

OREGON PUBLIC HEALTH DIVISION • DEPARTMENT OF HUMAN SERVICES

RECENT MULTI-STATE OUTBREAK INVESTIGATIONS

“A good investigator must know every possible type of surveillance. It is easy to learn this. The important rule to follow is never to lose your head. Be calm, cool, and collected and use plain common sense.”¹

FOODBORNE OUTBREAKS are clusters of cases linked to consumption of a common food. From July 2009 through June 2010, local and state public health agencies reported 34 foodborne outbreaks in Oregon. The pathogen was confirmed in 24 clusters: *Salmonella* (N = 13), norovirus (9), *Escherichia coli* O157:H7 (1), and *Listeria monocytogenes* (1). Based on clinical histories, other outbreaks were likely caused by noroviruses (3), *Clostridium perfringens* (2), and *Staphylococcus aureus* (1); there was insufficient information to guess for 4. A specific vehicle was identified in 14 outbreaks (41%).

A subset of foodborne outbreaks involve residents of multiple states; we call these “multi-state” outbreaks. Most are identified by laboratory subtyping of bacterial pathogens, e.g., by pulsed-field gel electrophoresis (PFGE). Multi-state outbreaks are of particular interest, because almost always they are caused by the distribution of contaminated commercial food products. During this period we participated in 8 such investigations. Vehicles were identified for 5; 2 investigations are still active; 1 (*E. coli* O157) was a total bust. Snapshots of the more successful investigations are presented below.

LISTERIOSIS

Listeriosis is a potentially devastating infection for the immunocompromised or pregnant host. Raw milk products, especially illegally manufactured Mexican-style *queso fresco*, are a common source, particularly among Hispanic women and their newborns. In January 2010, *queso fresco* made by a small Washington firm was linked to an outbreak of listeriosis, with 5 cases identified in Oregon (moms of Mexican origin, their newborns, and an immunocompromised woman) and at least 1 in Washington. Although made from

pasteurized milk, numerous deficiencies identified at the cheese-making facility led to cross-contamination of finished product. A recall was ordered, along with remedial training and structural modifications at the manufacturer’s facility.

SALMONELLA I

From July through September 2009, more than 125 persons in 28 states had PFGE-matching *Salmonella* Typhimurium infections. After many false starts, the investigation finally implicated shredded iceberg lettuce, but by the time that happened, the outbreak was long over, so there wasn’t much point to “warning” consumers. The lettuce was everywhere: the same brand went to—*inter alia*—Subway, Quizno’s, McDonalds, Burger King, Taco Bell, Sysco,... Indeed, it was hard to find consumers who weren’t at least potentially exposed. Ubiquitous and nondescript foods are difficult.

SALMONELLA II

After years of déjà vu experiences, sprout-associated outbreaks are no longer much of a professional challenge. In contrast to lettuce, background sprout consumption rates are relatively low (4%–7%), meaning that even a single salmonellosis or *E. coli* O157 case reporting sprout consumption should raise a red flag. We were particularly struck by the case of a 4-month-old infant with a history of only 4 non-lacteal per os exposures: banana, avocado, sweet potato, and alfalfa sprouts. The latter had been specifically recommended by the family naturopath as a good starter food.* An email query to epidemiologists in neighboring states turned up a nascent investigation of matching *S. Newport* infections in California, where already 3 of 9 cases had reported eating sprouts—and only 5 had been specifically asked. It was all over but the shouting.

Over the next few days, interviews in several states confirmed the connection to a grower in southern California, who quickly recalled the offending product. Ultimately, some 44 outbreak-associated cases were confirmed in 11 states.

* We do not concur with this advice.

The grower allegedly followed all FDA-recommended procedures; but those procedures (e.g., pre-soaking seeds in bleach; testing draining irrigation water) reduce but do not eliminate the threat of illness. If you are concerned about these risks, don’t eat sprouts.

SALMONELLA III

On May 28, 2010, CDC epidemiologists flagged a cluster of *S. Chester* cases—17 in 10 states. Chester is a rare serotype. The first of 2 Oregon cases was identified 3 days later. Almost from the outset, most participating states used Oregon’s standard hypothesis-generating “shotgun” questionnaire—a (40–60 minute) item-by-item survey. By June 10, 11 interviews had been completed, and suspicions focused on frozen boxed entrees (reported by 7 [64%]); 6 persons specifically named the Marie Callender brand produced by ConAgra.

Once a specific hypothesis emerges, investigations can move quickly. Within 24 hours it was obvious that Marie Callender entrees were the problem, and the only question was how narrowly the circle could be drawn. Many consumers ate multiple varieties, and had poor recall and worse documentation of which ones when. “Cheesy Chicken & Rice” was clearly part of the problem, but was it all of it? The fate of the entire multi-million dollar product line hung in the balance. On June 17, ConAgra pulled the plug on Cheesy Chicken & Rice.

At last count, 44 cases had been identified from 18 states. PFGE-matching *S. Chester* isolates had been cultured from Cheesy Chicken & Rice packages manufactured on 3 dates between July 2009 and March 2010. At this writing there has been no official word on what ingredient or process failure underlies this outbreak.

SALMONELLA IV

On July 19, 2009, a 61-year-old Multnomah County man became ill with what turned out to be salmonellosis; the isolate was serotyped as *S. Montevideo*. The PFGE pattern was novel for Oregon, but

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nationwide small numbers of matching cases had been identified for years.

The second Oregon case was 52. A resident of a different county, he became sick 8 days later. Two matching cases do not necessarily an outbreak make. Some patterns are common, and matches do not inherently indicate a common source. Moreover, given the multiplicity of potential exposures for bugs as cosmopolitan as *Salmonella*, small numbers of cases are difficult to link convincingly. Still, from the tiny acorn springs the mighty oak.

A national query in mid-August turned up a handful of matches. Oregon and Washington cases were “shotgunned” and analyzed together, albeit with little to show for it. While no additional Oregon cases were identified until late October, by September 21 a total of 36 cases had been flagged nationally, with the largest numbers in Washington, Massachusetts, and Illinois. Different states made more or less effort to investigate. California noted a localized subcluster among Latinos in the San Jose area, but this did not resonate in other states. By the beginning of December, the CDC noted with alarm that, far from petering out, the outbreak seemed to be accelerating. A long series of multi-agency conference calls ensued. Additional states began using the Oregon questionnaire, and by December 17—with now 165 matching cases in 37 states—questionnaire data were available from...30 people. Yes, it was as disappointing as it sounds.

Poor response rate notwithstanding, 30 interviews usually yield some promising hypotheses. This time, however, little emerged from the fog. There were vague intimations that people seemed to like “spicy food” and BBQ meats. In addition to the San Jose group, several subclusters had emerged: a wedding party in Arizona and a bunch of hunters from South Caro-

lina, notably; but epidemiologists were teased with incomplete food histories.

Meanwhile, up in Washington, epidemiologists had noted that 7 of 8 cases reported shopping at Costco. Now Costco is undeniably popular in Washington, its home state, but perhaps not *that* popular. This suggested the possibility that Product X was sold by the warehouse chain. Since Costco is only open to “members,” and all member purchases are recorded, it is relatively simple (with the member’s permission and Costco’s cooperation) to retrieve those purchase records. It seemed worthwhile to comb those purchase records to see if the cases had bought anything in common. They had.

After months of feckless efforts, the vehicle emerged with startling suddenness: Daniele brand “Italian-style” meats and salami. It was January 14, 2010. Within hours of the Washington discovery, investigators in other states were able to confirm the exposure for many (but not all) cases. Rhode Island authorities swooped into the factory, launching the second phase of the investigation, which would continue for months, and eventually identify the original sin as imported black and red pepper contaminated with multiple *Salmonella* serotypes. A variety of Daniele products were recalled. Months later several pepper-containing spice mixes were also recalled, although most of the other products made with the same pepper—consumption of which probably explains most of the “non-Daniele” cases—were never publicly identified.

While ultimately successful—a culprit was identified, and contaminated product was recalled—this was not a model investigation. The investigation sputtered along for months, with interest and effort waxing and waning, as the body count continued to increase. Even after a con-

certed investigation began anew in early December, it was another 6 weeks before the Daniele products were fingered. Interestingly, almost from the outset cases were asked specifically about consumption of “pepperoni, salami, prosciutto ...”, but only 29% answered yes, which raised no eyebrows.* It wasn’t until January 24 that a recall began. Many products made with the same contaminated spices were never recalled. It has been speculated that some of the matching infections from the months and years before the recognized outbreak might also have been pepper-related.

PARTING REFLECTIONS

Outbreak investigation is both art and science, and both can be messy. Defining success is somewhat arbitrary, and often self-serving. Unsuccessful investigations are rarely advertised. We try to learn from our mistakes, but sometimes find it easier to make excuses rather than find good explanations. Resources will always be limited. While we can’t go to the mattresses with every cluster, there is still regret at missed opportunities. In any event, we are confident of future opportunities to hone our craft.

FOR MORE INFORMATION

See Acute and Communicable Disease Prevention; www.oregon.gov/DHS/ph/acdl/outbreak/outbreak.shtml.

REFERENCE

1. Dixon FW. *Hardy Boy’s Detective Handbook*. New York: Grosset & Dunlap 1959: 242–43.

* This question has since been revised to split off pepperoni, >95% of which is roasted on pizzas, and to emphasize salami, prosciutto, or “similar” Italian-style meats. That said, it remains a mystery why so few people answered yes to this question originally; salami just doesn’t seem like one of those forgettable foods (e.g., tomatoes, spices, lettuce) that we fret about.