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OREGON PUBLIC HEALTH DIVISION • OREGON HEALTH AUTHORITY

STRAWBERRIES, DEER AND OTHER INVESTIGATIONS

Entropy is a principle of thermodynamics that can be metaphorically applied to medical, behavioral, and sociological phenomena to caution that ordered systems are predisposed to break down. Murphy's Law can be interpreted as a not-too-tortured example, and for that matter Shelley's *Ozymandias*.

We live in what Stanier called "a microbial world."[1] We are surrounded by, and indeed inhabited by, an enormous diversity of bacteria, viruses, parasites, and who knows what else[2] — some tiny fraction of which occasionally seems to hasten our arrival at a very disordered state. One could argue that outbreaks of infectious diseases are anomalies. After all, most of us are not at any given time sick, much less part of a group of persons with a common source of illness. But while the state of being part of an outbreak or epidemic may be the exception, the occurrence of outbreaks is itself part of the natural order. Were our mission defined as the eradication of disease in general, or outbreaks in particular, we would be doomed to failure; there are just too many of them. But if our goal is to investigate outbreaks, to learn from them, and whenever possible to limit their impact on human health — well, then, there is some hope.

OUTBREAK IDENTIFICATION

Even in these troubled economic times, outbreak identification and investigation remain a mainstay of health department activities. Oregon public health agencies recorded around 178.9 outbreaks annually in the decade from 2002–2011. Some "outbreaks" are more arbitrarily defined than others, e.g., a general increase in the number of pertussis cases in County X, but the notion of an "outbreak" remains a useful construct, particularly for the enteric diseases.

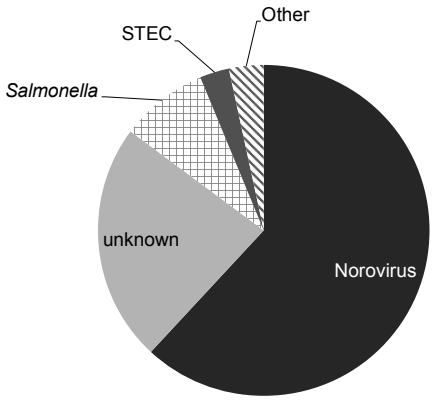
At least since the days of John Snow,[3] diarrhea and vomitus have been the bread and butter of public health epidemiologists. Indeed, 1,565 (87%) of the 1,789 outbreaks logged in Oregon during 2002–2011 were enteric or foodborne, and those will be the focus of this issue of this *CD Summary*.*

IT'S IN THE FOOD

The most common etiology of reported† foodborne/enteric outbreaks over the past decade has been the norovirus — responsible for at least 62%. (We say "at least" because 23% of the clusters were officially "unknown" — most of them with no specimens tested for etiology — and a good chunk of these probably were also noroviral.) Coming in a very distant second place was *Salmonella*, the cause of 9% of the outbreaks. Shiga-toxigenic *Escherichia coli* (STEC), primarily *E. coli* O157:H7, was the only other pathogen to crack the 2% threshold (Figure). The one- and two-hit wonder etiologies included *Listeria, Campylobacter*, sapovirus, *Clostridium perfringens, Staphylococcus aureus*, and *Cannabis sativa.*

About half (52%) of all reported outbreaks can be described as "nursing home Norwalk," i.e., norovirus outbreaks occurring in nursing homes, assisted living centers, and similar institutions. This is simultaneously a tribute to improved reporting from these venues, the relative ease of outbreak recognition in somewhat closed and well-monitored populations, and the frequency with which norovirus strikes these populations. Foodborne noroviral outbreaks do occur in these settings, but they are relatively uncommon: the great majority appear to propagate primarily, if not exclusively, by person-to-person spread. Local or state health department staff work with affected institutions to verify the etiology and implement control measures (e.g., enhanced environmental cleaning, restricted admissions and visitations, cohorting) to limit the propagation of these epidemics.

Figure. Foodborne/enteric outbreak pathogens, Oregon 2002–2011 (N=1,565)



Institutional outbreaks generally occur outside the limelight, as do most outbreaks that can be described as "event-centered," by which we mean clusters that can be linked to exposure at a definable event or location — for example, a restaurant meal, a wedding reception, or swimming in a neighborhood pool. The nature of the event defines the range of potential exposures (e.g., the menu) that the epidemiologist must sift through in search of the cause.

The outbreaks that make the headlines‡ tend to be those that are caused by contaminated products that are widely distributed. These are a small but disproportionately important minority of the total. Particular horrific recent examples (fortunately not affecting Oregonians) include last year's listeriosis outbreak affecting consumers of cantaloupe from a Colorado farm,[5] with at least 30 deaths; and the *E. coli* O104:H4 outbreak caused by contaminated fenugreek sprouts that wracked

* For the most part, the terms are synonymous; a very small proportion of foodborne outbreaks are not gastroenteritis — e.g., scombroid, botulism.

† A great epidemiologist once said "There are known knowns. There are things we know we know. We also know there are known unknowns. That is to say, we know there are some things that we do not know. But there are also unknown unknowns. The ones we don't know we don't know."[4] We will not continue to harp on it, but the statistics we report here are for the outbreaks that we know about. We assume that there are others — many others.

‡ To use an increasingly quaint metaphor

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Germany and killed more than 50.[6] Such outbreaks are commonly first recognized from the accumulation of "matching" bacterial isolates — matching by one or more subtyping schema that may include serotyping or pulsed-field gel electrophoresis (PFGE). Usually, individual cases appear initially to be "sporadic"; neither the patients nor their physicians have any indication that their illness is directly related to any other. (In contrast, event-centered outbreaks are generally recognized as such and reported by the victims themselves. "A bunch of us went to this restaurant for lunch and now we're all sick....")

STRAWBERRIES, DEER AND O157

Here in Oregon, last year's *E. coli* O157:H7 outbreak linked to strawberry consumption provides a great illustration of a contaminated product investigation. Late summer is the peak season for O157, and new cases are typically reported every few days. In August 2011, two cases of O157 were diagnosed in a wife and husband in Clatsop County. When their PFGE results became available a few days later, they matched each other (no surprise), but also several newly reported cases in Washington County and another case reported 10 days earlier.

Cases were interviewed: all but one case recalled consumption of locally grown strawberries that had been purchased at farmers' markets or roadside stands. A case-control study corroborated these findings — there was a strong association (matched odds ratio = 20) with consumption of strawberries from these non-grocery-store sources. Public health and food safety inspectors from the Oregon Department of Agriculture visited all the points of strawberry sale identified by cases, and learned that every location had sold berries from "Farm A."

While small (15 cases), the outbreak took a terrible toll. Six persons were hospitalized, including four with hemolytic uremic syndrome or thrombotic thrombocytopenic purpura, two of whom died. Most cases (and both who died) were older adults; the median age was 68.

At Farm A, we found that the strawberry fields harvested during the time of interest were heavily contaminated with deer droppings. Deer were observed in the fields in broad daylight. On initial sampling, 10 of the 50 deer fecal samples collected were culture-positive for O157; all matched the outbreak PFGE pattern. Fifty-four samples of soil and plant fragments that did not contain visible deer pellets were negative.

Deer[7] and elk (OPHD, unpublished data) have been previously identified as sources of O157, a pathogen more often associated with ruminant livestock (cattle, sheep, goats). Although previously suspected (e.g., the Odwalla apple juice outbreak[8]), this is the first time that deer have been confirmed as the source of a produce-caused outbreak. Some experts§ believe that deer may play a larger rôle than is currently appreciated in the maintenance and dissemination of O157 and perhaps other STEC in the environment.

The 2011 outbreak ended because the strawberry season had already played out, and the only items to be recalled were frozen berries. We advised consumers to discard any berries potentially from this source; no additional cases linked to strawberry consumption have been identified in the year since. Farm A did not grow strawberries in 2012.

The outbreak illustrates that locally grown produce is not magically exempted from food safety risks. Keeping deer out of fields is easier said than done, and other Good Agricultural Practices (including no-harvest zones around obvious fecal deposits and avoidance of heavily contaminated fields) may be the best fallback. Washing produce in general (and Oregon strawberries in particular) is not very effective at pathogen removal.

§ Well, at least the author of this article.

REFERENCES

1. Stanier RY, Ingraham JL, Wheelis ML, Painter PR. The Microbial World. Englewood Cliffs, NJ: Prentice Hall, 1986.
2. The Human Microbiome Project Consortium. Structure, function and diversity of the healthy human microbiome. Nature 2012;486:207–14.
3. Snow J. On the mode of communication of cholera. 2nd edition. London: Churchill;1855.
4. www.youtube.com/watch?v=GiPe1OiKQuk
5. CDC. Multistate outbreak of listeriosis linked to whole cantaloupes from Jensen Farms, Colorado. 2011. www.cdc.gov/listeria/outbreaks/cantaloupes-jensen-farms/120811/index.html, accessed 27 Jun 2012.
6. Buchholz U, Bernard H, Werber D, et al. German outbreak of *Escherichia coli* O104:H4 associated with sprouts. N Engl J Med 2011;365:1763–70.
7. Keene WE, Sazie E, Kok J, et al. An outbreak of *Escherichia coli* O157:H7 infections traced to jerky made from deer meat. JAMA 1997;27:1229–31.
8. Cody SH, Glynn MK, Farrar JA, et al. An outbreak of *Escherichia coli* O157:H7 infection from unpasteurized commercial apple juice. Ann Intern Med 1999;130:202–9.

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