The spinach-related E. coli O157:H7 outbreak that dominated headlines in late 2006 was notable on several counts. It was immense in scope, with more than 200 reported cases and an estimated 6,000 unreported cases. It involved an especially virulent pathogen, causing 104 hospitalizations, 31 cases of kidney damage and three deaths. And it was resolved with a swiftness unimaginable a decade earlier.

Reflecting on the investigation that traced the bacterium to one California spinach grower, Dave Warshauer, PhD, deputy director of the Wisconsin State Laboratory of Hygiene (WSLH) Communicable Disease Division, said, “The investigation worked the way it’s supposed to work. ... But the pieces have to be in place before the outbreak hits.”

The WSLH—Wisconsin’s state public health laboratory—was at the leading edge of the investigation. Warshauer’s staff received some of the very first specimens linked to the E. coli O157:H7 outbreak and confirmed 49 outbreak cases, almost twice as many as any other state.

Unlucky? Not exactly.

To detect a foodborne outbreak three things must happen. People must seek medical care after falling ill. Clinicians must report the illness to public health authorities. And authorities must determine that some subset of scattered cases of illness is linked to a common bug. This last task is almost always carried out by a public health laboratory using a specialized technique—pulsed field gel electrophoresis (PFGE)—that generates a DNA “fingerprint” of the disease organism isolated from a patient’s blood, stool or other specimen.

Carol Kirk, who manages a statewide program to foster collaboration among public health and
private, clinical laboratories in Wisconsin, said, “We don’t believe our people eat more spinach. We believe the clinical labs just did a great job getting the disease isolates to the state public health laboratory so outbreak cases could be identified.”

Submission of disease isolates varies substantially from state to state. Yet even though Wisconsin does not mandate isolate submission as some states do, its rates are notably high—close to 95% for reported cases of foodborne illness.

Physical possession of the disease organism is a boon to health authorities, as it enables the laboratory to subtype the organisms via PFGE as a matter of routine disease surveillance.

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Deputy Director,
Wisconsin State Laboratory of Hygiene

To encourage isolate submission, the WSLH provides packaging materials and pays for shipping. Clinical laboratory staff donate the time needed to complete accompanying paperwork and to pack specimens in accord with safety regulations.

The close working relationships built over 15 years have paid big dividends. Wisconsin detects foodborne illness at a rate more than 80 times that of one Upper South state. It also has the nation’s best record diagnosing the causes of foodborne illness, confirming the specific pathogen involved in 90% of its outbreaks.

Wisconsin was the first state to post the PFGE profile of the 2006 outbreak bacterium on the CDC’s electronic PulseNet web board, enabling comparison with E. coli O157:H7 bacteria isolated from other patients in other jurisdictions. Ultimately, laboratorians in 26 US states and one Canadian province posted identical PFGE profiles, mapping the extent of the outbreak.

Once the outbreak was detected, it took epidemiologists just days to single out spinach as the common source of exposure among outbreak patients with laboratory-confirmed diagnoses (as segregated from dozens of other patients across the country with random E. coli O157:H7 infection).

Wisconsin’s food safety laboratory, part of the Wisconsin Department of Agriculture, Trade and Consumer Protection, was one of several U.S. labs to successfully isolate the bacterium from spinach taken from a patient’s home. In Wisconsin, the WSLH performed the PFGE analysis confirming the spinach-recovered E. coli O157:H7 as the same strain of the bacterium infecting outbreak patients. With packaging from the tainted spinach in hand, federal investigators could confidently trace the vegetable to its place of origin on the West Coast.

Without such rigorous, laboratory-based surveillance, Warshauer said, “People would have continued eating the spinach and we would’ve continued to have cases. Maybe down the road physicians would begin to notice that ... but it would be way, way down the road, and they wouldn’t have a clue as to the cause.”

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References: