats
- Sept 2015 -Beefhide chicken sticks
- July 2015 -Pet chews (beef tripe)
- June & July 2015 –Chicken sprinkles, Turkey sprinkles
- July 2014 –Beef gullet strips

Salmonella –FDA Standard Language

- *Salmonella* can affect animals that eat contaminated products and there is a potential risk to humans if they come in contact with *Salmonella* from handling contaminated products.

- Healthy people infected with *Salmonella* should monitor themselves for some, or all, of the following symptoms: nausea, vomiting, diarrhea or bloody diarrhea, abdominal cramping and fever. Rarely, *Salmonella* can result in more serious ailments, including arterial infections, endocarditis, arthritis, muscle pain, eye irritation, and urinary tract symptoms. Consumers exhibiting these signs after having contact with this product should contact their healthcare providers.

- Pets with *Salmonella* infections may be lethargic and have diarrhea or bloody diarrhea, fever, and vomiting. Some pets will have only decreased appetite, fever and abdominal pain. Infected, but otherwise healthy pets can be carriers of *Salmonella* and infect other animals or humans. If your pet has consumed the recalled product and has these symptoms, please contact your veterinarian.

What leads to Salmonella Contamination?

- Harvesting procedures
- Poor agricultural practices

} Ingredient Contamination

- Cross contamination during processing
- Improper thermal processing or drying

Ingredient Contamination
Salmonella in Spices

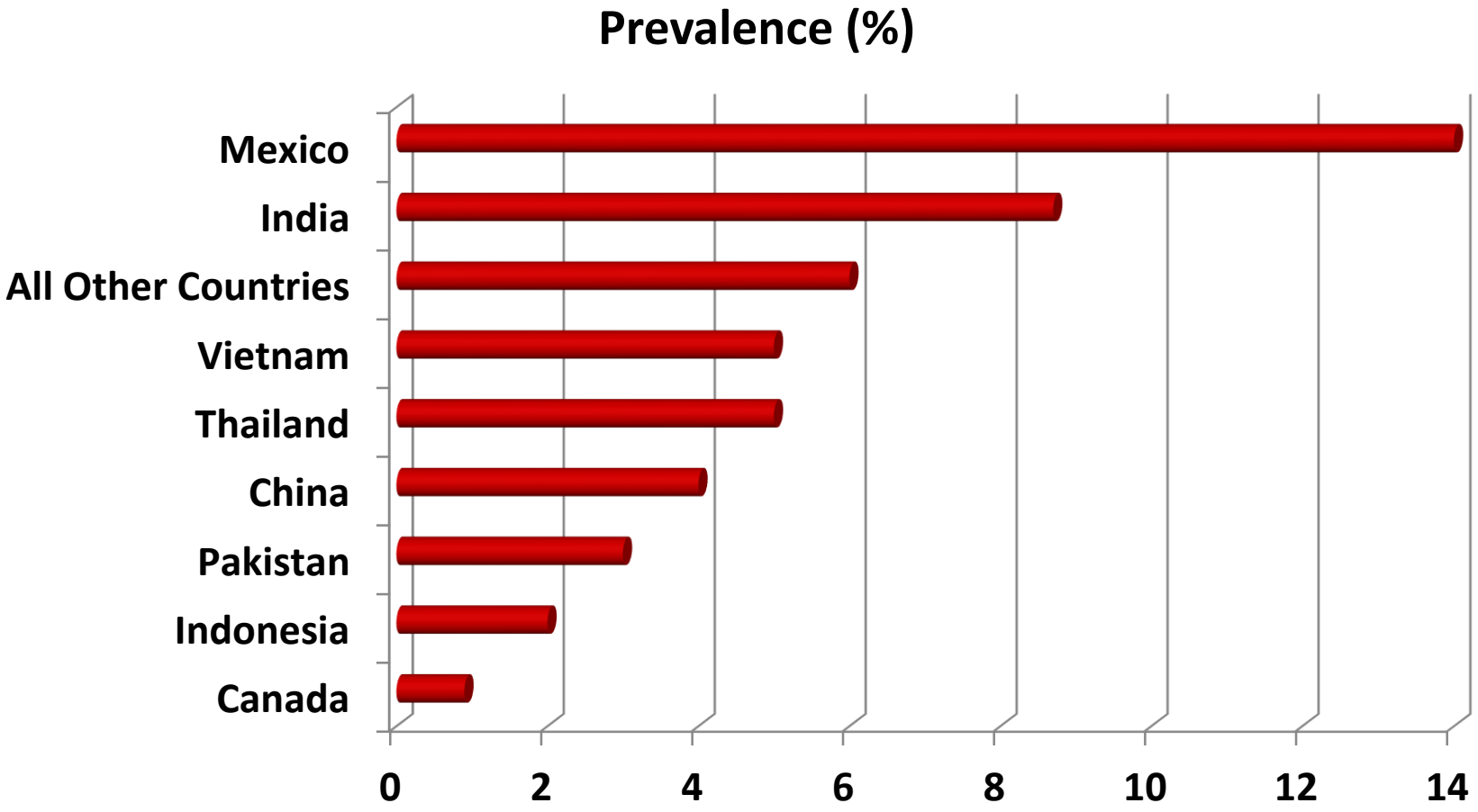
- **80% of U.S. spices imported**

  India is country of origin for 40% of U.S imports

- **Shipments derived from the fruit/seed or leaves had larger prevalence for Salmonella than shipments derived from the bark/flower of spice plants**

J.M. Van Doren et al. / Food Microbiology 34 (2013) 239-251

Salmonella Prevalence in Shipments by Exporting Country (2007-2009)

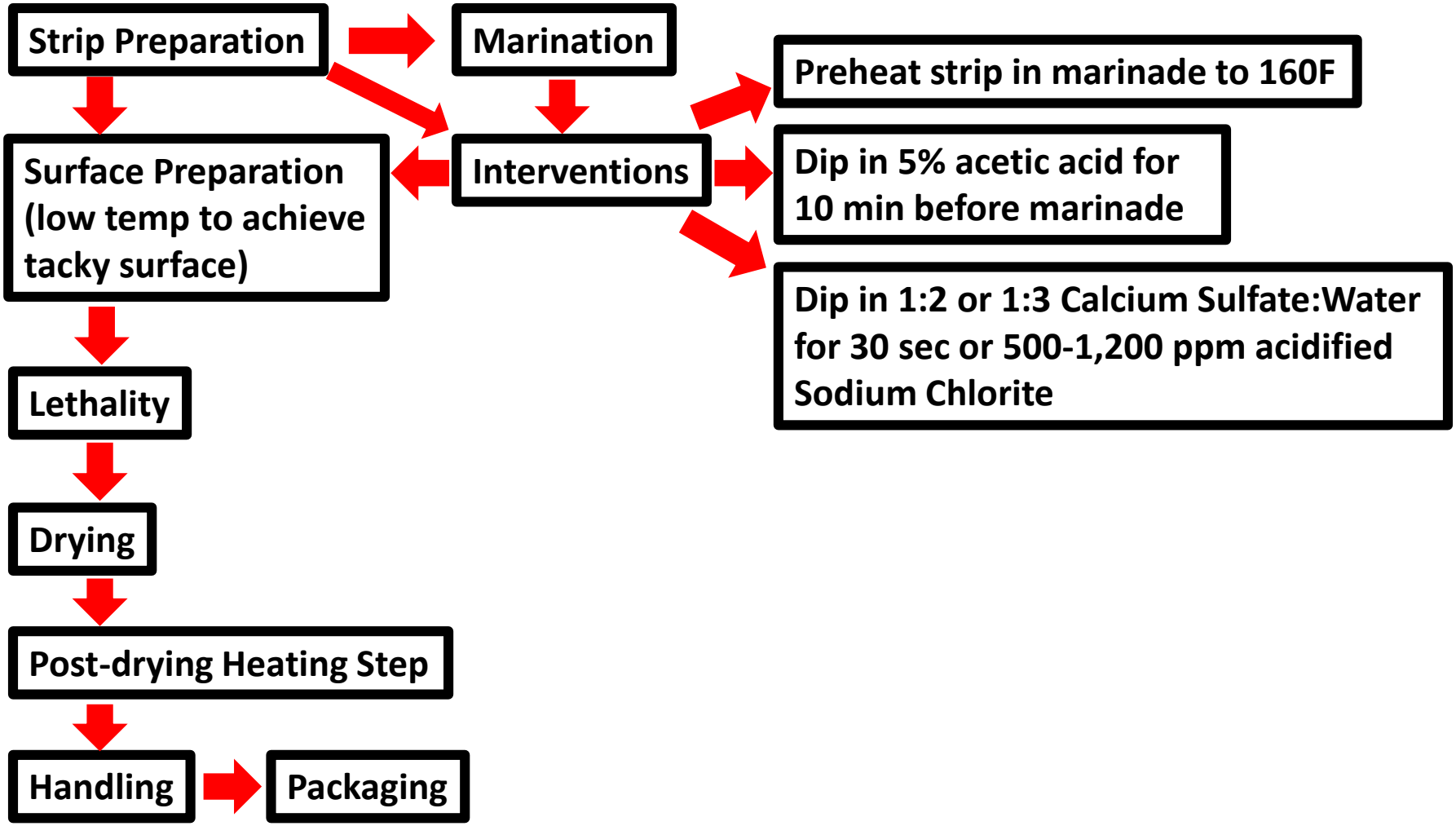


All other countries = 71-country group excluding listed countries

J.M. Van Doren et al. / Food Microbiology 34 (2013) 239-251

Processing Safety Concerns

Dried treat production steps



Processing Safety Concerns

- Using **Standard of Identify** for labeling and interpreting it for safety
- SOI for jerky : MPR

MPR ≤ 0.75:1

The SOI is NOT related to safety!

JERKY COMPLIANCE GUIDELINES

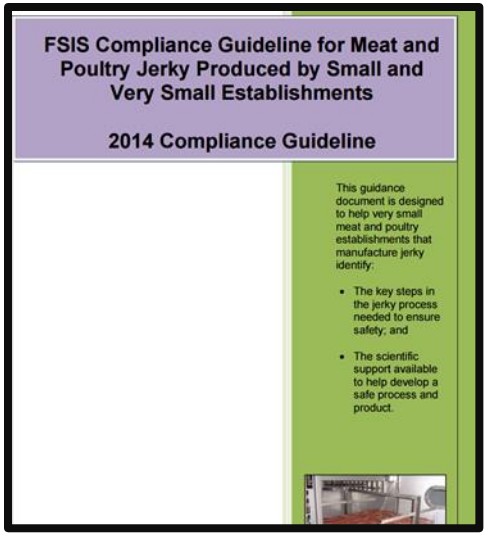
- First issued December 2004; **UPDATED 2014!**
- FSIS found that producers of meat and poultry jerky may not be adequately processing jerky to achieve the lethality necessary to produce a safe product
- In 2003, *Salmonella* Kiambu outbreak in jerky

  -22,000 lbs beef jerky recalled

  -22 illnesses

  - Product manufactured using very slow drying process under low RH (1% RH, 180F DB, 86F WB)

  -Allowed Salmonella to dehydrate during drying and become heat resistant



http://www.fsis.usda.gov/wps/wcm/connect/5fd4a01d-a381-4134-8b91-99617e56a90a/Compliance-Guideline-Jerky-2014.pdf?MOD=AJPERES

Processing Safety Concerns

- Variability in thermal processing or dehydrator functionality
- Critical Operational Parameters (COP)
- Need to achieve at least a 5.0-$\log_{10}$ reduction of *Salmonella* (and at least a 5.0-$\log_{10}$ reduction of shiga-toxin producing *E. coli* for products with beef)
- Should achieve at least a 3.0-$\log_{10}$ reduction in *L. monocytogenes*

COP

- **Ensuring adequate lethality treatment**

  USDA FSIS Appendix A =time and temperature

RH must be maintained above 90% throughout the cooking or thermal heating process if Appendix A is used

Without sufficient humidity the product surface may dry too quickly, and the bacteria may become more heat resistant

USDA FSIS Appendix A: Compliance Guidelines For Meeting Lethality Performance Standards For Certain Meat And Poultry Products

lanuary 1999
Jpdated June 1999

Appendix A

Compliance Guidelines For Meeting Lethality Performance Standards For Certain Meat And Poultry Products

ntroduction

Establishments producing ready-to-eat roast beef, cooked beef and corned beef products and certain ready-to-eat poultry products are required by FSIS to meet the lethality performance tandards for the reduction of Salmonella contained in §§ 318.17(a)(1) and 381.150(a)(1) of the meat and poultry inspection regulations. Further, FSIS requires meat and poultry establishments, f they are not operating under a HACCP plan, to demonstrate how their processes meet these lethality performance standards within a written process schedule validated for efficacy by a process uthority (§§ 318.17(2)(b)and (c) and 381.150 (2)(c) and (d)).

To assist establishments in meeting the lethality requirements, FSIS is issuing these compliance guidelines, which are based upon the time/temperature requirements contained in previous egulations. Establishments may choose to employ these guidelines as their process schedules. FSIS considers these guidelines, if followed precisely, to be validated process schedules, since they ontain processing methods already accepted by the Agency as effective.

Also within these guidelines, FSIS has provided discussion regarding disposition of product following heating deviations and advice for the development of customized procedures for neeting the lethality performance standards.

Guidelines for Cooked Beef, Roast Beef, and Cooked Corned Beef

.. Cooked beef and roast beef, including sectioned and formed roasts, chunked and formed roasts, and cooked corned beef can be prepared using one of the following time and temperature ombinations to meet either a 6.5-$\log_{10}$ or 7-$\log_{10}$ reduction of Salmonella. The stated temperature is the minimum that must be achieved and maintained in all parts of each piece of meat for a east the stated time:

Minimum Internal Temperature		Minimum processing time in minutes or seconds after minimum temperature is reached	
Degrees Fahrenheit	Degrees Centigrade	6.5-$\log_{10}$ Lethality	7-$\log_{10}$ Lethality
130	54.4	112 min.	121 min.
131	55.0	89 min.	97 min.
132	55.6	71 min.	77 min.
133	56.1	56 min.	62 min.
134	56.7	45 min.	47 min.
135	57.2	36 min.	37 min.

Methods to Introduce Humidity

- Heating to minimum IT 145F (PRODUCT TEMPERATURE) if RH of oven is maintained by:
  - -continuously injecting steam for 50% of cook time or use sealed oven for over 50% cook time
  - -if RH is maintained at 90% or higher at least 25% of total cook time and no less than 1 hour
- Appendix A and RH is 90% or higher at least 25% of total cook time and no less than 1 hour

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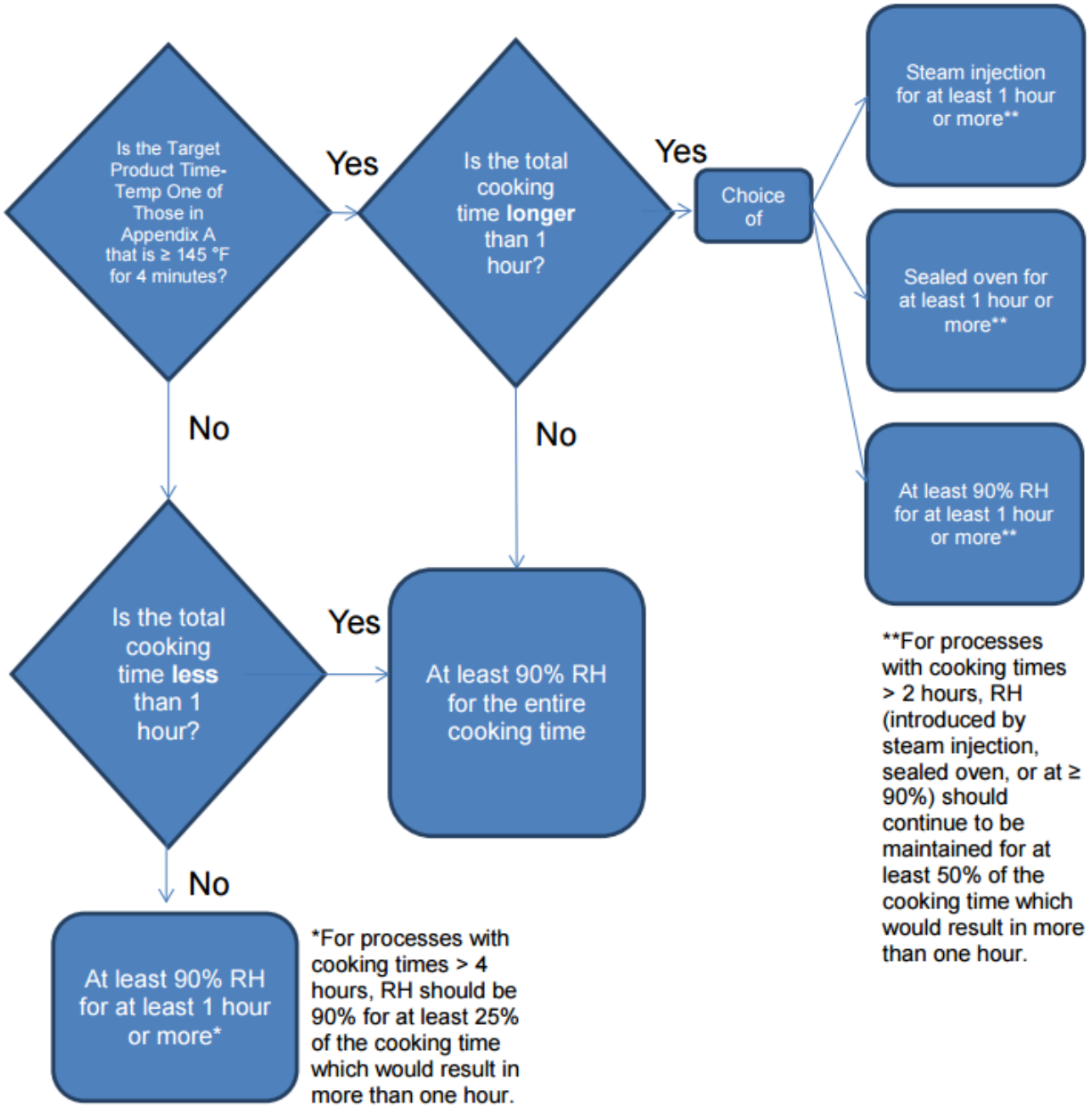
- In order to introduce humidity--Jerky cooking time must be a minimum of 1 hour

Flow Chart to Identify Humidity Options when Using the *Appendix A* Guidelines as Scientific Support For a Jerky Process



*For processes with cooking times > 4 hours, RH should be 90% for at least 25% of the cooking time which would result in more than one hour.

**For processes with cooking times > 2 hours, RH (introduced by steam injection, sealed oven, or at ≥ 90%) should continue to be maintained for at least 50% of the cooking time which would result in more than one hour.

SUPPORTING DOCUMENTATION

Journal of Food Protection, Vol. 69, No. 9, 2006, Pages 2091–2099

Lethality of Commercial Whole-Muscle Beef Jerky Manufacturing Processes against *Salmonella* Serovars and *Escherichia coli* O157:H7

DENNIS R. BUEGE,[1] GINA SEARLS,[1] AND STEVEN C. INGHAM[2]*

[1]*Department of Animal Sciences and* [2]*Department of Food Science, University of Wisconsin, Madison, Wisconsin 53706, USA*

MS 05-582: Received 15 November 2005/Accepted 27 April 2006

ABSTRACT

Thermal processes used in making whole-muscle beef jerky include a drying step, which may result in enhanced pathogen thermotolerance and evaporative cooling that reduce process lethality. Several salmonellosis outbreaks have been associated with beef jerky. In this study, a standardized process was used to inoculate beef strips with five-strain cocktails of either *Salmonella* serovars or *Escherichia coli* O157:H7, to marinate the strips at pH 5.3 for 22 to 24 h at 5°C, and to convert the strips to jerky using various heating and drying regimes. Numbers of surviving organisms were determined during and after heating and drying. *Salmonella* reductions of ≥6.4 log CFU and similar reductions in *E. coli* O157:H7 were best achieved by ensuring that high wet-bulb temperatures were reached and maintained early in the process (51.7 or 54.4°C for 60 min, 57.2°C for 30 min, or 60°C for 10 min) followed by drying at 76.7°C (dry-bulb temperature). Processes with less lethality that reduced counts of both pathogens by ≥5.0 log CFU were (i) heating and drying at 76.7°C (dry bulb) within 90 min of beginning the process, (ii) heating for successive hourly intervals at 48.9, 54.4, 60, and 76.7°C (dry bulb), and (iii) heating at 51.7°C (dry bulb) and then drying at 76.7°C (dry bulb), starting before the product water activity dropped below 0.86. In several trials, separate beef strips were inoculated with a commercial *Pediococcus acidilactici* starter culture as a potential surrogate for evaluating pathogen thermotolerance. The results of these trials suggested that this experimental approach may be useful for in-plant validation of process lethality.

KSU Project Objectives

- Develop a dehydrated chicken dog treat prototype
- Evaluate effectiveness of “at home” dehydrators with limited humidity and temperature control on *Salmonella* lethality
- Evaluate the difference in humidity generated by dehydrator load (3-Tray vs. 5-Tray) and subsequent effect on lethality of *Salmonella*

PROCEDURES

- **Tyson chicken breast purchased from Wal-Mart (different lots for each rep)**
  - **Cut and rolled to a similar thickness**
  - **Cut into 6 x 6 cm squares**

- **5-strain cocktail**

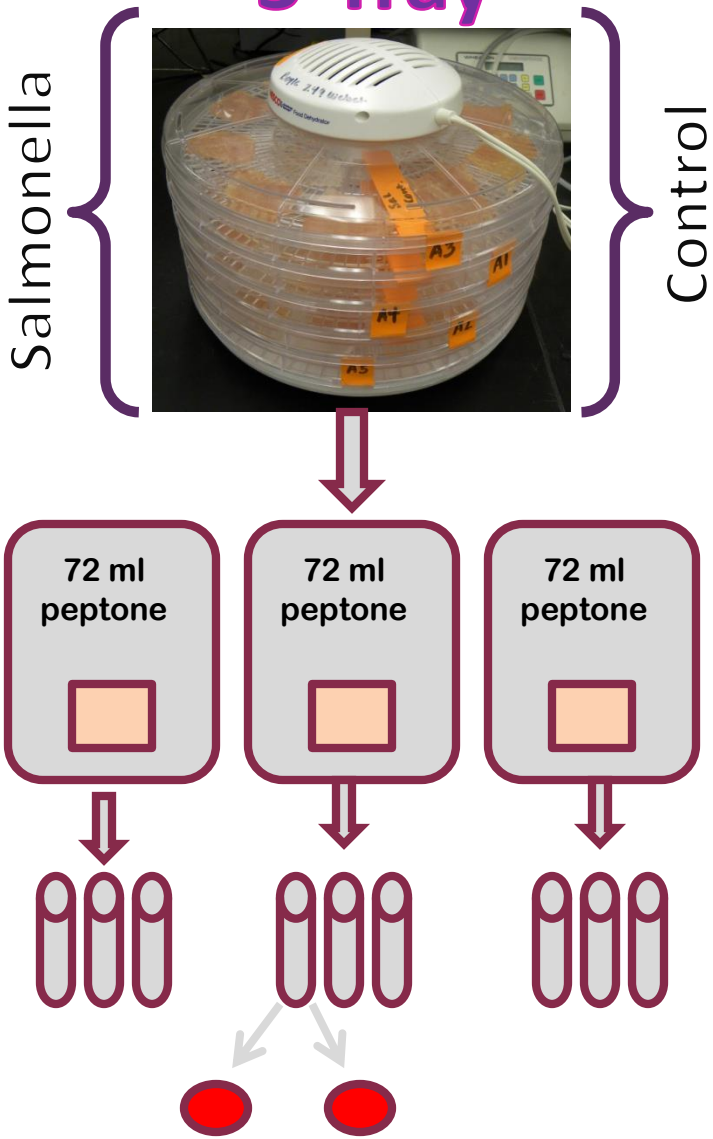
Bacterium	ATCC number	Source
Salmonella Typhimurium	13311	Human experiencing salmonellosis
Salmonella Enteritidis	13314	Laboratory strain
Salmonella Abaetebua	9263	Laboratory strain
Salmonella Enteritidis	6962	Foodborne illness fatality in England
Salmonella Enteritidis	BAA-710	Clinical specimen

PROCEDURES

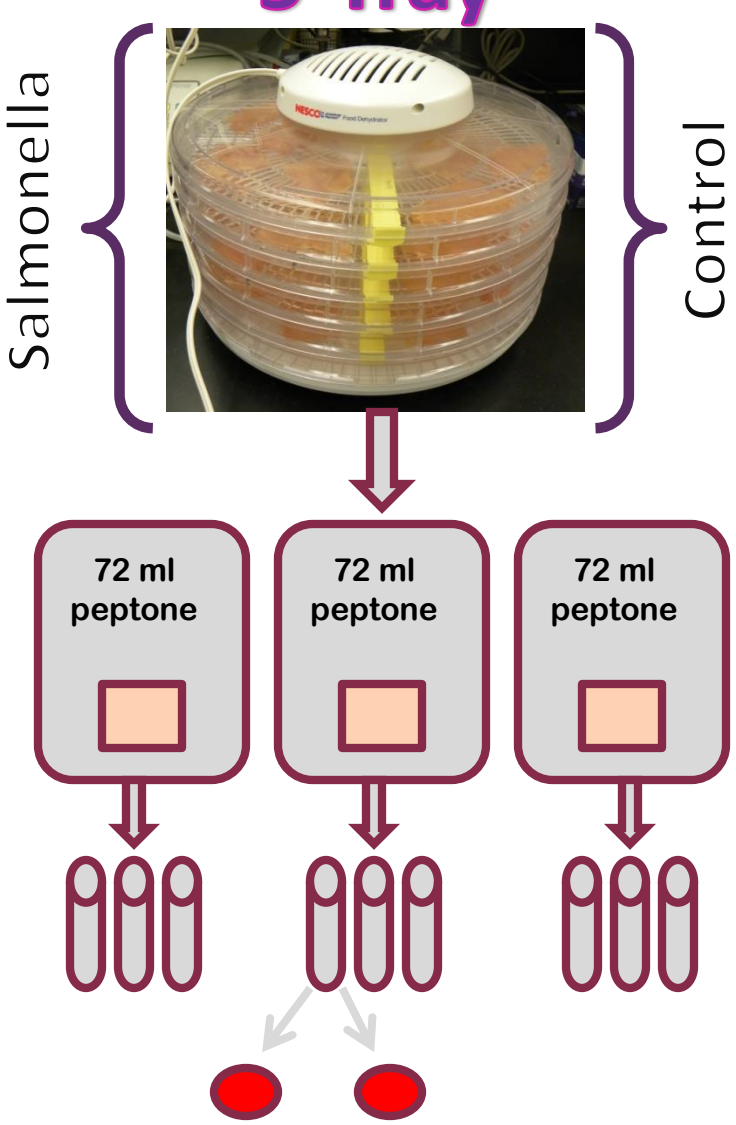
- 3 ml of cocktail (or sterile TSB) per each side
- Air dried for 15 minutes on each side

PROCEDURES

3-Tray

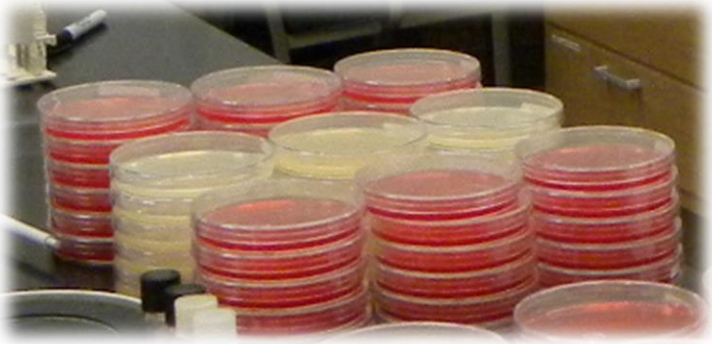


5-Tray



PROCEDURES

- **Xylose Lysine Desoxycholate Agar (XLD)**
  - **Enumeration of *Salmonella***
- **TSA-XLD (TAL)**
  - **25 ml XLD, 14 ml TSA**
  - **Recovery of injured cells**
- **Tryptic Soy Agar (TSA)**
  - **Total Plate Counts**



Design and Analysis

- Completely Randomized Design
- One-way treatment structures at 2 levels
  - 3-Tray Dehydrator Load
  - 5-Tray Dehydrator Load
- 3 replications
- 3 samples/time = repeated measures
- Blocked by day
- Proc Mixed in SAS

RESULTS

Temperatures and RH statistically similar between 3 T and 5T

40 mL H_2O added to 9 weigh boats = 360 mL H_2O

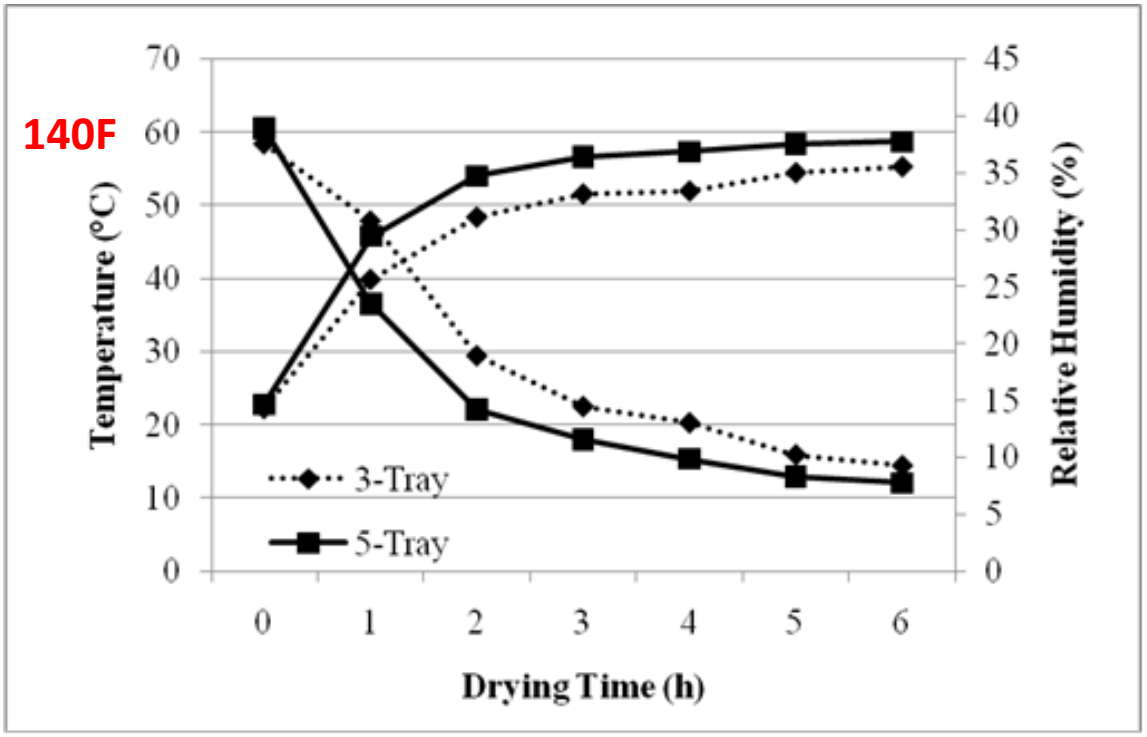


FIGURE 1. *Chamber temperature and relative humidity profiles of three-tray (n =3) and five-tray (n =3) home-style dehydrators. Twelve pieces of chicken were placed on each of trays 1 (top), 3 (middle), and 5 (bottom) for the three-tray dehydrator load and on every tray for the five-tray dehydrator load.*

Dehydrator load[a] and sample location[b] effect on a_w of chicken pieces dried for 3 or 6 h in home-style dehydrators

	Dehydrator Load			Sample Location		
Drying Time	3-tray	5-tray	SE[c]	Tray 1	Tray 5	SE
3 h	0.966	0.967	0.007	0.958	0.975	0.007
6 h	0.724	0.811	0.056	0.720	0.815	0.061

[a]For the 3-tray dehydrator load, 12 pieces per tray were placed on trays 1, 3, and 5 and on all trays for the 5-tray dehydrator load.
[b]Tray 1=top of dehydrator; tray 5=bottom of dehydrator.
[c]SE = standard error.

There was no effect ($P > 0.05$) of dehydrator load on a_w

Shelf Stable Food Safety Criteria
$a_w \leq 0.85$ (vacuum package, anaerobic)
$a_w \leq 0.70$ (aerobic conditions-NOT vacuum packaged)

Dehydrator load[a] effect on mean reduction (log CFU/cm^2) on XLD, TAL-XLD and TSA after 3 and 6 h of drying in home-style dehydrators

	Media Type[b]								
	XLD Enumerate *Salmonella*			TAL-XLD Recovery of injured cells			TSA Total Plate Counts		
Time	3-tray	5-tray	SE[c]	3-tray	5-tray	SE	3-tray	5-tray	SE
3 h	1.8 A[d]	1.3 A	0.3	2.1 A	1.5 B	0.4	1.7 A	1.2 A	0.1
6 h	3.4 A	3.1 A	0.3	2.8 A	2.7 A	0.3	2.7 A	2.5 A	0.7

[a]For the 3-tray dehydrator load, 12 pieces per tray were placed on trays 1, 3, and 5 and on all trays for the 5-tray dehydrator load.
[b]XLD = xylose lysine desoxycholate agar used for the enumeration of *Salmonella*; TAL-XLD = thin agar layer of XLD and TSA used for recovery of injured *Salmonella* cells; TSA = tryptic soy agar used for enumeration of total plate counts.
[c]SE = standard error.
[d] Means with a different letter within a sample time and media type differ by $P < 0.05$.

XLD-Dehydrator load (3T vs 5T)-no effect on *Salmonella* lethality

TAL-XLD-Higher reductions on 3T than 5 T after 3 hours drying

Did not achieve 5-$\log_{10}$ lethality after 6 hours drying

Sample location[a] effect on mean reduction (log CFU/cm^2) on XLD, TAL-XLD and TSA after 3 and 6 h of drying in home-style dehydrators

	Media Type[b]											
	XLD				TAL-XLD				TSA			
	Enumerate *Salmonella*				Recovery of injured cells				Total Plate Counts			
Time	Tray 1	Tray 3	Tray 5	SE[c]	Tray 1	Tray 3	Tray 5	SE	Tray 1	Tray 3	Tray 5	SE
3 h	2.4 A[d]	2.5 A	0.5 B	0.5	2.5 A	1.6 B	1.3 B	0.4	0.9 A	1.6 A	0.9 A	0.3
6 h	4.2 A	3.9 A	1.5 B	0.3	3.6 A	3.0 A	1.8 B	0.3	3.2 A	3.0 A	1.7 B	0.2

[a]Tray 1=top of dehydrator; tray 3=middle of dehydrator; tray 5=bottom of dehydrator.
[b]XLD = xylose lysine desoxycholate agar used for the enumeration of *Salmonella*; TAL-XLD = thin agar layer of XLD and TSA used for recovery of injured *Salmonella* cells; TSA = tryptic soy agar used for enumeration of total plate counts.
[c]SE = standard error.
[d]Means with different letters within a sample time and media type differ by $P < 0.05$.

XLD-Tray 5 had significantly lower *Salmonella* reductions

TAL-XLD-Trays 3 and 5 had significantly lower *Salmonella* reductions after 3 hours drying; and tray 5 still had significantly lower *Salmonella* reductions after 6 hours drying

Article for Reference

Journal of Food Protection, Vol. 74, No. 7, 2011, Pages 1079–1082
doi:10.4315/0362-028X.JFP-11-037

Efficacy of Home-Style Dehydrators for Reducing *Salmonella* on Whole-Muscle Chicken

M. J. D. WEBER,[1,2] E. A. E. BOYLE,[1,3]* K. J. K. GETTY,[1,3] N. M. HARPER,[3] C. G. WEBER,[4] AND T. L. ROENBAUGH[1,3]

[1]*Department of Animal Sciences and Industry,* [3]*Food Science Institute, and* [4]*Department of Human Nutrition, Kansas State University, Manhattan, Kansas 66506; and* [2]*Cargill Meat Solutions, 300 West 1st Street, Wichita, Kansas 67202, USA*

MS 11-037: Received 27 January 2011/Accepted 3 March 2011

ABSTRACT

Home-style dehydrators commonly used by consumers have limited relative humidity (RH) and temperature control. To evaluate the effect of dehydrator load on temperature and RH and subsequent reduction of *Salmonella* on whole-muscle chicken, chicken breasts were rolled and cut into samples (1 to 2 mm thick, 6 by 6 cm^2) and inoculated with a five-strain *Salmonella* cocktail. The samples were allowed to air dry for 15 min and then were loaded into home-style three-tray (3T) or five-tray (5T) dehydrators, with 12 chicken pieces per tray. No difference ($P > 0.05$) was observed in RH or temperature between the 3T and 5T dehydrators. Peak RH was 38% and gradually deceased to 8.5% after 6 h of drying. Temperatures peaked at 57°C after 6 h of drying. Dehydrator load had no effect ($P > 0.05$) on lethality for *Salmonella*. A reduction of 3.3 ± 0.2 log CFU/cm^2 was observed after 6 h of drying. However, sample location affected *Salmonella* reduction ($P < 0.05$). Samples from the bottom tray had a 1.5-log reduction, whereas samples from the top and middle trays had 4.1- and 3.9-log reductions, respectively. The water activity of samples after 6 h of drying was 0.71 ± 0.17 regardless of tray location or dehydrator type. When chicken was dried in home-style dehydrators, increasing the dehydrator load did not increase RH or achieve greater *Salmonella* lethality. Tray location had a significant impact on *Salmonella* lethality. Adequate reduction of *Salmonella* on chicken was not achieved when chamber temperatures were below 57°C with limited RH throughout drying.

MEAT SCIENCE K STATE

SUMMARY

- Important to know water activity of finished product
- Need thermal processing conditions- time/temperature/relative humidity that can achieve a 5-$\log_{10}$ reduction in Salmonella
- If using a dehydrator, may have to re-engineer to provide for introduction of humidity and allow for humidity control

IMPLICATIONS

- **"At home" or small scale dehydrators may not generate enough humidity to ensure lethality of pathogens such as *Salmonella***
- **Increasing dehydrator load or adding water to the bottom of dehydrators may not increase humidity and yield a 5-$\log_{10}$ reduction in pathogens such as *Salmonella***

Contact Information

Dr. Liz Boyle
249 Weber Hall
Department of Animal Sciences and Industry
Kansas State University
Manhattan, KS 66506
lboyle@ksu.edu
785-532-1247