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What Veterinarians and Producers Should Know About Multidrug-Resistant *Salmonella* Newport

Salmonella spp. are ubiquitous in nature, and all serotypes have the potential to cause infections in all types of animals, including domestic animals. Infections vary in clinical presentation, but diarrhea is the most common clinical manifestation. In some cases, a herd's morbidity risk can become quite high and mortalities can occur. It has been shown that cattle infected with *Salmonella* spp. can shed the organism in feces, either when displaying signs of salmonellosis or when not exhibiting clinical signs. *Salmonella* spp., transmitted to people via all types of consumed food, contribute to the estimated 1.3 million annual cases of human foodborne illness. It is estimated that foodborne *Salmonella* spp. infections result in some 16,000 human hospitalizations and more than 500 deaths annually.

What is multidrug-resistant *Salmonella* Newport?

Many *Salmonella* spp. serotypes have been identified as a cause of human and animal disease. Though over 2,000 serotypes of *Salmonella enterica* exist, the majority of laboratory-confirmed human *Salmonella* infections are attributed to a relatively small number of serotypes. While some *Salmonella* spp. are susceptible to most antimicrobials, others have genetic elements that confer resistance to antimicrobials. Recently, *Salmonella* serotype Newport isolates have exhibited various antimicrobial susceptibility patterns, and many have shown resistance to multiple antimicrobials. The multidrug resistant (MDR) *S. Newport* of particular concern is resistant to eight antimicrobials including ampicillin, chloramphenicol, streptomycin, sulfonamides, tetracycline, amoxicillin/clavulanic acid, ceftiofur,

and cephalothin. It also displays reduced susceptibility to ceftriaxone.

Is MDR *S. Newport* occurring at higher than expected frequencies?

Compared to previous years, some veterinary diagnostic laboratories have seen an increase in submissions culture-positive for MDR *S. Newport*. In addition, public health laboratories have been receiving more submissions from human cases attributed to MDR *S. Newport*. Also, the arm of the National Antimicrobial Resistance Monitoring System (NARMS) that scrutinizes human infections has reported a rise in the number of MDR *S. Newport* isolates from people, as a percentage of all *Salmonella* isolates over the past few years.

From 1997 to 1999, *S. Newport* accounted for 5.3 percent (225/4,266) of human *Salmonella* isolates tested at NARMS. In 2000, *S. Newport* accounted for 9 percent (124/1,378) of human *Salmonella* isolates tested at NARMS. The proportion of *S. Newport* isolates identified as resistant to 2 or more antimicrobials changed from 6.3 percent (3/48) isolates in 1997 to 2.6 percent (2/78) in 1998; 17.2 percent (17/99) in 1999; and 22.6 percent (28/124) in 2000.

Salmonella isolates from a variety of sources (multiple species of ill and healthy animals) are tested in the arm of the NARMS program that scrutinizes animal infections, including those isolates collected at federally inspected slaughter or processing facilities (Table 1). Since 1997 the numbers of *S. Newport* isolates tested have increased but *S. Newport* remains a minority of the total number of *Salmonella* isolates tested in the system.

Furthermore, while the number of total isolates and the number of *S. Newport* isolates from the sampling at slaughter and processing facilities have increased, the number of isolates with the exact MDR pattern of the human outbreak strain has declined after an initial rise.

Table 1. Animal-origin *Salmonella* isolates tested in NARMS and the proportion that were *S. Newport*.

	1997	1998	1999	2000
Total <i>Salmonella</i> Tested	2,391	3,318	8,508	7,834
<i>S. Newport</i> Tested	18 (0.75%)	42 (1.26%)	134 (1.57%)	282 (3.60%)
<i>S. Newport</i> from all species with exact MDR pattern	0	0	24	2
<i>Salmonella</i> isolates from slaughter tested	521	1,886	4,637	3,530
<i>S. Newport</i> from slaughter	0	11	70	122
<i>S. Newport</i> from cattle at slaughter	0	8	54	109
<i>S. Newport</i> from cattle at slaughter with exact MDR pattern	--	0	17	2

Salmonella spp. isolates submitted to the National Veterinary Services Laboratories (NVSL) for serotyping also indicate an increase in *S. Newport* isolates. Overall, 230 (1.1%), 331 (1.6%), 695 (3.1%), and 1275 (5.8%) isolates were serotyped as *S. Newport* for 1998, 1999, 2000, and 2001, respectively. These numbers represent total submissions to the NVSL, which include clinical isolates as well as those from on-farm monitoring and monitoring in slaughter and processing facilities. In some cases, the same isolate may have been submitted multiple times for serotyping. Therefore, it is unknown whether the trend toward increased *S. Newport* isolates represents an increased occurrence, or rather a heightened awareness and interest in these isolates. Furthermore, these numbers reflect the total numbers of *S. Newport* isolates, regardless of the antimicrobial resistance pattern. There have been no reports of an emergence of MDR *S. Newport* in Europe.

What animal health problems is MDR *S. Newport* causing?

On dairy operations, the clinical picture of MDR *S. Newport* has been one of adult cows with marked watery diarrhea and a rapid drop in milk production. As with infections with other serotypes of *Salmonella*, fresh cows and heifers infected with *S. Newport* are affected more commonly than animals in other stages of lactation. Infected animals often have a high fever (104-106 °F) and are typically unresponsive to therapeutics used commonly to treat enteric salmonellosis, including anti-inflammatory agents and antibiotics. These animals remain clinically ill for longer periods than animals infected by other serotypes of *Salmonella*, which is considered a reflection of the poor response to therapy. Often, animals infected with *S. Newport* do not return to good milk production. Many are culled because of their poor milk production and decreased body condition. In some areas, a significant occurrence of the disease also has been reported in calves.

What are the public health concerns?

Since *Salmonella* spp. are associated with foodborne illness there is concern that the rising occurrence of MDR *S. Newport* infections in cattle may lead to more cases of illness in people. Although most *Salmonella* spp. infections in humans are confined to the digestive tract and are self limiting, occasionally infections become systemic and require antimicrobial treatment. For systemic cases, MDR forms of *Salmonella* complicate therapy. In some human outbreak investigations, the consumption of undercooked or raw ground beef or unpasteurized milk products have been suggested as risk factors.

What can veterinarians and producers do to limit the spread?

There are numerous reasons to limit the spread of all *Salmonella* spp., including MDR *S. Newport*. These include: limiting cattle morbidity and mortality; limiting zoonotic spread of the organism by direct contact with ill or carrier animals; and reducing the potential for foodborne spread to

humans. As with other *Salmonella* spp., controlling infections is best achieved through biosecurity efforts, rather than through treatment of infected animals. Biosecurity emphasizes:

- 1) separation by age of animals
- 2) limiting fecal exposure among classes of animals through good hygiene (cleaning and sanitizing feeding equipment)
- 3) limiting contact between ill/infected animals and healthy animals
- 4) addition of any new animals to the herd only after consideration of biosecurity risks
- 5) minimizing the potential introduction of agents via visitors or fomites by restricting access, and cleaning and disinfecting boots and equipment
- 6) avoidance of contaminated feed sources
- 7) limiting human contact with ill animals and appropriate hygiene

The New York State Cattle Health Assurance Program (NYSCHAP) has an entire module devoted to understanding the epidemiology of *Salmonella* and working with critical control points. The expanded use of bacterial culture and susceptibility testing may help in monitoring the distribution of the agent and directing therapy.

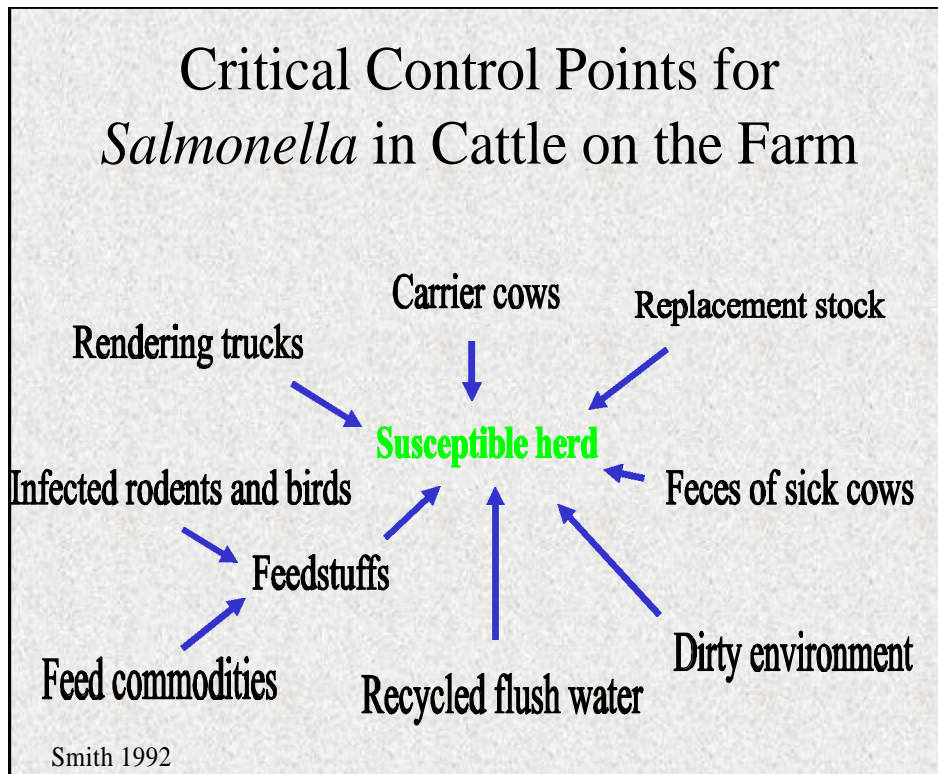
In addition, since MDR *S. Newport* does possess multiple antimicrobial resistance determinants, it is important that practitioners and producers use antimicrobials in a manner that will not facilitate the selection of this organism.

Where can more information be found?

More information on the occurrence of *Salmonella* spp. in cattle populations can be found at the National Animal Health Monitoring System's (NAHMS) web site: <http://nahms.aphis.usda.gov>

In addition, monitoring information on antimicrobial resistance among *Salmonella* spp. from animal and human sources can be found at the NARMS web sites. Human data are at: <http://www.cdc.gov/narms/default.htm>
Animal data are available at: <http://www.arrru.saa.ars.usda.gov>

Information on control points for *Salmonella* spp. infections on cattle operations can be found at the NYSCHAP web site at <http://nyschap.vet.cornell.edu/>



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Contributors

Dave Dargatz and Brian McCluskey, USDA:APHIS Centers for Epidemiology and Animal Health, Fort Collins, Colorado

Pat McDonough, Cornell University Diagnostic Laboratory, Ithaca, New York

John Adaska, California Veterinary Diagnostic Laboratory, University of California – Davis, Davis, California

Don Hansen, Oregon State University, Corvallis, Oregon

Paula J. Fedorka-Cray, USDA:ARS
Antimicrobial Resistance Research Unit, Athens, Georgia

For more information, contact:

USDA:APHIS:VS:CEAH
NRRC Building B., M.S. 2E7
2150 Centre Avenue
Fort Collins, CO 80526-8117
970.494.7000
E-mail: NAHMSweb@aphis.usda.gov
www.aphis.usda.gov/vs/ceah/cahm
#N363.0902

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