three longitudinal strips by soil levees. The strips were further subdivided into five ponds with connecting spillways. Soil salinity samples to 5 feet of depth were taken 15 feet and 60 feet from the tile trench, in each of the pond areas of each strip. Each strip was flooded individually for a 1-month period. After the water had receded, soil samples of the areas were again taken. The levees were flattened, and the following year on February 16, 1967, the southern strip was chiseled to 22 inches, the center strip was slip plowed to 48 inches, and the north strip was left untreated. The field was left fallow for three months to allow the soil to dry out. The levees were again constructed and the strips flooded indivdually for 1-month periods with the exception of the untreated check, which was flooded for 2 months. After the water had receded in the ponds, soil samples were again taken at sites 15 and 60 feet from the tile trench. Soil samples were also taken directly over the tile. The infiltration rate was obtained by measuring the rate of fall of the impounded water.

The reduction in soil salinity from leaching the area prior to the soil manipulation was compared with the reduction from leaching after the soil manipulation (table 1). Conductivities of the saturated soil extract after leaching each soil treatment are shown in table 2. The rate of fall of the ponds after the cessation of water flow is shown in table 3.

The data indicate that the ponds which had been slip plowed showed the greatest reduction in salinity at the midpoint between the tile trenches. It is believed that the slip trench served to channel water flow to the tiles, allowing a faster movement of water at the midpoint between the tile. The result was a better leaching of salts from the midpoint.

Table 2 shows that both the chiseled area and the untreated area had significantly lower soil salinity in the tile trench. The slip-plowed area did not show this effect. It appears that the slip plow opened up the soil profile sufficiently to allow leaching from all points at the same depth to proceed at nearly equal rates.

Table 3 shows that the greatest increase in soil intake rates was in the slip plowed area.

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GASTROINTESTINAL PARASITISM OF LAMBS . . . *a survey of Imperial Valley feeder lambs*

N. F. BAKER · J. B. BURGESS · G. L. CRENSHAW

ANIMAL HUSBANDRY practices in the production of fat lambs in the Imperial Valley of California are quite different from those in the remainder of the state. Shipment of feeder lambs into the Imperial Valley begins early in September and is usually completed by the end of October. The lambs are grazed inside temporary fencing on alfalfa and barley stubble pastures. Pastures of 80 acres are usually used, and a band of 1,500 to 2,000 lambs is grazed for 1 to 2 weeks, after which the lambs are driven or trucked to another pasture. Dry hay is occasionally fed as supplemental feed. Most shearing is done by the middle of December, and most of the lambs are marketed directly from pasture by the first of March. In view of these husbandry practices, different patterns in the host-parasite relationship might be expected between sheep and their gastrointestinal nematode (roundworm) parasites in the Imperial Valley than in other regions of the state.

To obtain information on the status of parasitism in Imperial Valley lambs, a cooperative project between the Agricultural Extension Service (El Centro) and the School of Veterinary Medicine, Davis, was initiated. This program was conducted for two years—1963 and 1964. The objects of the program were, first, to assess the level of parasitism in lambs arriving from different geographic areas; second, to determine whether or not the degree of parasitism increased or decreased during the feeding period; and third, to attempt to assess whether or not the parasites were detrimental to the growth of the lambs.

Procedure

In 1963, eight bands of sheep differing in origin or condition were selected for study, while in 1964, five bands were studied. These bands were characterized as follows: The eight bands in the 1963 tests included: (1) a "tail end" band of mixed blackface crosses sorted from a larger band and originating in the Fort Bridger area of southwestern Wyoming; (2) medium weights from the same original flock as band 1; (3) heavy lambs from the same original band from which bands 1 and 2 were selected; (4) whiteface crosses (Columbian rams × Western whiteface ewes) originating on the continental divide in southwestern Wyoming; (5) mainly crossbred blackface lambs shipped from San Angelo, Texas; (6) mainly whiteface lambs shipped from Artesia, New Mexico; (7) whiteface lambs shipped from the Fort Stockton area in west Texas; and (8) a band similar to band 7.

The five bands studied in 1964 included: (9) lightweight crossbred lambs from the Fort Bridger area of Wyoming (similar to band 1); (10) predominantly western whiteface lambs from the continental divide northeast of Fort Bridger, Wyoming (similar to band 4); (11) crossbred lambs from Ely, Nevada; (12) largely whiteface lambs from Pecos, Texas (band made up at Fort Stockton, Texas); and (13) a band similar to band 12.

To study the host-parasite relationships in these lambs, 40 individual fecal samples were collected at random from each band monthly for quantitative determinations of the number of parasite eggs per gram of feces (epg).

Results

In 1963, early egg counts in the feces of all bands originating in Texas (bands 5, 7, and 8) were considerably higher (see graphs 1 and 2) than in those of the bands from Wyoming (bands 1, 2, 3, and 4) and New Mexico (band 6). The reason for the higher egg count in the feces of the Texas bands is that these particular eggs were produced by *Haemonchus con-*

tortus, the large stomach worm. This species is capable of producing 5,000 to 10,000 eggs per day per female, compared with the 100 to 300 eggs per day per female of the other species present in these lambs. In addition, the spontaneous loss of *H. contortus* as the result of immunological or other phenomena is to be expected; thus the subsequent decrease in egg counts from the Texas lambs can be explained (see graph 2).

The sampling procedure of the 1963 study proved to be adequate to separate the one band of Wyoming lambs reared on the continental divide (band 4) from those reared in the Fort Bridger region (bands 1, 2, and 3). Nematode parasites could not be considered as the cause of the difference in condition between the latter three bands, since in all three the parasite burdens were similar. It should be noted, however, that no attention was given to any parasitic organisms besides the nematodes (roundworms).

In a comparison between the 1964 results (see graph 3) and those of 1963, it is noteworthy that, with the exception of the absence of relatively high counts in early samples from Texas, and the presence of a somewhat higher mean count in lambs from the continental divide of Wyoming, all results are quite similar. These differences are in all probability due to the influence of environmental conditions on the development of the parasite to its infectious stages at the point of origin.

In both years there were increasing numbers of parasites during the late portion of the feeding period for the Texas lambs (bands 5, 8, 12, and 13). The parasites increased for one of two reasons: (1) return of the lambs to previously contaminated pastures, or (2) the "spring rise" phenomenon caused by the maturing of larvae which were carried through the winter in an arrested state of development in the tissues. In either case the possibility exists that, were the feeding period extended, clinical levels of infection might have developed in these animals. However in no case were the egg counts indicative of clinical levels of parasitism.

On the basis of results obtained over many years in the Parasitology Laboratory of the School of Veterinary Medicine, it can be estimated that following the loss of *Haemonchus contortus*, the mean parasite burdens in all bands numbered less than 3,000 adult nematodes of the genera *Ostertagia*, *Trichostrongylus*, *Cooperia* and *Nematodirus*. In five bands (bands 4, 6, 9, 10, and 11) the mean burdens would have been less than 500 adult nematodes of the same genera.

Conclusions

The data indicate that under the common conditions of management used in the Imperial Valley, no significant exposure to and/or "build-up" of roundworm parasites in the gastrointestinal tract of lambs takes place. In the few animals where an increasing number of parasites did occur, the increase was late in the feeding period and lambs were marketed quite some time before these levels would have reached clinical significance. It was also found that there is a difference in the parasite burdens, both qualitatively and quantitatively, in feeder lambs brought into the Valley from different points of origin.

From the standpoint of animal health and production, the foregoing data suggest that, when clinical parasitism occurs in the Imperial Valley lambs, it is usually the result of the purchase of sick (parasitized) animals. Sometimes, also, the stress of shipment and the effects of the severe alteration in environment lower an animal's ability to resist the pathogenic effects of parasites already present in the gastrointestinal tract. Where possible, competent professional examination of lambs should be conducted at least 7 to 14 days prior to shipment and, when necessary, therapeutic treatment with an appropriate anthelmintic should be administered at least 7 days prior to shipment. Where this is impractical, an examination and any therapy necessary should be conducted as soon as possible after lambs arrive in the Imperial Valley.

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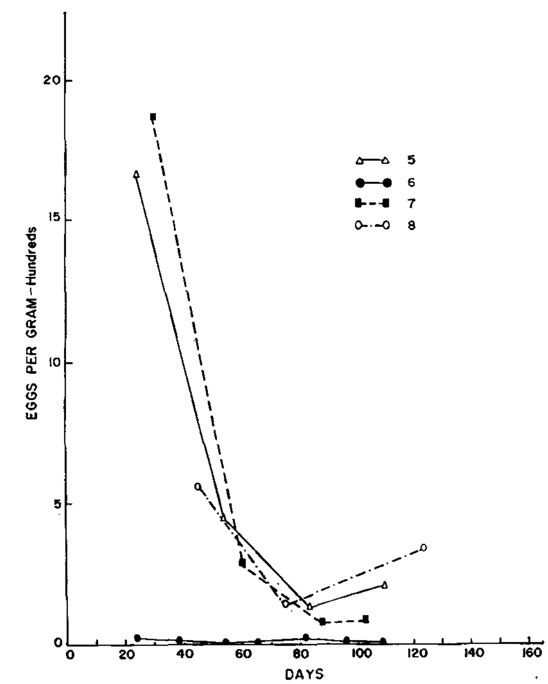
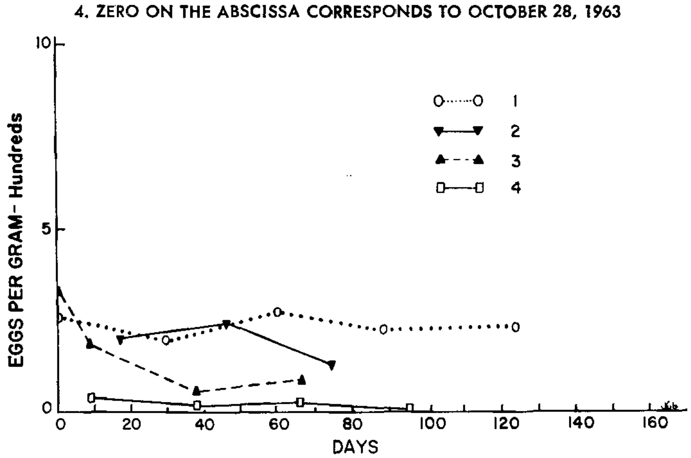
GRAPH 2. MEAN PARASITE EGGS PER GRAM OF FECES IN BANDS 5 THROUGH 8. ZERO ON THE ABSCISSA CORRESPONDS TO OCTOBER 28, 1963



GRAPH 1. MEAN PARASITE EGGS PER GRAM OF FECES IN BANDS 1 THROUGH 4. ZERO ON THE ABSCISSA CORRESPONDS TO OCTOBER 28, 1963



GRAPH 3. MEAN PARASITE EGGS PER GRAM OF FECES IN BANDS 9 THROUGH 13. ZERO ON THE ABSCISSA CORRESPONDS TO OCTOBER 30, 1964