1-1-1984

Protecting off-shears sheep in adverse weather

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In January 1982 in the Narrogin-Darkan area of Western Australia, about 14,500 sheep up to 40 days off-shears died after a 48-hour period of heavy soaking rain that followed a thunderstorm three days previously. An estimated 100,000 sheep died throughout the South-West at that time. P. G. Buckman—at the time Department of Agriculture District Veterinary Officer, Narrogin—surveyed 17 properties in the area. He found that losses in unshedded sheep 0 to 40 days off-shears ranged from 0 to 84 per cent of sheep on the property with an overall average of 27.9 per cent. Rainfall in the area of the survey ranged from 87 mm to 288 mm in the 48 hours. Losses did not appear to be related to age or condition of the sheep or to nutrition or paddock shelter at the time of the rain. They were directly proportional to rainfall.

Such heavy losses over a whole area are exceptional. The more usual situation involves significant losses on individual farms on which recently shorn sheep have been caught in sudden summer thunderstorms or by severe cold snaps associated with winter storms.

T. Ellis, Veterinary Pathologist with the Animal Health Laboratories, discusses one way to protect these sheep—using plastic coats made from industrial bin bags.
Background

Researchers at CSIRO's Division of Animal Physiology have demonstrated that plastic coats could protect shorn sheep in adverse weather. However, using plastic coats on all shorn sheep in winter or in the face of possible summer thunderstorms would be impractical and uneconomic.

Another strategy is possible. This would involve applying plastic coats to shorn sheep that were already wet and cold stressed in the face of continuing adverse weather. In a practical sense this may be feasible.

To investigate this strategy further, researchers at the Department of Agriculture's Animal Health Laboratories measured some physiological changes in recently shorn Merino sheep that were subjected to cold stress, then covered with plastic coats and subjected to further cold stress.

The Research

Merino sheep four days off-shears were put in individual pens in an enclosed room cooled by fans and airconditioning. The sheep were wet continually with overhead sprinklers to simulate the cold stress induced by prolonged wind and rain storms. Each sheep's rate of energy use was monitored through an intravenous infusion line—a plastic microtube—inserted into the jugular vein.

In the trial a test group of 10 sheep were wet for 10.5 hours, then covered with plastic coats and wet for a further 80 hours. Their reactions were compared with those of three control groups of 10 sheep each: one group kept dry all the time, one wet with no coats on for the first 21 hours, and one wet with coats on all the time for 90 hours.

Several measurements were taken from the sheep at intervals during the trial.

Energy use was measured by determining the rate at which carbon dioxide (the product of energy metabolism) entered the blood stream. The blood corticosteroid levels gave a measure of the degree of stress and the thyroxine or thyroid hormone levels were measured as an indication of physiological response to cold.

Animals were slaughtered at the end of the trial and special methods were used to determine levels of muscle and liver glycogen which is an energy store in these tissues. The levels of a liver enzyme, tyrosine aminotransferase, which builds up with cold stress, were also measured.

Results

The averages of body temperatures, rates of energy use and corticosteroid and thyroxine levels of the four groups of sheep over the period of cold stress are shown in the graphs.
After 10.5 hours of wetting the test group sheep and wet controls had become hypothermic (abnormally low body temperature). But 2.5 hours after the coats were put on and despite continued wetting, the body temperatures of the test group sheep had returned to normal (39 ± 0.5°C). The temperatures remained normal despite continued wetting for another 77 hours (Figure 1).

The body temperatures of the wet control sheep however continued to fall. These sheep were slaughtered between 10.5 and 21 hours after wetting had started.

The rate of energy use rose markedly in both the test group sheep and wet controls, but had returned to pre-wetting levels 80 hours after the coats were put on the test group sheep (Figure 2).

The corticosteroid levels in the test group sheep rose sharply in response to the cold stress, but had returned to pre-wetting levels 20 hours after coats were applied. There also appeared to be an increase in thyroid hormone production (Figure 4) during the first 10.5 hours of wetting, but this had returned to normal levels 10.5 hours after coats were applied.

The muscle and liver glycogen levels in the test group sheep, dry controls and coated wet controls were similar. However, they contrasted dramatically with the severely depleted levels in the wet control sheep that were slaughtered between 10.5 and 21 hours after wetting had started. Therefore, despite continued wetting after coats were put on, the test group sheep had been able to replenish liver and muscle energy stores to normal levels within 80 hours.

The levels of the liver enzyme tyrosine aminotransferase were similar in the test group sheep and coated wet controls after 90 hours of wetting. Thus levels of a liver enzyme associated with cold stress had returned to near normal 80 hours after coats were put on to protect test group sheep from further cold stress.

From the above measurements it is evident that there was a rapid improvement in survival chances of cold-stressed recently shorn sheep that had plastic coats fitted in the face of continued wetting.

**Fitting plastic coats**

The plastic coats used in the study were cut from 75 micron thickness green plastic industrial bin bags (1170 mm x 630 mm). Their purchase price (January 1983) was $297 per 1000 bags (30 cents each). The bag was shaped to fit the sheep as shown in the diagram.

Some pilot investigations by P. W. Morcombe (Department of Agriculture District Veterinary Officer, Moora) indicated that paddock sheep kept their coats on and that these coats could last for 17 days. No detrimental effects of coating were observed. Cutting the plastic bags by hand was time consuming; there would be a need for plastic coats either cut to shape or moulded as a coat at roughly equivalent prices.

There is probably another survival advantage in deciding to apply plastic coats to cold-stressed recently shorn sheep. This is the increased heat production of the sheep during mustering before the coats were put on.

**Conclusion**

Fitting plastic coats to recently shorn sheep that are already cold-stressed can markedly improve their condition and hence their survival chances in the face of continued adverse weather. Therefore if weather forecasts indicate continued rain and adverse weather, fitting coats to those sheep most at risk is an alternative to housing them in a shearing shed or to moving them to bush shelter if this is available.