# CONTROL OF OVINE PROGRESSIVE PNEUMONIA (OPP)

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Surveys have suggested that ovine progressive pneumonia (OPP), frequently referred to as Visna-maedi infection, of cull sheep in western US ranges from 1 percent to 67 percent with a mean of 34.9 percent (4). The incidence in range sheep in Idaho was 16 percent in yearlings to 83 percent in ewes over seven years of age (9). A serological incidence of 35.7 percent (high of 67.6 and a low of 20 percent) was recorded in sheep in Quebec, Canada with a 0 to 36.8 percent in infection goats (14).

It has been demonstrated that when newborn lambs are removed from the ewe and her environment immediately following birth and before nursing that the lambs remain free of OPP infection (2, 7, 17). It has also been demonstrated that lambs remaining with OPP infected ewes for 10 hours post-birth were 28 percent infected or 76 percent infected if they were with infected ewes until weaning (7). Serum antibody to OPP is not present in the newborn lambs of infected ewes until they have nursed, thus there is no evidence of placental transmission of the OPP virus (22, 23). Antibodies are demonstrable and the OPP virus can be isolated from the colostrum of infected ewes (8, 10, 15, 16, 19, 22, 23).

There are two reports of vertical transmission *in utero*, but in one case no tests were made until the lambs were four months old so infection could have occured after lambing (1). In the second report OPP virus was reportedly isolated from one lamb fetus (2). It has also been suggested that *in utero* infection is possible but no proof was offered. (6, 13).

A serum neutralization test for OPP was described in 1960 (21). Other serological testing procedures include complement fixation and indirect fluorescent antibody test (8, 11). Indirect immunofluorescence and immunodiffusion tests can detect specific antibodies before the complement fixing test, but neutralizing antibodies appear later than the complement fixation antibodies (24). The immunodiffusion test has been reported to be more sensitive then the complement fixation test (3, 5). Immunodiffusion test were reported to be efficacious and have been frequently employed in the detection of OPP infection (4, 18, 24).

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## MATERIAL AND METHODS

In an attempt to evaluate two programs for the elimination of OPP from farm or ranch flocks of sheep, cooperating owners were contacted an informed of the potential problems of OPP. Two programs for establishing OPP-free flocks were offered to each owner.

Plan A. All sheep including lambs under one year of age were to be bled and the serum tested for OPP by the agar-gel immunodiffusion test (AGID). Following testing all positive sheep were marketed. A repeat test was to be made at six-month intervals until two negative test were obtained for the flock. Further testing would be at yearly intervals or at the descretion of the owner.

Plan B. This plan was designed for those flock owners whose flocks were so extensively infected with OPP that dispersal of all positive sheep would be economically impossible. The sheep were tested as described in plan A, but reactors were either moved to another premise or the OPP-positive flock was separated from the OPP-negative flock but maintained on the same premises. Weaned lambs from the positive flock were placed into the clean flock without test to serve as all or part of the replacements for the established flock.

## RESULTS

Fifteen cooperators initially indicated interest in this investigation and had their flocks of sheep bled for the AGID testing for OPP. Of the 15 breeders only four maintained interest to the degree that four test were made on each flock. In the case of these four breeders the testing period lasted four years.

Initial testing of 15 flocks indicated that 28.6 percent of 1,989 sheep were seropositive for OPP. One flock of 89 sheep had no detectable OPP infected sheep. The highest infection occured in a flock of 417 with 58.5 percent infection.

Two breeders utilized the Plan A approach to OPP elimination and continued with the plan for a minimum of four tests. As demonstrated in Table 1, when all seropositive sheep were removed from the flocks immediately following the determination of their infection

**TABLE 1 PLAN A**

| DEGREE OF INFECTION | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Initial Test | | | Second Test | | | Third Test | | | Fourth Test | | |
| Flock Infection | | | Flock Infection | | | Flock Infection | | | Flock Infection | | |
| Size | No. | % | Size | No. | % | Size | No. | % | Size | No. | % |
| 29 | 7 | 24.1 | 28 | 0 | 0 | 27 | 0 | 0 | 27 | 0 | 0 |
| 29 | 3 | 10.3 | 28 | 1 | 3.6 | 29 | 0 | 0 | 29 | 0 | 0 |

status the involved flocks had no further reactors detected following the second test. It will also be noted that the flocks were comparatively small and that the removal of all the seropositive sheep had a minimum economic effect to the owner.

Two breaders utilized Plan B. As recorded in Table 2 these were larger flocks than those recorded in Plan A. Though the number of animals seropositive to OPP decreased following the second test, not all seropositive sheep were eliminated up to and including test number four. It should also be noted that the flock size generally decreased following the second testing.

**TABLE 2 PLAN B**

| DEGREE OF INFECTION | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Initial Test | | | Second Test | | | Third Test | | | Fourth Test | | |
| Flock Infection | | | Flock Infection | | | Flock Infection | | | Flock Infection | | |
| Size | No. | % | Size | No. | % | Size | No. | % | Size | No. | % |
| 234 | 67 | 28.6 | 234 | 49 | 20.9 | 188 | 34 | 18.1 | 163 | 5 | 3.1 |
| 98 | 17 | 17.3 | 82 | 17 | 20.7 | 117 | 19 | 16.2 | 93 | 3 | 3.2 |

## DISCUSSION

It is obvious from the various surveys conducted in the United States and Canada that OPP is a serious respiratory disease of sheep and goats (4, 9, 14). It has been suggested that OPP-positive flocks are more subject to other respiratory infections, exibit decreased fertility, and do not gain as efficiently as OPP-free flocks (5, 9). The survey completed in this investigation would indicate that North Dakota has a sufficient flock infection of OPP to conclude that OPP is a serious disease in sheep in this geographical area.

It appears that any plan where the OPP-seropositive sheep are removed from the flock will serve to eliminate the OPP problem. When all OPP-seropositive sheep are completely removed from the premises as soon as detected there was a more rapid elimination of the OPP problem then if prolonged or partial removal was employed. The economics of removing all positive sheep and hence the source of infection could be impractical where all or a major part of the producer's income is dependent upon sheep. On the average this would be nearly 29 percent of a North Dakota flock or 35 percent of a flock in the western United States.

Separation of OPP-seropositive sheep from OPP-seronegative sheep but maintaining both flocks on the same premises and depending upon untested lambs from the positive flock as replacement subjects the owner to less financial stress but prolongs the process of establishing a totally OPP-free flock. Testing lambs before employing them as clean flock replacements may hasten the process of establishing OPP clean flock, however there is always the possibility that a lamb having an OPP-negative test may be in the incubative stage of infection and hance not detectable by serodiagnosis (12, 13, 15, 16). Twenty percent of lambs removed from OPP negative ewes immediately following birth and supplied ovine colostrum containing OPP virus became AGID seropositive within two months of virus administration (20). Others have also demonstrated colostral transmission (1, 3, 13).

Though the original plan called for biannual testing until the involved flocks were free of OPP, all owners preferred annual testing as it was more applicable to their management.

## SUMMARY

This investigation further demonstrates that OPP infection in sheep can be eliminated and controlled by utilizing the agar gel immunodiffusion test and removal of seropositive sheep from the involved flock. Two approaches may be employed to meet the needs of the sheep producers, one consisting of testing and immediate elimination of reactors from the premises and obtaining all replacements from OPP free ewes. The second approach would consist of testing and placing all reactors in a separate flock on the same premises and obtaining some replacements from the lambs of OPP positive ewes. The latter approach will delay the process of elimination of OPP infection in the flock.

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to a smaller amount of water lost as evaporation early in the growing season and a more favorable soil water status during the growing season.

## SUMMARY

This research supports the value of small grain residue for water conservation. The most significant benefit was from snow trapping and subsequent increase in soil water content. In addition, the stubble reduced stage one evaporation losses during rainy periods. In general the evapotranspiration from NE was less than NW until the first week of July. After this the evapotranspiration from NE became greater because of greater soil water availability for transpiration. The cumulative water use became equal on July 19; however, for the growing season NE used 2.67 inches more water than NW resulting in 7.8 bushels per acre greater soybean yield.

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