



## ***Escherichia coli* O157 on U.S. Dairy Operations**

In 1982, *Escherichia coli* O157 was first identified as a pathogen for human disease. Since then, it has been associated with foodborne illness. The 1982 *E. coli* O157:H7 outbreaks in Michigan and Oregon demonstrated the serious consequences this pathogen can inflict on humans.<sup>1</sup> In 1986, other cases of illness associated with *E. coli* O157:H7 occurred in nursing homes and day care centers,<sup>2,3,4</sup> and a large regional outbreak occurred in Washington, Idaho, California, and Nevada in 1992/1993.<sup>5</sup>

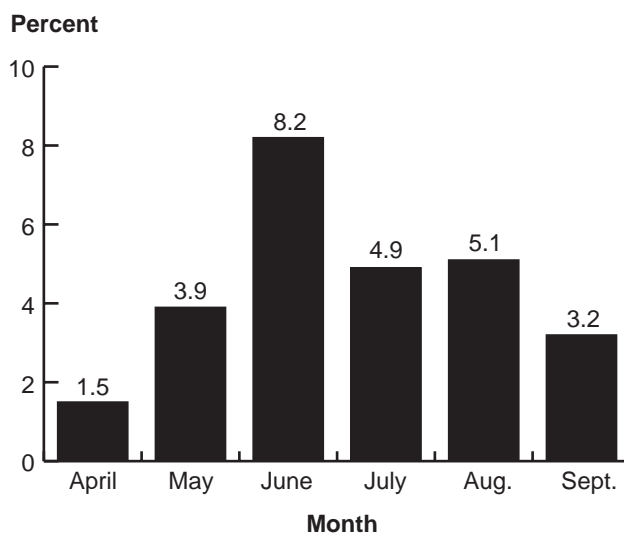
Cattle have been implicated as a major reservoir of *E. coli* O157. *E. coli* O157 outbreaks have been traced to consumption of hamburger and raw (unpasteurized) milk, as well as contaminated fruits, vegetables, water, and exposure to live animals and their environments.

In 2002, the USDA's National Animal Health Monitoring System (NAHMS) conducted Dairy 2002, NAHMS' third national study of U.S. Dairy operations. During Dairy 2002, fecal samples were collected via rectal retrieval from approximately five operations in each of the 21 States\* participating in the study. On each operation, fecal samples were collected from approximately 40 cows. From March 27 through September 25, a total of 3,733 samples were collected on 96 operations for culture and identification of *E. coli* O157.

Overall, 160 samples (4.3 percent) were culture positive for *E. coli* O157. *E. coli* O157 isolates were evaluated further for virulence factors. Seventy-five samples (46.9 percent) were positive for shiga-toxin type 1; 146 (91.3 percent) were positive for shiga-toxin type 2; 72 (45.0 percent) were positive for both shiga-toxin type 1 and shiga-toxin type 2; and 149 (93.1 percent) were positive for the attaching and effacing antigens.

The percentage of cows shedding *E. coli* O157 was highest during the summer months: 8.2, 4.9, and 5.1 percent of cows in June, July, and August, respectively (Figure 1).

**Figure 1. Percent of Cows Culture Positive for *E. coli* O157, by Month**

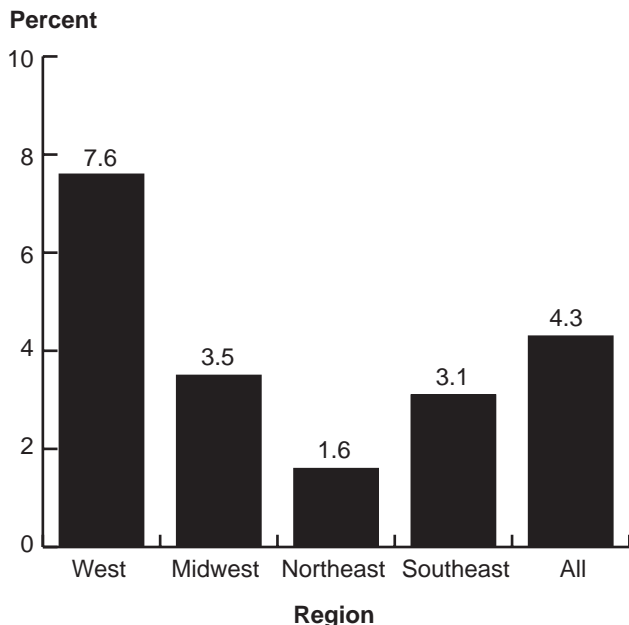


**\*Regions/States:**

- West:** California, Colorado, Idaho, New Mexico, Texas, Washington
- Midwest:** Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin
- Northeast:** New York, Pennsylvania, Vermont
- Southeast:** Florida, Kentucky, Tennessee, Virginia

The West region had the highest percentage of cows test positive (7.6 percent), followed by the Midwest (3.5 percent), Southeast (3.1 percent), and Northeast (1.6 percent) regions (Figure 2).

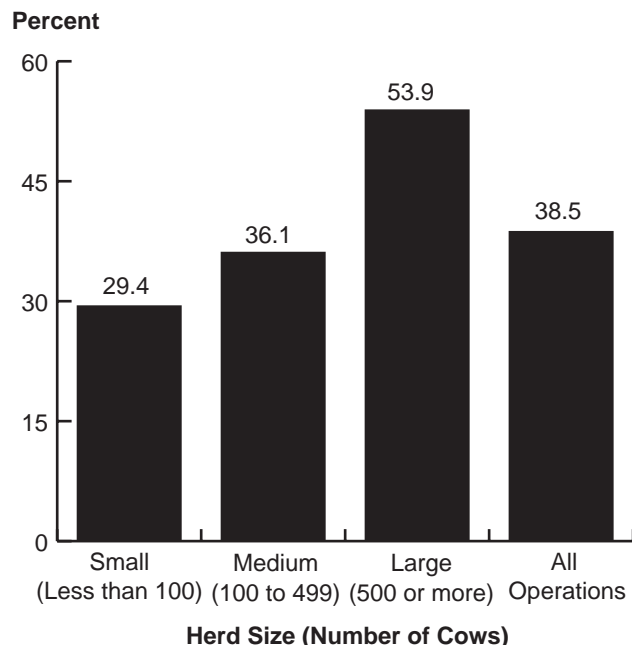
**Figure 2. Percent of Cows Culture Positive for *E. coli* O157, by Region**



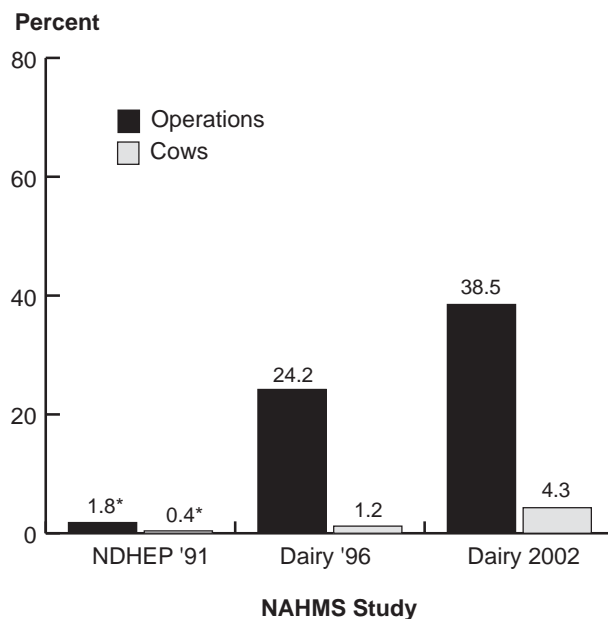
Overall, 38.5 percent of operations had one or more *E. coli* O157 culture-positive cows. Large operations (500 or more cows) were more likely to have *E. coli* O157 culture-positive cows (53.9 percent of operations) than medium (100 to 499 cows) and small (less than 100 cows) operations (36.1 and 29.4 percent of operations, respectively) (Figure 3). The higher prevalence on large operations is consistent with results from previous NAHMS studies, including Dairy '96. The majority of large dairies are located in the West region.

Figure 4 compares the prevalence of *E. coli* O157 on dairy operations as reported in all three NAHMS' dairy studies: 1991's National Dairy Heifer Evaluation Project (NDHEP); Dairy '96; and Dairy 2002. The higher prevalence reported in Dairy 2002 is likely a result of improved culture methods that have increased the sensitivity of organism detection and differences among the studies' designs.

**Figure 3. Percent of Operations with at Least One *E. coli* O157 Culture-Positive Cow, by Herd Size**



**Figure 4. Percent of Operations (and Percent of Cows on these Operations) Culture Positive for *E. coli* O157, by NAHMS Study**



\*In the NDHEP study, 10 samples/farm were collected.

Previous research has presented inconsistent results in risk and protective factors for *E. coli* O157. On-farm control of this pathogen will be difficult until such factors can be identified and incorporated into management practices. However, it has been suggested that management practices that increase stress are likely to alter immunologic responses and predispose cows to shifts in the normal microflora of the gastrointestinal tract, resulting in an increase in the numbers and shedding of *E. coli* O157.<sup>6,7</sup>

#### References:

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