

Feed is Food: Occurrence of Salmonella in Pet Food Demonstrating the Need for Routine Surveillance for Zoonotic Disease Causing Pathogens in Animal Feed

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ABSTRACT

Salmonella causes over 1.2 million human illnesses and 400 deaths annually in the U.S. A 2012 random surveillance sampling of dry dog and cat food as well as livestock feed by the Michigan Department of Agriculture and Rural Development lead to the recovery of *Salmonella* Infantis from an unopened bag of dry dog food. This organism was ultimately linked to 52 human illnesses in 21 states and Canada through the PulseNet bacterial subtyping network, prompting a recall of the specific lot number. Follow up samples of dry pet food from the same manufacturer resulted in 8 subsequent recalls, totaling over 30,000 tons of dry pet food recalled. Surveillance sampling in 2013 has already identified 3 bags of dry cat food contaminated with *Salmonella* Liverpool, and 3 livestock feed mixes contaminated with *Salmonella* SaintPaul and/or *Salmonella* Liverpool. Two additional pet foods, one dog food and one cat food, have *Salmonella* isolates with PFGE patterns matching the previous 2013 samples. These organisms have not been linked to human illness, however their recovery from animal feed demonstrates the need for surveillance sampling of pet foods and livestock feed to reduce the occurrence of salmonellosis in humans, household pets and livestock.

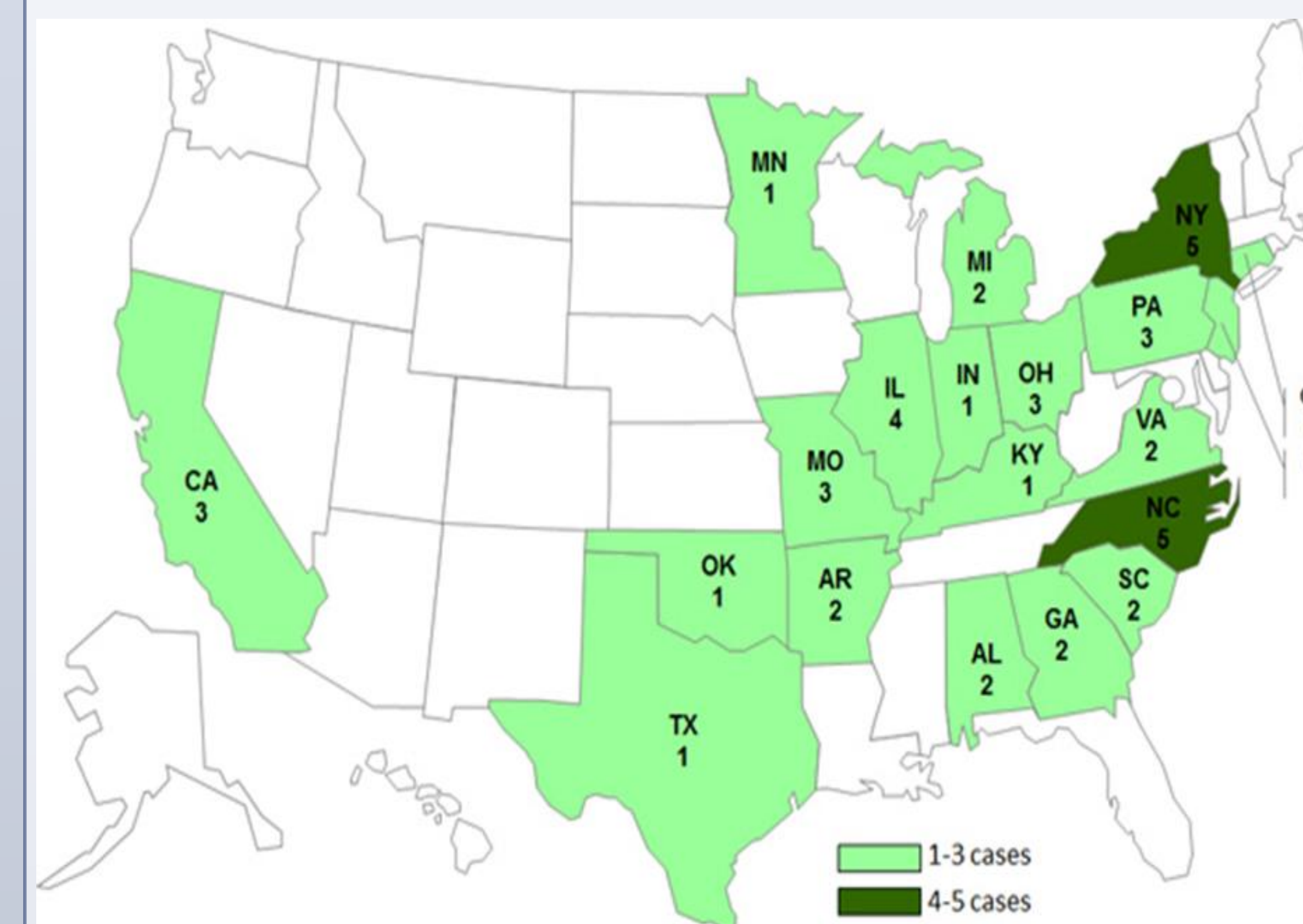
ASEPTIC SAMPLING of PET FOOD



METHOD

An unopened bag of dry dog food collected by a Michigan Department of Agriculture and Rural Development (MDARD) Pesticide and Plant Pest Management Division inspector on March 14, 2012 was sent to the microbiology section of MDARD's Geagley Laboratory. The sample was tested using the following method. A 25 gram sample was aseptically removed from the previously unopened bag of dry dog food and stomached for 2 minutes in 225 mL of lactose pre-enrichment broth. Following a 22±2 hour overnight incubation at 35±2°C, the enriched sample was swirled to mix and 0.1 mL was transferred to 10 mL of Rappaport-Vassiliadis (RV) enrichment broth. In parallel, 1 mL was transferred to 10 mL of tetrathionate (TT) broth. Both enrichment broths were vortexed to mix and incubated for 24±2 hours in a 42±2°C circulating water bath. Following the overnight enrichment, 1 mL of each enrichment broth was vortexed, then transferred to separate 10 mL tubes of M-broth and incubated for 6 hours in a 42±2°C water bath. After incubation, all M-broth tubes were vortexed and 250 mL of the M-broth containing RV and 250 mL of the M-broth containing TT were transferred to a single bioMerieux VIDAS® SLM strip. The strips were heat for 15±1 minutes in Heat and Go® blocks at approximately 100°C, then allowed to cool at room temperature for approximately 10 minutes. The strips were appropriately labeled and placed into the VIDAS with a Solid Phase Receptacle (SPR) and the instrument started. Approximately 45 minutes later, the relative fluorescent value (RFV) was calculated by the instrument and indicated a presumptive positive result. The RV, tetrathionate and both M-broths were sub-cultured to bismuth sulfite (BS), xylose lysine desoxycholate agar (XLD) and Hektoen agar and 5% Sheep Blood Agar (5% SBA). The plates were incubated at 35±1°C for 24±2 hours. Typical colonies, glossy black on Hektoen and pink with or without black centers on XLD, were selected for biochemical testing. Triple sugar iron agar (TSI), lysine iron agar (LIA) and urea were inoculated and the following day showed typical alkaline over acid with H₂S and gas (K/A/H₂S + gas) on TSI, alkaline over alkaline with H₂S (K/K/H₂S) on LIA and negative urea. The 5% SBA was used to inoculate a bioMerieux Gram Negative (GN) card, producing a *Salmonella* spp. identification after 5 hours. The isolate was subbed to a tryptic soy agar (TSA) slant and transferred to the Michigan Department of Community Health where pulse field gel electrophoresis (PFGE) and sero-typing were performed. The organism was identified as *Salmonella* Infantis. The PFGE pattern was uploaded to the CDC PulseNet data base where it was compared to previously identified *Salmonella* to determine if it matched any outbreak strains.

EPIDEMIOLOGY



Persons infected with outbreak strain of *Salmonella* Infantis, by state
Map used courtesy of CDC

The surveillance sample of pet food collected on March 14, 2012, was confirmed by the Michigan Department of Agriculture and Rural Development to be contaminated with *Salmonella* spp. and sero-typed by the Michigan Department of Community Health (MDCH) as *Salmonella* Infantis. MDCH uploaded the Pulse Field Gel Electrophoresis (PFGE) pattern to the CDC PulseNet data network on April 2, 2012. A search of the PulseNet data base revealed matches with several human salmonella illnesses across the United States whose source of infection was unknown. Once the source of the outbreak was discovered, additional product testing from the same production site was conducted by the Ohio Department of Agriculture, the South Carolina Department of Agriculture and the FDA resulting in additional *Salmonella* Infantis positive samples. By late July 2012, 47 individuals were reported to be infected with outbreak strain of *Salmonella* Infantis in 20 states plus 2 in Canada. The age range of patient-cases was <1 to 82. 10 individuals were hospitalized with no deaths reported. Numerous cats and dogs were sickened with multiple animal deaths reported. An initial voluntary recall was announced by the manufacturer on April 6, 2012. As additional products were implicated by positive samples during the summer of 2012, the recall was expanded 8 times. Ultimately, 17 brands of dry dog and cat food were included in the recalls, involving greater than 30,000 tons of dry pet food. An illness from a non-outbreak strain of *Salmonella* produced by the same manufacturer was reported in Canada during the outbreak.

2013

In 2013, eight recalls have been issued for dog and cat foods due to the potential to be contaminated with *Salmonella*. This covers more than 120 different pet food products. As of August 1, 2013 no human illnesses have been associated with these products.

Surveillance samples of dry pet food collected and tested by the Michigan Department of Agriculture and Rural Development in March, 2013, lead to the recovery of *Salmonella* Livingstone and a subsequent recall. Additional samples from Michigan, Georgia and FDA lead to expanded recalls.

CONCLUSIONS

Transmission of bacterial pathogens from pet food to humans occurs through both direct and indirect routes. The most common forms of direct contact with pet food are human ingestion of the pet food, hand to mouth following direct contact with the pet food or contact with an infected pet or infected pet feces. Indirect transmission can occur through contact with the pet, pet habitats, including bedding and eating area and cross-contamination of human food with pet food. Hand washing is essential following contact with pet food, symptomatic and asymptomatic pets and pet feces. Extra precautions for persons immuno-compromised, young children and the elderly are strongly advised to prevent severe illness. This outbreak underscores the need for surveillance pet food sampling.

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FDA: Investigation of a Multi-State Outbreak of *Salmonella* Infantis Linked to Dry Dog Food
<http://www.fda.gov/Food/FoodSafety/CORENetwork/ucm302904.htm>

CDC: Multistate Outbreak of Human *Salmonella* Infantis Infections Linked to Dry Dog Food
<http://www.cdc.gov/salmonella/dog-food-05-12/index.html>

BAM Online, 8th Edition, 2001, Chapter 5, *Salmonella*
www.cfsan.fda.gov/~ebam/bam-5.html