

Mycoplasma ovipneumonia on U.S. Sheep Operations

Background

Respiratory disease in sheep and lambs is an important cause of economic losses on U.S. sheep operations. In 2009, 4.8 percent of nonpredator death losses in sheep and 12.6 percent of nonpredator death losses in lambs were attributed to respiratory diseases such as pneumonia or shipping fever (USDA, 2010). Other production losses caused by respiratory disease are more insidious but can be economically detrimental to sheep due to poor growth rates, decreased feed-conversion efficiency, and increased labor and management costs (Alley, 1987).

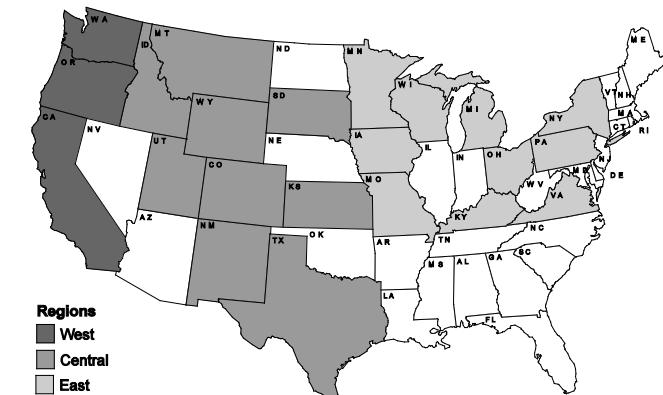
The bacterium *Mycoplasma ovipneumonia* is one of many common respiratory pathogens affecting domestic sheep and goats in the United States. It was first isolated in New Zealand in 1974 and has since been recovered from the respiratory tracts of healthy and symptomatic sheep worldwide (Clark, 1974). Transmission occurs via aerosol spread and close contact with infected animals. *M. ovipneumonia* typically resides in an adult animal's nasal cavity, where it can spread easily to young lambs, often causing transient, mild respiratory disease. Subclinically infected sheep, when placed under stress due to shipping, weather, poor nutrition, or other factors, may develop acute pneumonia (Nicholas, 2008).

Alone, it is not normally highly pathogenic, but *M. ovipneumonia* predisposes sheep to other respiratory infections by interfering with normal ciliary activity in the respiratory tract and by suppressing lymphocytes (Niang, 1998; Nicholas, 2008; Shahzad, 2010). In 1998, a combined infection of *M. ovipneumonia* and *M. arginina* was attributed to paroxysmal coughing, leading to rectal prolapse and reduced weight gain in lambs in the Midwestern United States (Niang, 1998). Combined *M. ovipneumonia* and *Pasteruella hemolytica* infections are frequently found in lambs with chronic atypical pneumonia and low mortality rates. Economic losses can be high due to chronically unthrifty lambs.

Mycoplasma ovipneumonia on U.S. sheep operations

In 2011, the USDA's National Animal Health Monitoring System conducted Sheep 2011, an in-depth study of U.S. sheep operations conducted in 22 of the Nation's major sheep-producing States. For the study, these States were divided into three regions (see map). Operations with more than one ewe met the study inclusion criterion; collectively, these operations represented 85.5 percent of the U.S. ewe inventory and 70.1 percent of the U.S. farms with ewes (USDA, 2012).

Sheep 2011 Participating States



The Sheep 2011 study focused on sheep health and management and was the first study to estimate the national prevalence of *M. ovipneumonia* in U.S. sheep. As part of the study, nasal swabs were collected from up to 10 adult ewes per flock on 453 operations in the 13 participating States. These 10 swabs were then pooled and tested by PCR for *M. ovipneumonia* DNA fragments. Operations with PCR-positive pooled samples were considered positive. For operations in which pooled results were indeterminate or negative, individual ewe swabs were PCR tested. Operations were considered positive if they had one or more PCR-positive individual-animal samples.

Of the pooled samples taken from the 453 operations tested, 350 were initially positive for *M. ovipneumonia* and another 51 were positive after individual-animal nasal swabs were tested. Overall, 401 operations (88.5 percent) were positive by PCR (table 1). Additionally, serum from up to 16 adult ewes per flock was tested for antibodies to *M. ovipneumonia* using an ELISA test. Serum was collected from 4,073 ewes on 408 of the PCR-sampled operations from March 14 through June 30, 2011. At least one ewe was ELISA positive on 85.3 percent of these operations. Of the 4,073 individual samples tested, 1,199 (29.4 percent) were seropositive using the ELISA. The mean within-flock seroprevalence in ELISA-positive flocks was 34.6 percent.

Table 1. Number and percentage of operations and animals PCR and ELISA positive for *M. ovipneumonia*, by flock size

Number/Percent Operations				
Flock Size (number of ewes)				
	Small (20–99)	Medium (100–499)	Large (500 or more)	All operations
ELISA				
Operations	142/183 (77.6%)	138/151 (91.4%)	68/74 (91.9%)	348/408 (85.3%)
Animals	481/1,827 (26.3%)	521/1,506 (34.6%)	197/740 (26.6%)	1,199/4,073 (29.4%)
PCR				
Operations	165/203 (81.3%)	159/173 (91.9%)	78/78 (100.0%)	401/453 (88.5%)

A lower percentage of operations with small flocks were PCR positive for *M. ovipneumonia* compared with operations with medium or large flocks (table 1). This finding was true for both the ELISA and PCR tests ($p<0.01$). The percentages of seropositive ewes in small, medium, and large flocks were consistent across flock sizes.

All herded range flocks were PCR positive, while 86.4 percent were ELISA positive (table 2). In herded range flocks, 25.9 percent of ewes had antibodies to *M. ovipneumonia*. The percentages of PCR-positive flocks in fenced range and pasture managed flocks were similar to the ELISA seroprevalence. Ewe level seroprevalence did not vary by flock type (table 2).

Table 2. Number and percentage of operations and animals PCR and ELISA positive for *M. ovipneumonia*, by flock type

	Number (Percent)				
	Flock Type	Herded range	Fenced range	Pasture	Dry lot
ELISA					
Operations	38/44 (86.4)	74/86 (86.0)	208/246 (84.5)	28/32 (87.5)	
Animals	114/440 (25.9)	238/860 (27.7)	750/2,453 (30.6)	97/320 (30.3)	
PCR					
Operations	47/47 (100.0)	83/94 (88.3)	237/277 (85.6)	34/35 (97.1)	

The mean flock size in PCR-positive operations was larger (689 ewes, standard error 85.3) compared with the mean flock size for PCR-negative operations (103 ewes, standard error 15.0). ELISA-positive operations were also larger, on average, than ELISA-negative operations (680 ewes in positive operations compared with 375 ewes in negative operations). This size difference was true for all regions in the study, with the exception of the Central region ELISA results.

Conclusions

The high percentage of PCR- and ELISA-positive flocks indicates *M. ovipneumonia* is a ubiquitous organism in U.S. sheep flocks. All herded-range flocks were positive for *M. ovipneumonia carriage*. A higher percentage of medium and large flocks than small flocks tested positive.

Detection of DNA fragments in the nasal cavities of ewes indicates carriage and possibly shedding, but not necessarily active infection. Factors such as weather, movement, crowding, or poor nutrition may affect ewes' ability to respond to *M. ovipneumonia* exposure. The presence of this opportunistic pathogen may be important for producers experiencing lamb-growth impairment associated with chronic, nonprogressive pneumonia or that are experiencing lamb mortality associated with bronchopneumonia, which is usually associated with underlying *M. ovipneumonia* infection. Producers can reduce the likelihood of disease from *M. ovipneumonia* by avoiding overcrowding, isolating newly added sheep and lambs, and improving ventilation indoors. Antibiotic treatment may help temporarily, but response likely varies depending on the strain of *M. ovipneumonia* involved.

Further work should be done to describe the on-farm ecology of this organism and the factors that contribute to shedding of the organism.

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