

## SALMONELLOSIS OUTBREAK TRACED TO ALFALFA SPROUTS — OREGON AND B.C.

**E**ARLY IN JANUARY, an astute microbiologist at the Public Health Lab noted seeing an unusual number of *Salmonella enterica* serotype Newport isolates. Although typically Oregon sees about one of these each month, he had identified six specimens within the previous week. The Health Division launched an epidemiological investigation.

### INITIAL OBSERVATIONS

To begin, we reviewed existing case reports for *S. Newport*. In response to reports from physicians and labs, local health department nurses or sanitarians contact cases and obtain demographic information. They also ask about obvious risk factors for salmonellosis, such as playing with reptiles, eating raw chickens, or drinking raw milk. Travel and restaurant meal histories are also collected.

The initial review of the December 1995 Newport case data yielded several striking findings. First, all cases were adults (18-45 years old); about two-thirds were women. (Salmonellosis is typically most common among young children; see figure.) Second, while most cases lived around Portland, 30% lived elsewhere—even one in Newport. Almost all cases ate out, but there were no common restaurant exposures. Third, there were no reports of multiple cases within a single household. Taken together with the ongoing nature of the outbreak (more cases coming in almost daily), our “psychological profile” of the vehicle suggested a widely distributed

food that was primarily eaten by adults, perhaps preferred by women, and most commonly eaten away from home.

### FOREIGN INTRIGUE

We contacted neighboring states and the CDC; no unusual concurrent Newport activity was being investigated anywhere else in the country. In British Columbia, however, our counterparts at the B.C. Centre [*sic*] for Disease Control were investigating a Newport outbreak that sounded familiar—so familiar, in fact, that we began to coordinate our respective investigations through a flurry of e-mail, phone, and fax communications. This raised another question: what product might be distributed in Oregon and B.C., but not [apparently] elsewhere in the U.S. or Canada?

Many possible sources were considered, including Christmas chocolates, vegetables, and spices. We learned that at least five states had investigated Newport clusters in the fall of 1995, but only one of them (Vermont) had found a link to any particular source: alfalfa sprouts. Sprouts had been considered because a previous (1994-95) Newport outbreak in Denmark had been traced to alfalfa sprouts, and the demographic profiles of these clusters were somewhat similar.

### CASE-CONTROL STUDIES

As the number of cases grew, we conducted a case-control study, interviewing patients with onsets since January 1 1996, and controls drawn from earlier 1995 *Salmonella* cases (not Newports). We asked about recent illness and food consumption in either the five days before onset (for cases) or the five days before the interview (for controls). Cases were 7.7 times more likely to have eaten alfalfa sprouts than controls ( $P=0.003$ ). Although only 13 (36%) of 36 cases initially recalled eating alfalfa sprouts (vs. 3/44 controls), several cases who initially denied sprout consumption later remembered definite or possible exposures. Stray sprouts also may have been eaten unintentionally. The next time you visit a

salad bar, see for yourself how far they can migrate.

Of those who remembered eating sprouts, all had eaten them at restaurants, delis, or fast food establishments. Sprouts eaten by 9 of these 13 cases could be traced to a single grower, who supplied a number of restaurants and vegetable wholesalers. No operating deficiencies were found on inspection of this grower's facility. All alfalfa seeds in recent use there came from a single lot obtained from a Kentucky distributor. Records provided by the distributor showed that the lot in question—40,000 pounds of seed—had been consigned to only a small number of sprouters, almost all in B.C. and Oregon. The seeds came to Kentucky on a ship from the Netherlands,\* but their farm(s) of origin and mode of contamination are unknown.

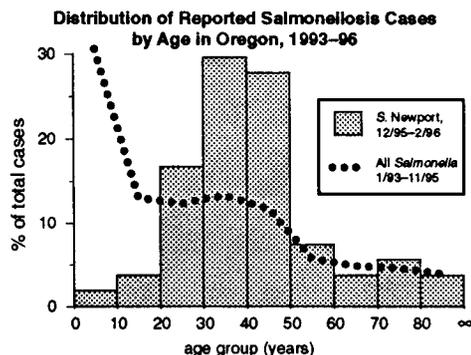
A case-control study conducted in B.C. reached similar conclusions; 7/14 cases vs. 1/41 controls remembered eating sprouts (odds ratio = 40;  $P=0.0001$ ).

With the cooperation of sprout growers, distributors, and regulatory agencies, remaining seed and sprouted product from the implicated lot were embargoed or recalled. Coordinated news releases were issued in Portland and Vancouver, B.C., on February 8 1996, but in Oregon, flood news washed this story away.

### SCOPE OF THE OUTBREAK

Salmonellosis is the most commonly reported bacterial enteric illness in the United States, with about 40,000 culture-confirmed cases each year. After Typhimurium, Enteritidis, and Heidelberg, Newport is the fourth most common serotype identified—about 5% of all isolates. As of February 20, 58 Newport cases have been confirmed in Oregon with onset since the beginning of December—over 70 in B.C. (see figure, *verso*). Past studies suggest that for every reported case of salmonellosis, some 20-90 go undiagnosed and/or unreported.<sup>1</sup>

\* well, probably part way on a truck.



Could any or all of the earlier 1995 U.S. Newport outbreaks have been caused by sprouts? A review of the demographics of these clusters is underway. Preliminary subtyping data have established that Oregon and B.C. isolates are indistinguishable from each other and from isolates obtained during earlier outbreaks in Georgia, Vermont, and Denmark. Other isolates remain to be analyzed. The background variability of *S. Newport* isolates is poorly understood, so the significance of this homogeneity is uncertain.

**SX AND RX**

Of the 34 Oregon cases with complete clinical histories, all but one reported diarrhea (the other had a UTI); 82% reported abdominal cramping, 74% reported fever, and a surprising 68% reported bloody diarrhea. Three patients were hospitalized, including a newborn who was secondarily infected at birth, and a young woman who underwent an appendectomy. No deaths have been reported.

Antibiotics are not indicated for persons with salmonellosis, unless the patient is septic or is in any of several groups at

increased risk for invasive disease (neonates, immunosuppressed persons, and the superannuated).<sup>2,3</sup> Despite these recommendations, 16 (47%) of 34 Oregon cases interviewed reported being treated with antibiotics. In uncomplicated cases, antimicrobial treatment does not shorten or mitigate symptoms. It is associated with prolonged excretion of salmonellae,<sup>2</sup> thereby increasing the risk of secondary transmission and adding to the woes of food handlers and others whose return to employment may be contingent on negative stool cultures.

**SO WHAT ABOUT SPROUTS?**

In recent decades, alfalfa sprouts have insinuated themselves into salads and sandwiches, sometimes without the consumer even noticing. Sprouts have previously been implicated as a source of salmonellosis in a small Washington outbreak (*S. Anatum*; 1990) and in a large, multistate (and international) outbreak of *S. Stanley* infections in early 1995 (pers. comm., Barbara Mahon, MD; CDC).

Alfalfa seeds are bought on the international market and shipped to local sprouters

around the world. To germinate, seeds are kept warm and moist for 5-7 days. Not surprisingly, some of the bacteria that may be on seeds multiply rapidly under these conditions. Many if not most consumers do not wash sprouts. They are difficult to wash satisfactorily, and the protective efficacy of washing is undemonstrated. Unpublished research suggests that pretreating seeds with a bleach solution or with mild heat may greatly reduce the risk of *Salmonella* outgrowth on sprouts, but these methods are not in widespread use, and their effectiveness is untested in real life situations.

As dietary habits change, contaminated fruits and vegetables may play an increasing role in the etiology of foodborne disease.<sup>4</sup> Consumers, particularly persons at greatest risk for invasive salmonellosis (notably persons who are elderly or immunosuppressed), should understand that alfalfa sprouts, like other vegetables that are eaten raw, can be contaminated with enteric pathogens. Because of the way they are produced, sprouts may be more likely than most to carry potential pathogens. The magnitude of that risk, while probably very low, is not known. We support the initiatives of the sprout industry, food safety experts, and others to explore these issues and to identify ways to minimize these risks.

**REFERENCES**

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**Reported *Salmonella* Newport Infections, 1995-96**

