

NAHMS Dairy '96: Salmonella Status on U.S. Dairy Operations

Why is Salmonella important?

Salmonella species have been associated with illness among many animals, including humans, and are one of the most commonly reported bacterial causes of human food-borne disease. Animals shedding Salmonella may be a source for food-borne infection of people. Under the new HACCP systems, the USDA-FSIS has identified Salmonella as a target organism for monitoring in large slaughter plants beginning in 1998. This monitoring is likely to result in novel cooperative approaches between producers and processors to assure reduction of Salmonella shedding in cattle at the time of slaughter.

Over 2,400 different serotypes of Salmonella have been identified to date. Differences in distributions and ecology exist, though all can be considered pathogenic at high enough exposure and low enough host resistance. From the NAHMS Dairy '96 Study, the most common Salmonella serotypes isolated from dairy cows were similar to the most common serotypes shed by feedlot cattle in the 1995 NAHMSA Cattle on Feed Evaluation but differed from the most common isolates from clinically ill cattle.

One of the phage types of *S.typhimurium* of particular concern to animal and public health agencies currently is definitive type 104 (DT104). A clone of DT104 recently emerged in the United Kingdom in both human and cattle disease outbreaks that has an antimicrobial resistant pattern (R-type) to ampicillin, chloramphenicol, streptomycin, sulfonamides, and tetracycline. DT104 has also been reported in the U.S. in humans, cattle, other farm animals, cats, wildlife, and birds. In the U.S. reports to date indicate lower numbers of DT104 shedding cattle than in the U.K.

Salmonella typhimurium was not one of the most common serotypes isolated from dairy cows in the NAHMS DAIRY '96 Study (only 2.9% of isolates; results from phage typing of *S.typhimurium* isolates from this study are still pending) However, prevalence of *S.typhimurium* shedding is higher in dairy calves, as evidenced by results from a previous NAHMS study (26.5% of dairy calf *Salmonella* isolates from the 1991-1992 NAHMS National Dairy Heifer Evaluation Project were *S.typhimurium*).

How common is Salmonella on U.S. dairy operations?

NAHMS Dairy '96 Study results show that fecal shedding of Salmonella in milk cows on farm is similar to that in feedlot cattle. (5.4% compared to 5.5% of samples from the NAHMS Cattle on Feed Evaluation) Fecal shedding, however, was higher in dairy cows designated for culling within subsequent 7 days (18.1%) and in culled dairy cows at markets (14.9%, Figure 1). Research is needed to better understand why these dairy cows had higher prevalence of shedding, even before subjected to the stress of transport to markets.

Overall, 27.5% of dairy operations and 66.7% of markets had at least one cow shedding Salmonella (Figure 2). This estimate was similar to the 38% of feedlots found culture-positive in the 1995 NAHMS Cattle on Feed Evaluation.

These results were based on a one-time sampling which would be expected to differ from results of studies involving repeated sampling. Though only 5.4% of milk cows were positive, percentages of culture-positive dairy operations and cull dairy cow markets indicate cattle are widely exposed to Salmonella.

One method to measure exposure to Salmonella is through use of antibody tests which indicate previous exposure to the bacteria but not necessarily fecal shedding. In a California study using both culture and antibody tests, 75% of dairy herds showed evidence of recent Salmonella exposure with serology, while only 16% showed evidence based on culture. The authors concluded that a single culture lacks sensitivity, and that the 75% prevalence is likely to be a more accurate prevalence estimate. The herds in this California study were large drylot dairies.

The NAHMS Dairy '96 Study associated Salmonella fecal shedding with herd size; 56.5% of the herds with at least 400 milk cows had at least one cow shedding Salmonella compared to 38.5% of herds with 100-399 cows and only 4.8% of herds with fewer than 100 cows.

Season of sample collection was related to fecal shedding of Salmonella, as it was for E.coli 0157. Prevalence of Salmonella shedding was higher for cows sampled on or after May 1 than for cows sampled before May 1.

How can we reduce fecal shedding of Salmonella on-farm?

Research has shown that reduction of Salmonella fecal shedding is possible in poultry and swine through modification of management practices. As with E. coli 0157, an approach for dairy cattle using identification and removal of Salmonella infection sources, and adoption of quality assurance programs to assure use of this process, seems more promising than a test and cull approach. Salmonella species appear to become established in some environments.

If salmonellosis is an animal health problem, on-farm control strategies should be directed toward the Salmonella serotypes of concern to the operation. Serotype to serotype epidemiology does differ as some serotypes are more dependent on a cattle host and others on feed or other sources (though persistent shedding of the latter by cattle may occur). For example, removal of long-term carrier (shedding) cattle is most important with serotypes adapted to cattle, namely Salmonella dublin. These carriers can best be identified using serology; any animal over 6 months of age is tested twice at a 3-month interval, and animals with persistently high titers to S. dublin are culled. In general, these animals can make up 2 to 4 % of an infected herd.

Other important factors regarding Salmonella reduction include the presence of carrier cows, source(s) of replacement stock, exposure of fresh cows to sick cow feces, environmental hygiene, use of recycled flush water, contaminated feeds, using contaminated water to irrigate forage crops (especially green chop), infected rodents and birds, and access of rendering trucks to animal areas.

Various factors have been recommended for inclusion in "good management practices" of quality assurance programs, but the relative importance of each, documentation of reduction of Salmonella shedding levels associated with full or partial adoption of these practices, and their application to dairy operations still need to be determined. To provide the best science as well as uniformity to this process, the Salmonella Committee of the U.S. Animal Health Association is currently working on Best Management Methods for controlling salmonellosis for cattle operations, having already written guidelines for broiler, layer and turkey operations.

Farm families should consider health risks due to direct or indirect exposure to Salmonella from cattle. Hygienic measures, especially around ill cattle or calves, are important. Unpasteurized milk should not be consumed as it contains Salmonella (and other human pathogens) on many farms.

While much information is available about E. coli 0157 and Salmonella, a great deal of research is needed before pathogen reduction practices can be implemented on dairy operations on a broad scale. Once identified, these measures will form a basis for further research efforts focused at reduction of shedding and persistence in cattle.

Food safety and quality are primary concerns for everyone involved in food production, processing and preparation. The dairy production industry has a role in implementing management practices demonstrated through time to reduce shedding of fecal pathogens.