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William Haddock Dalrymple

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Louisiana State University and A. & M. College
Baton Rouge

Victim of Stomach Worms

Bare-Lot vs. Grass-Lot
In Relation to Stomachal and Intestinal Parasitism
of Lambs.
Further Experiments

By W. H. Dalrymple, M. R. C. V. S.

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BARE-LOT vs. GRASS-LOT

In Relation to

STOMACHAL AND INTESTINAL PARASITISM OF LAMBS.

Further Experiments.

By W. H. Dalrymple.

During previous experiments by the Veterinary Division of this Station to endeavor to obtain some practical method by which lambs could be raised free, or virtually so, from nodule-disease of the intestines, it was found that notwithstanding the success attained by the "bare-lot" method, stomach worms (*Haeomonchus contortus*) were always found in considerable numbers in the abomasum, or fourth compartment of the lambs' stomachs.

It was decided, in the early part of the present year, to continue the experiments with nodule-disease, and to include, also, treatment directed against stomach worms, and, at the same time, test the difference in the results, if any, that might be secured with lambs raised on a grass-lot, as against those kept on a bare-lot, or one free from grass.

The bare-lot used was the same as that employed in last year's work, but, after the lambs were taken off in September, 1906, the ground was thoroughly ploughed and harrowed, and left in that condition until the latter part of February, when it was hoed and raked over and put in final shape for the reception of the ewes and lambs. (See description of lot in Bulletin No. 83, page 4.)

The grass-lot had not been occupied by sheep at all since January, 1904, when three lambs occupied it for about six months, but which, when butchered and examined, did not have any sign of nodule-disease.

As it was decided to use check, or control, animals, both in the pasture and bare-lot tests, each lot was divided lengthwise by a suitable fence, and a small shed for shelter was provided for each bunch of ewes and lambs. The sheep had common salt
before them all of the time in small boxes, and fresh water was provided out of wooden tubs. A little crushed grain was fed out of troughs once a day, and the bare-lot bunches were "soiled," or received cut green food out of racks. In short, the only difference in the method of feeding the ewes and lambs in the bare-lot and on pasture, was that the latter had to obtain their green food by grazing, while the former received theirs from racks.

Thirteen native and common grade ewes, with young lambs, were purchased for the experiments. The oldest lambs were not more than two or three weeks, the rest, younger, and were from an extensive area of pasture country in the neighborhood where sheep were not numerous and where the chance of previous infestation of the lambs, at such an early age, was slight, if any. It should be stated, however, that the ewes had previously belonged to a flock in another section that was infested with both rodulie and stomach worms.

On March 6, 1907, two ewes, with their lambs, were placed, without any previous treatment, in a section of the bare-lot provided for the control, or check, animals; and three ewes and lambs were put in the control-division of the grass-lot. The remaining eight ewes and eight lambs were retained in a covered shed for treatment of the ewes before turning both into the lots.

TREATMENT OF EWES.

March 15.—Each of four of the ewes was given 4 ounces of a 1 per cent solution of coal tar creasote, and, on the following day, each of the remaining four ewes received a mixture of 1 drachm of carbon bisulphide and 1 drachm of absolute alcohol, in 4 ounces of sweet milk.

March 18.—The above treatment was repeated, with the exception that the carbon bisulphide was mixed with 2 ounces of Carron oil (equal parts of raw linseed oil and lime-water) instead of the alcohol and sweet milk. The Carron oil was found to be quite a satisfactory vehicle for the bisulphide when the mixture was well shaken before its administration.

The drenching was accomplished by means of a piece of one-quarter-inch rubber tubing, about three and one-half feet
long, with a hard-rubber nozzle inserted in the lower end, and a glass funnel in the upper. It was found that by gripping the rubber tube, just below the insertion of the funnel, with the under border of the left hand, the flow of the material could be easily regulated. An assistant introduced and held the nozzle in the animal’s mouth.

March 19.—Each of the eight ewes received 8 ounces of a saturated solution of magnesium sulphate (Epsom salt).

March 21.—The udders and surrounding parts of the eight ewes were washed with a 3 per cent solution of carbolic acid and water to destroy any infection that might be present; after which they, with their lambs, were placed in their respective lots.

The above line of treatment was adopted with a view of destroying and dislodging parasites, either free nodule-worms or stomach worms, that might be present in the ewes, as well as to destroy any infection that might be on the surface of the udders, teats, etc., before placing them, with their lambs, on the grass and bare-lots which they were to occupy.

May 18.—One of the three check ewes died in the grass-lot. Postmortem examination revealed extensive nodule-disease, with a number of nodule worms (Oesophagostoma columbianum) free in the large intestine, and a few stomach worms in the fourth stomach.

May 25.—A second check ewe died in the grass-lot, showing numerous nodules and several stomach-worms.

June 2.—Two stray dogs, unfortunately, gained access to the check or control-division of the grass-lot and killed two of the lambs. One of the lambs showed numerous nodules, with a great number of stomach worms; the other, a few stomach worms, but no nodules that could be seen.

June 9.—The last one of the three control ewes, in the grass-lot, died. She was extensively affected with nodule-disease.

July 1.—One of the bare-lot ewes, which had received coal-tar creasote solution, died in the experiment-division. This ewe had always appeared somewhat emaciated and unthrifty. On
account of the hot weather, decomposition had set in so rapidly that a postmortem examination was not made. There could be little question, however, of her being severely affected with nodule-disease.

It would seem that sheep which have survived the effects of stomach worms, during lambhood, frequently succumb to nodule-disease of the intestines when confined to areas where this disease is prevalent.

July 10.—The lambs in both divisions of the bare-lot were weaned by the removal of their mothers.

July 15.—The grass-lot lambs in the experiment division were weaned in a similar manner. It will be remembered, as already mentioned, that the last of the control ewes in the grass-lot died on June 9.

July 28.—The remaining check lamb, in the grass-lot, died. Postmortem examination revealed great numbers of stomach worms in the fourth stomach, but no nodules, so far as could be discovered. A picture of this lamb, taken the evening before it died, may be seen on the front page.

With the exception of the unthrifty ewe which died on July 1, no losses were met with among the ewes and lambs in the bare-lot divisions.

TREATMENT OF LAMBS IN GRASS-LOT.

July 17.—One lamb, whose mother had received the coal-tar creasote treatment, was given 3 ounces of the same solution. And another lamb, whose mother had been treated with carbon-bisulphide in linseed oil and lime water, was drenched with one and one-half ounces of the same mixture, which was equivalent to three-quarters of one drachm of the bisulphide of carbon. The remaining two lambs in this division did not receive any medicine at all.

July 24.—The same two lambs received similar quantities of the same medicinal agents.
SHOWING DIVISIONS OF GRASS-LOT.

(Photo taken after the loss of two ewes and two lambs in Control-Division.)
TREATMENT OF LAMBS IN BARE-LOT.

July 17.—The treatment of the lambs in the bare-lot was, in every respect, a duplicate of that followed in the case of those in the grass-lot, and the medicines were administered on the same dates—viz., July 17 and 24.

Our line of treatment was aimed at (1) to test what effect, if any, the previous treatment of the mothers might have on the infection of the lots, and on the lambs that were not, themselves, treated; (2) to see if the two treated lambs would show better results than the two untreated ones (in both grass and barelots);
and (3) to note the difference, if any, in the efficacy of the two medicinal agents used.

No further treatment was given the lambs in either grass or bare-lots, and on August 10th all of them (10 in number) were butchered and their stomachs and intestines examined for stomach worms and nodules.

POSTMORTEM EXAMINATIONS.

Bare-Lot.

Experiment-Division in Which the Four Ewes and Two of the Lambs Had Received Treatment.

1. Ewe lamb. Fairly nourished. Treated twice with coaltar creasote solution.
   Nodules: About two or three small nodules on large intestine.
   Stomach worms: Numerous.
2. Ram lamb. Well nourished. Received no treatment.
   Nodules: One or two small nodules on large intestine.
   Stomach worms: Less numerous than in previous case (No. 1).
   Nodules: About two or three small nodules present.
   Stomach worms: Very few.
4. Ewe lamb. Fairly nourished. Received no treatment.
   Nodules: One or two small nodules observed.
   Stomach worms: Not very numerous.

Check or Control-Division in Which Neither Ewes nor Lambs Had Received Any Medicinal Treatment.

1. Ram lamb. Well nourished.
   Nodules: Three or four small nodules on large intestine, and about half a dozen scattered along small intestines.
   Stomach worms: Very numerous. That is to say, they could be found covering almost, if not every part of the mucous lining of the stomach.
Experiment-Lambs in Bare-Lot.
2 Ewe lamb. Well nourished.
Nodules: No nodules that could be detected.
Stomach worms: Very numerous—similar to previous case.

GRASS-LOT.

Experiment-Division in Which the Four Ewes and Two of the Lambs Had Received Treatment.

1 Ewe lamb. Poorly nourished. Treated twice with coal tar creasote solution.
Nodules: Almost negative.
Stomach worms: Extremely numerous. This lamb showed marked symptoms of acute internal parasitism.

2. Ram lamb. Well nourished. Received no treatment.
Nodules: About a dozen small nodules present.
Stomach worms: Moderately numerous.

3. Ewe lamb. Well nourished. Treated twice with carbon bisulphide in Carron oil.
Nodules: About a dozen small nodules present.
Stomach worms: Quite numerous.

Nodules: One or two small nodules present.
Stomach worms: Moderately numerous.

Check or Control-Division in Which Neither Ewes nor Lambs Had Received Any Medicinal Treatment.

The three lambs originally occupying this division had all died previous to the examination of the others; the postmortem findings have already been recorded.

We do not know that the terms used convey an intelligent idea of the number of stomach worms present in each case. These parasites are exceedingly difficult to count in a severe attack. We might say, however, that the numbers ranged from a few straggling ones, here and there, over the mucous lining of the stomach, as in the case of Ram Lamb No. 3, which was treated with the carbon-bisulphide mixture, in the Experiment-
Division of the Bare-Lot, to a "seething mass" of the worms, covering all parts of the mucous membrane, as was the case in Ewe Lamb No. 1, which received coaltar creasote solution, in the Experiment-Division of the Grass-Lot.

INFERENCES AND REMARKS.

The parasitic infection, both nodule and stomach worms, was, doubtless, introduced on to the lots by the purchased ewes.

The lambs were somewhat mixed as to breeding and quality, and a little irregular as to size and age.

All of the lambs, including controls, on the bare-lot were in marketable condition, and the carcasses were purchased by a leading local butcher.

Only two, out of the four lambs on the experiment-division of the grass-lot, were in condition for the market, and these were bought along with the bare-lot bunch.

No losses occurred, either in ewes or lambs (two of each) in the control-division of the bare-lot.

All of the ewes (three in number) and one lamb died in the control-division of the grass-lot, independent of the two lambs that had been destroyed by dogs.

One delicate ewe (out of four) died in the experiment-division of the bare-lot.

None of the four ewes died in the corresponding division of the grass-lot.

None of the four lambs died in the experiment-divisions of either the grass or bare-lots. At the same time, all of those in the bare-lot were in marketable condition when butchered, while only two of those in the grass-lot were in condition for the market—one of the remaining two being in poor flesh; the other, ailing as the result of acute internal parasitism.

Notwithstanding that all of the lambs were, more or less, infested with stomach worms, the uniformly good condition of those in the bare-lot (both controls and others) showed that their health was little, if at all, impaired; while, at least, two of the experiment-division grass-lot lambs did not thrive sufficiently to be considered fit for the butcher.
Experiment—Lambs in Grass-Lot.
On the whole, the lambs raised by the bare-lot method were, in every way, more satisfactory than those raised on the grass-lot.

As only one ewe died out of eight that had received medicine, it is thought probable that the treatment had a beneficial effect, both on the ewes and in preventing, to some extent, the transmission of infection to the lots, as none of the untreated lambs of the treated mothers had died up to the time of slaughter, while the three untreated ewes died in the control-division of the grass-lot, although those in the bare-lot division did not seem to suffer.

The effect of the few nodules found on the intestines might be considered as negative, so far as interfering with the nutrition and development of the lambs, for market, was concerned, as they were very small, and occupied but a minute area of the absorbing surface of the bowel.

The test, in these experiments, may be looked upon as a peculiarly severe one, on account of greater exposure of the lambs to grosser infection (due to the very restricted area of the lots) than would likely be found in practice on the farm.

From these, and our previous experiments, it cannot be definitely stated that the "bare-lot," as used by us, had any appreciable effect in preventing the lambs from obtaining stomach-worms, although, in the case where both ewes and lambs were treated, and even where the mothers, alone, received medicine, the worms were considerably fewer in number than in the control lambs. This result was evidently, largely due to the ewes being treated before being placed in the lots.

It is our opinion that no kind of lot, or corral (so-called bare-lot) where the ground-surface cannot be kept absolutely free from dust, or loose soil, and feces (droppings), will prevent lambs obtaining stomach worms in some form; that is, where the infection exists, as was the case in our experiments—the worms having passed from the ewes—as we have frequently observed the lambs nibbling and "nosing around" amongst the dust and manure, even when not a spear of grass appeared to be present.

We are inclined to the opinion, although we have not yet made the test at this Station, that one of, if not the most satis-
factory manner of dealing with the stomach-worm problem would be a system of periodic rotation of the pasture or other feeding grounds, combined with suitable vermicide medicines.

So far as we are aware, the bisulphide of carbon had not previously been employed as a vermicide in sheep; and from the use of only two doses each to two lambs, we are scarcely in a position to give a definite opinion as to its efficacy, although we are inclined to think that it gave rather better results, in our case, than the coaltar creosote, as may be seen by reference to the record of post-mortem examinations.

We believe that carbon bisulphide is worthy of further trial in practice, but we must add a word of caution. This agent is very combustible, and must be handled with great care. The better method of preparing the mixture would seem to be to first add the bisulphide to the raw linseed oil and agitate the two thoroughly. Then add the lime water and again shake the whole until thoroughly amalgamated.

After administering this mixture to the two lambs, and one or two of the ewes, it was observed to have what appeared to be a slight, temporary intoxicating effect, the animals holding their heads to one side, and in one or two cases a tendency to "buck jump," as it were. This may have been due, however, and we think it quite probable, more to the uncomfortable sensation produced in the more exposed part of the mouth and around the lips by the rapid evaporation of the bisulphide. As previously stated, the effect was only temporary, and we had no bad after-effects whatever in any of the animals so treated. This might be obviated by administering the bisulphide in a gelatine capsule, as has been done when giving this agent to dislodge "stomach bots" in horses, but we did not attempt this method in our experiments.

We are inclined to think, however, that in the case of the sheep, medicines in fluid form are more likely to sooner reach the fourth stomach than when given as a solid, which the capsule would tend to represent.

We mention this experience so that anyone trying the bisulphide-Carron-oil-mixture in practice might be prepared for the
CONTROL-LAMBS IN BARE-LOT.
effects, stated, in some of the animals. It was also observed that when the drench was well given, and none of it forced forward in the mouth by the sheep, or smeared over the outside of the mouth and lips, very little, if any, of this effect was produced; which would rather indicate that it was due to the speedy evaporation of the bisulphide from the more exposed parts alluded to.

The opinion here expressed with regard to the apparent efficacy of bisulphide of carbon is predicated solely upon our observations in these experiments, and not on its direct action upon the living parasites outside of the stomach. This we hope to take up later when an opportunity presents itself.

Neither the eight lambs nor their carcasses were weighed on this occasion, but the butcher who purchased the latter pronounced their general condition favorably comparable to, and the quality of the flesh better than, any he had handled during the season.