

TOPIC COLLECTION: LISTERIOSIS AND OTHER FOOD-BORNE INFECTIOUS DISEASES

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Letter from the Editor

In recent years, two types of infection seem to be on the rise. Zoonosis is infection carried in animals and transferred to human by direct contact (e.g., rabies, perhaps COVID-19) or via an insect vector, such as mosquitoes (e.g., Zika virus, West Nile virus, Lyme disease). This increase appears to be associated with climate change and ease of travel, which allow or promote the migration of insect species to new areas.

The other burgeoning type of infection is food-borne. One common denominator in large food-borne outbreaks is the growth and consolidation of agribusiness, which furnishes edibles to large, disbursed populations. Instead of contamination of a dozen people in a single town served by a local farm, we see dozens, if not hundreds, of people infected by eating contaminated meat or produce from one grower or distributor. Emerging food-related organisms can also be seen when foods are eaten raw or are introduced into an area where they are not indigenous or have not previously been in wide use. In these pages, we report on four examples of food-borne infection and introduce potential remedies.

In *Outbreak of Listeriosis in South Africa Associated with Processed Meat*, reported in the *New England Journal of Medicine*, investigators describe a listeriosis outbreak in a province in South Africa in which they identified 937 cases, many in pregnant or immunocompromised patients, that was effectively traced to a single distributor of a bologna-like meat product (polony). The investigators made use of genetic analysis of the offending *Listeria monocytogenes* organism to identify the source. The outbreak ceased with the recall of the product.

NEJM Journal Watch summaries cover other food-borne infections. *Shewanella haliotis: An Emerging Infection* describes the emergence of a gram-negative bacterium previously found primarily in Asia in the gut of abalone that has apparently been introduced to the U.S. and caused abscess disease in a man who ate raw salmon.

In a similar scenario, a bacterium, *Vibrio vulnificus*, indigenous to brackish waters along the Southeast coast of the U.S., seems to be moving northward and has caused systemic infection in patients with a history of crabbing or eating raw crab.

Finally, a warning for next Thanksgiving. *Salmonella Reading*, an unusual pathogenic species, caused 356 food poisoning cases in 42 states. The food source was turkey, in undercooked human food and raw dog food, but no geographic or production source could be identified.

When considering both types of new and threatening disease, food-borne and zoonotic, a bright side is our ability to diagnose the offending etiologic agents rapidly and with great precision, which, coupled with increasingly connected and cooperating health departments, is enabling definition, sourcing, and the development of preventive and therapeutic measures.

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ORIGINAL ARTICLE

Outbreak of Listeriosis in South Africa Associated with Processed Meat

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ABSTRACT

BACKGROUND

An outbreak of listeriosis was identified in South Africa in 2017. The source was unknown.

METHODS

We conducted epidemiologic, trace-back, and environmental investigations and used whole-genome sequencing to type *Listeria monocytogenes* isolates. A case was defined as laboratory-confirmed *L. monocytogenes* infection during the period from June 11, 2017, to April 7, 2018.

RESULTS

A total of 937 cases were identified, of which 465 (50%) were associated with pregnancy; 406 of the pregnancy-associated cases (87%) occurred in neonates. Of the 937 cases, 229 (24%) occurred in patients 15 to 49 years of age (excluding those who were pregnant). Among the patients in whom human immunodeficiency virus (HIV) status was known, 38% of those with pregnancy-associated cases (77 of 204) and 46% of the remaining patients (97 of 211) were infected with HIV. Among 728 patients with a known outcome, 193 (27%) died. Clinical isolates from 609 patients were sequenced, and 567 (93%) were identified as sequence type 6 (ST6). In a case-control analysis, patients with ST6 infections were more likely to have eaten polony (a ready-to-eat processed meat) than those with non-ST6 infections (odds ratio, 8.55; 95% confidence interval, 1.66 to 43.35). Polony and environmental samples also yielded ST6 isolates, which, together with the isolates from the patients, belonged to the same core-genome multilocus sequence typing cluster with no more than 4 allelic differences; these findings showed that polony produced at a single facility was the outbreak source. A recall of ready-to-eat processed meat products from this facility was associated with a rapid decline in the incidence of *L. monocytogenes* ST6 infections.

CONCLUSIONS

This investigation showed that in a middle-income country with a high prevalence of HIV infection, *L. monocytogenes* caused disproportionate illness among pregnant girls and women and HIV-infected persons. Whole-genome sequencing facilitated the detection of the outbreak and guided the trace-back investigations that led to the identification of the source.

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Shewanella haliotis: An Emerging Infection

This organism, previously primarily in Asia, was isolated in 2018 from a New York patient who had ingested raw fish.

Shewanella haliotis is a gram-negative rod that grows in small yellow-brown mucoid colonies and was first identified from abalone gut flora in 2007 and has been isolated in China, Japan, South Korea, and Thailand. In December 2018, an 87-year-old man was evaluated at a Flushing, New York, hospital for lower-right abdominal pain. Computed tomography showed appendiceal abscesses, and percutaneous drainage of the abscesses revealed a cloudy jelly-like substance. An organism was isolated and identified by 16S ribosomal sequencing as *Shewanella haliotis*. Drug testing indicated susceptibility to aminoglycosides, fluoroquinolones, broad-spectrum cephalosporins, and some penicillins. Empiric treatment with intravenous piperacillin-tazobactam was successful, and the patient was discharged with a prescription for oral amoxicillin-clavulanic acid. Follow-up at day 13 showed good recovery.

This patient's only probable exposure was ingestion of raw salmon 10 days before illness onset, an incubation period consistent with previous reports (3–49 days). The authors note that risk factors for infection have been identified in only about half of cases, usually in marine environments and involving contamination of cultivated shellfish. Other *Shewanella haliotis* isolates have shown variable antibiotic resistance patterns, but isolates in an outbreak of 13 cases in Martinique reported in 2013 were sensitive to the antibiotics used in this case.

COMMENT

Although this is the first report of infection with *Shewanella haliotis* in the U.S., the widespread ingestion of raw fish and shellfish (some of which is imported from Asia) in this country would predict the much more common emergence of this organism in the future.

— **Stephen G. Baum, MD**

Liu D et al. First reported case of Shewanella haliotis in the region of the Americas — New York, December 2018. MMWR Morb Mortal Wkly Rep 2019 Dec 20; 68:1168. (<https://doi.org/10.15585/mmwr.mm6850a5>)

Dangerous Bacterium Moves Up the East Coast

Vibrio vulnificus, a bacterial denizen of brackish water, recently caused severe infections in areas north of its usual habitat.

Several types of infectious agents have emerged in recent years. Some, like *Candida auris*, are newly recognized; others appear in new geographic areas either because their vector (e.g., a mosquito or tick species) invades new territory or, as seems to be the case with *Vibrio vulnificus*, the environment necessary for replication changes or expands. *V. vulnificus* grows in warm brackish water along the Southeast Coast of the U.S. and was previously found as far north as the Chesapeake Bay. Now, authors report 5 cases of *V. vulnificus* infection in patients exposed to water and shellfish in Delaware Bay, a cooler body of water north of Chesapeake Bay.

Patients ranged in age from 38 to 64 years, and four had underlying medical conditions that might have predisposed them to infection. Three had hepatitis, one had Parkinson disease, and one had type 2 diabetes and morbid obesity. Four patients had a history of crabbing or cleaning crabs in Delaware Bay with resultant trauma to extremities. One worked in a seafood restaurant. All patients presented with erythema, tenderness, and swelling in the area of skin trauma that rapidly progressed to necrotizing fasciitis, and all required emergency debridement or fasciotomy. All patients had admission blood or wound cultures positive for *V. vulnificus*; one developed shock with disseminated intravascular coagulopathy and required four-limb distal amputation. One patient died.

COMMENT

The authors reasonably attribute the northward migration of this pathogenic bacterium to the well documented warming of waters along the East Coast. Given this association, healthcare providers along the New Jersey coast should be on the lookout for similar presentations. Fasciitis, no matter what the etiology, requires vigorous surgical intervention. — **Stephen G. Baum, MD**

King M et al. Vibrio vulnificus infections from a previously nonendemic area. Ann Intern Med 2019 Jun 18; [e-pub]. (<https://doi.org/10.7326/L19-0133>)

Contaminated Turkey — Have a Happy, Healthy Holiday Table

Salmonella Reading, an unusual pathogen, gained wide access to human and animal consumption at many points in the food distribution cycle.

In 2018–2019, a combined effort by U.S. government entities identified 356 food-poisoning cases caused by a rare serotype of *Salmonella* (*S. Reading*) in 42 states and Washington, DC. No point source was identified, but the organism was found in raw turkey products such as ground turkey and raw pet food, and in live turkeys.

In an illustrative study, the Minnesota Department of Health, using pulsed-field gel electrophoresis (PFGE), found identical isolates across a four-patient outbreak in 2018. The source in one patient was ground turkey, and two patients lived in a household where pets ate raw turkey pet food. In another two outbreaks, one in Iowa and one in DC, 152 people became ill, 51 of whom had identical isolates by PFGE. Whole turkey and boneless roast turkey were the culprits.

Of 300 patients with available information, 44% were hospitalized and one died. Many patients reported turkey exposure in the week before becoming ill, including ingestion of inadequately cooked or poorly stored turkey, pets eating raw turkey pet food, and work by self or family member in turkey raising or processing facilities. In all, *S. Reading* was identified in 178 samples of raw turkey from 24 slaughterhouses and 14 processing plants in 21 states and from live turkeys in several states.

COMMENT

These outbreaks and the wide distribution of turkey sources again demonstrate the importance of properly preparing and storing this food, especially popular at this time of year. Cook the bird to 165°F internal temperature, refrigerate it before and after preparation, and clean all preparation surfaces carefully. It would seem that raw turkey pet food should be avoided. Wishing you a happy and healthy holiday table. — **Stephen G. Baum, MD**

Hassan R et al. Multistate outbreak of Salmonella infections linked to raw turkey products — United States, 2017–2019. MMWR Morb Mortal Wkly Rep 2019 Nov 22; 68:1045. (<https://doi.org/10.15585/mmwr.mm6846a1>)