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The sheep lice detection test

By Peter Morcombe, Veterinary Epidemiologist, Animal Industries, South Perth

Sheep farmers would agree it is difficult to find sheep lice when carrying out an inspection.

The lice detection test makes this task easier and helps farmers decide how to control lice. The test also helps community liaison groups with eradication of lice infestations in specific areas, and provides data for epidemiologists to monitor changes in prevalence of lice and efficacy of treatments. Tests are much cheaper than flock inspection on the farm.

The present lice detection test was developed by the Australian Wool Testing Authority (AWTA) and introduced as an integral part of the Western Australian Sheep Lice Eradication Campaign in 1987. In Western Australia, more than 82,000 lots of wool submitted under 11,400 wool bale brands are tested each year. More than 80 per cent of these brands have been identified to wool growers.

Presently, each Western Australian wool grower contributes about $45 a year towards the cost of conducting 82,000 tests. Expressed another way, it costs about 1.5 cents per head to test for lice in sheep.

About the test

The test is a visual examination for lice in the vegetable matter fraction of fleece wool submitted for pre-sale quality testing.

At the wool store, about 1 kg of greasy wool is cored from the bales in each sale lot and sent to the testing laboratory, where a 150 g subsample is taken for washing. A 40 g subsample of the clean wool is then dissolved in sodium hydroxide, dried and spread onto a conveyor which passes under a video camera set at ten times magnification. An operator watches the projected image and electronically records the presence or absence of lice.

Reporting the test result

The test result is recorded as 0 (no lice), 1 (one louse) or 2 (more than one louse). Wool lots with one louse are re-tested and this result is then reported as 1-0 or as 1-1, depending on the outcome.

At the end of each week test results are entered into a computer data bank. When a test result is 2, or 1-1, wool bale brand owners are notified by letter that there is a high probability that lice were present in their flocks at shearing and therefore flocks should be treated.

If the test result is 1-0, wool bale brand owners are informed of the possibility of infestations. If owners have seen no evidence of lice in flocks, and flock lice detection tests suggest the risk of infestation is low, owners are advised to keep flocks under observation to ascertain if treatment is necessary.
The lice detection test in progress at the AWTA.

Once wool is received by the laboratory it takes about two weeks for testing and reporting of results to wool growers. The delay in the reporting of the lice detection test result may be six weeks or more, depending on how soon after shearing wool is delivered to the wool store.

In some areas, growers now receive both positive and negative test results one week earlier through a computer link to their Department of Agriculture district office and by telephone through a farmer network.

**Accuracy of the test**

The ability of the test to detect lice in wool from an infested flock depends largely on the severity of infestation and the number of tests conducted on wool from that flock. It is not possible to estimate the ability of the lice detection test to detect lice when the severity of infestation is below that which can be detected by inspectors.

The number of tests conducted on a flock depends on the number of sale lots submitted under the owner’s wool bale brand.

**Test sensitivity**

A single test can detect between 30 and 40 per cent of actual infestations. This low sensitivity is understandable as only 150 g of wool from lots weighing 1000 to 5000 kg is tested. When an average of five tests were conducted on 51 known infested flocks, the test’s sensitivity increased to 75 per cent.

**Test specificity**

If the lice detection test finds a louse is the test result correct? From work conducted with the AWTA, the Department of Agriculture’s estimate from testing 200 known lice-free samples is that 99 per cent of these samples will have a negative test result. For each additional test conducted on a flock there is a 1 per cent increase in the chance that the flock will be incorrectly tested positive. This small number of false-positive detections is a result of cross-contamination of samples and mis-identification of lice.

**Test repeatability**

The repeatability of the lice detection test, that is, its ability to produce the same result when conducted on a second subsample of wool from the same lot, depends on the number of lice detected in the first test (see Table 1).

These results were obtained when the AWTA re-tested 280 of the ‘keeper’ samples retained for reference purposes. The low repeatability of the test, particularly when only one louse is detected, is probably due to the uneven distribution of lice in the ‘keeper’ sample, a

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**Table 1. Repeatability of the lice detection test in relation to the initial test result**

<table>
<thead>
<tr>
<th>Initial test</th>
<th>No. of samples re-tested</th>
<th>% repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>No lice</td>
<td>60</td>
<td>92</td>
</tr>
<tr>
<td>1 louse</td>
<td>60</td>
<td>26 (1 test)</td>
</tr>
<tr>
<td>1 louse</td>
<td>100</td>
<td>63 (7 tests)</td>
</tr>
<tr>
<td>2 or more lice</td>
<td>60</td>
<td>94</td>
</tr>
</tbody>
</table>

Merv Harvey (left) of Noggerup and veterinarian, Ralph Hudson, inspecting a sheep for lice. The sheep lice detection test, together with flock inspections, helps farmers decide if dipping is necessary.
poorer rate of visual detection when only one louse is present, and the loss of lice from the sample during processing.

Acknowledgements
The following persons have contributed to the development and evaluation of the lice detection test: F. Wilkinson, G. Young and A. Mercy, Department of Agriculture; H. van Schie, T. Wilson, P. Walsh and M. Jackson, AWTA.

Advantages of the test for sheep farmers
As a management tool
The lice detection test, together with close observation by farmers for signs of infestation, can be used to help farmers decide whether to dip the whole flock. The test is not accurate enough to select individual mobs of sheep that need dipping. Remember at least 25 per cent of infested flocks are not picked up by the lice detection test.

The value of the lice detection test in predicting the 'real' lice infestation status of a flock depends on the number of tests that are conducted on the flock. If only one or two tests are conducted, then a negative result is not helpful and the decision to dip depends on the overall risk of infestation.

On the other hand, if owners receive a confirmed positive result they should treat the whole flock. If a large number of tests is conducted on the same flock, then a negative flock result, together with no sign of infestation in the sheep, is fairly conclusive that the flock is lice-free. With a large number of tests, one unconfirmed positive test is a less certain indicator of infestation.

For the lice detection test to be of use, farmers must be prepared to forgo an off-shears treatment. They would also need to be notified of any positive test results within four to six weeks post-shearing so that dipping can be completed while the wool is short enough to achieve complete saturation of the sheep.

The lice detection test can detect up to 30 per cent of infestations of which farmers are not aware. While a proportion of infested flocks will be missed, the test increases the information available to farmers on the lice status of their flocks.

Some sheep farmers, however, are unhappy with the inaccuracies of the test. Increasing the number of tests conducted on each lot of wool could improve accuracy, but only at additional, unacceptable expense.

Advantages of the test for lice committees
To determine priorities for eradication
Data on regional infestations of lice can help identify priorities for coordinated extension activity to eradicate lice. For example, the information can show the relative importance of continued or new infestations. This information, together with local knowledge, identifies the roles played by stock trading, ram selling, poor fencing, difficult mustering or ineffective treatment, in the spread of lice.

Flock histories generated by the lice detection test now provide information on the status of individual flocks over a five-year period. Flocks potentially responsible for infestation of neighbouring flocks or the client flocks of ram breeders can be identified. This information has become the focus for specific action by lice liaison committees.

Advantages of the test for the Department of Agriculture
To monitor the apparent prevalence of infestation
In Western Australia, all flocks that have had wool submitted for pre-sale quality assessment are checked for lice. Only a small amount of the wool sold privately is not monitored. Therefore, we have lice-prevalence data on a regional and a State basis which is used to assess the effectiveness of the eradication program.

Lack of alternatives to the test
Criticisms of a lack of accuracy in the lice detection test are justifiable. However, there is no better, practicable, cost-comparable alternative. The lice detection test is just one of several information sources sheep farmers can use to gauge the prevalence of lice in flocks. Apart from an owner's inspections of a flock, additional information on the presence of lice may come from shearsers and wool classifiers.

The low sensitivity and repeatability of the test when conducted on lightly infested flocks limits its usefulness and has undoubtedly caused difficulties in its acceptance by sheep farmers.

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