**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.

**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 tetradionate (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 at 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, tetradionate and both M-broths were subcultured 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 were 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.

**EPIEMIOLOGY**

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 manufacturer 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.

**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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