Phenothiazine-Salt Mixture for Control of *Haemonchus Contortus* in Range Sheep

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A LONG-TERM field trial of the use of a 1:9 phenothiazine-salt mixture for controlling *Haemonchus contortus* in range sheep was begun at the Sonora station in 1945. Preliminary trials had suggested that such a mixture offered free choice the year 'round might satisfactorily control the large stomach worm and could possibly replace the practice of drenching.

The study was conducted at the Sonora substation, commonly called the Ranch Experiment Station, which is on the Edwards Plateau, an area of approximately 34,000 square miles in west-central Texas extending eastward from the Pecos River almost to Austin. Vegetation consists of bunch and turf grasses, weeds, and browse. The elevation above sea level varies from 700 to 2,500 ft., and is approximately 2,400 ft. at the Sonora Station. Rainfall is light, an annual average of 24 in. having been recorded at the station over a thirty year period. Summer seasons are relatively hot, and the winters are mild. Sparsity of the vegetation necessitates the grazing of limited numbers of sheep on large pastures, providing some natural control of endoparasites. Also worthy of consideration is the fact that while the bunch grasses common to many pastures may to some extent fail to protect parasite eggs and larvae against the intense sunlight, the turf grasses provide excellent protective environment for them.

Haemonchus contortus is the most important roundworm parasite of sheep in the area with which this article is concerned. It had constituted a serious threat to the local sheep industry prior to the routine use of phenothiazine drench.

Many sheep raisers in the Edwards Plateau region now supply phenothiazine-salt mixtures free choice, having found that it is practicable and controls the large stomach worm satisfactorily. The salt mixture method is more economical than drenching, for although the drug cost of each method is about equal, there are some factors associated with periodic drenching of large flocks of sheep to which a monetary value can not be accurately ascribed. These include time and labor expended in gathering the sheep, weight loss occasioned by holding in pens, and occasional injuries which subsequently become infested with screwworms. The authors concur with some ranchmen in the observation that the phenothiazine-salt mixture method of free choice administration had to be used for one or two years before satisfactory control was established on certain ranches.

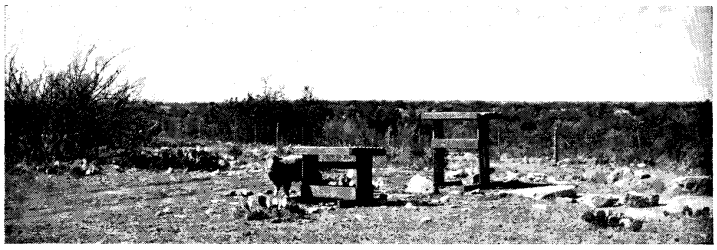

Fig. 1—Covered salt troughs. When cattle and sheep are pastured together, cattle are furnished plain white salt in high troughs; medicated salt is available for sheep in the lower troughs.

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The work reported in this paper was conducted by Drs. Boughton and Hardy the first three years; by Dr. Hardy during the following two years; and subsequently by Dr. Price.

The authors appreciate the help of Dr. R. D. Turk, head, Department of Veterinary Parasitology, A. & M. College of Texas, in the preparation of this manuscript.

LITERATURE

A considerable amount of literature is available regarding the use of phenothiazine-salt mixtures, but it will best serve our purpose here to make only a few pertinent remarks concerning it. Some of the earliest work with phenothiazine-salt mixtures for controlling parasites was reported in the early 1940's.[2, 5, 10] Since then, there have been numerous trials, both in this country and abroad, to determine the efficacy of phenothiazine-salt mixtures against nematodes of sheep. Under some conditions, the salt mixtures have failed to afford adequate control and recommendations for supplemental drenching have naturally followed. Some workers, on the other hand, have reported satisfactory control when the proportion of phenothiazine in salt has varied from 1:9 to 1:15. Most of the reports have dealt with short-term studies, some for only three or four months, while the most extensive heretofore published was the four-year study of Rietz and Wilson.[16]

PROCEDURE

Animals used in this study were purebred Rambouillet ewes which were bred to lamb in November and December each year. The conditions under which they were maintained are typical of the local husbandry. Due to mild winters, shelter was never provided, and lambing occurred at pasture without any special attention. Lambs spent the remainder of their lives in the pasture where they were born, except for the brief periods when they were penned for the collection of fecal samples. As ewes became too old for breeding, they were sent to market.

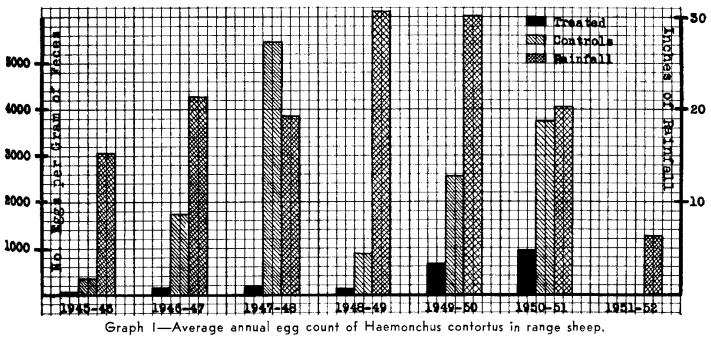
A 400-acre pasture stocked with 65 to 70 breeding ewes and their lambs had access, free choice, to phenothiazine-salt mixture at all times. An adjoining 100-acre pasture containing 14 to 18 ewes with their lambs was furnished with plain white salt only and provided for controls. Both pastures were similar in vegetative covering.

The drug was purchased on the open market as phenothiazine N. F. powder, and was mixed with sufficient ground stock salt to give a 1:9 mixture. Covered salt troughs were used in both pastures, the treated sheep having continual access free choice to the phenothiazine-salt mixture, and the controls having the same stock salt without phenothiazine.

The lambs in each pasture were penned at regular monthly intervals for the collection of fecal samples. Such samples were taken from the new lambs beginning in May each year and continuing periodically until the following May, when the males were slaughtered for the purpose of making actual worm counts. Fecal samples were obtained directly from the rectum. The pellets of each sample were crumbled by hand, then divided into two portions of 3 Gm. each. One portion was subjected to a microscopic egg count, utilizing Stoll's method so modified that the dilution gave results in multiples of 400. The other portion of each sample was incubated in a test tube at room temperature to provide an estimation of larval development. The sides of the tubes were moistened daily to enable larvae to ascend the walls and estimations of larval numbers were made at the end of a week. Designations of 1 + to 4 + were ascribed, indicating larval numbers of 1 to 25, 25 to 50, 50 to 100, and more than 100.

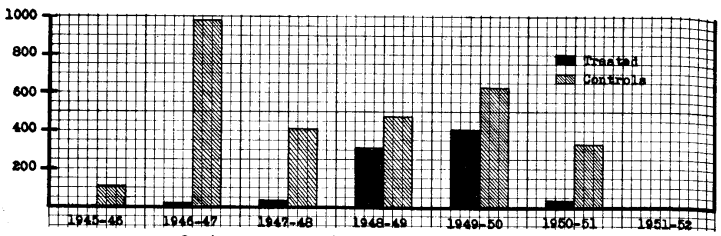
RESULTS

Graphs 1 to 3 summarize the data obtained with respect to egg counts, larval development, and worm counts at necropsy. The near-zero level of egg counts during the 1951-1952 season is probably the direct



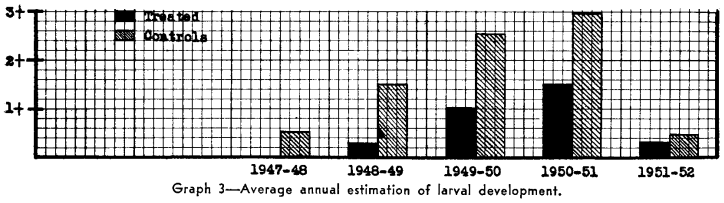
Graph 1—Average annual egg count of Haemonchus contortus in range sheep.

result of the most severe drought ever recorded in West Texas. The total rainfall recorded at the Sonora station for the year ending May, 1952, was 6.29 inches. Although a few Haemonchus parasites were counted during necropsy examinations at the end of that period, the dilution used in the egg counting technique was such that eggs were not detected in such small numbers.



Graph 2—Average number of worms counted at autopsy.

Although all of the sheep in each flock were observed clinically each time fecal samples were collected, at no time were there noted any symptoms attributable to phenothiazine toxicity. This seems especially significant in view of the fact that the ewes usually attained the age of 6 to 8 years before they were sent to market. There were no apparent differences between the treated and control flocks with respect to wool or lamb production.



Graph 3—Average annual estimation of larval development.

The phenothiazine-salt consumption averaged slightly less than 150 Gm. per sheep per month, the rate varying considerably from month to month and from year to year, due probably to variations in the annual rainfall and to the presence each year of growing lambs.

SUMMARY

Two flocks of sheep were used in a seven-year study to determine whether a 1:9 phenothiazine-salt mixture would serve as the sole means of controlling *Haemonchus contortus* in sheep maintained under range conditions typical of the Edwards Plateau. One flock had continual access, free choice, to a 1:9 phenothiazine-salt mixture during the entire period; the other flock, in an adjoining pasture, provided for controls and received plain white salt only.

Data obtained from egg counts, estimations of larval development, and actual worm counts at necropsy, all showed that the 1:9 phenothiazine-salt mixture satisfactorily controlled *H. contortus* in range sheep over a period of five to seven years under the climatic conditions obtaining on the Edwards Plateau.

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Terramycin in Actinomycosis in Man

Seven cases of mandibular actinomycosis in patients ranging from 13 to 51 years of age were treated with terramycin (oxytetracycline hydrochloride) with complete recovery in each case. The dosage was from 250 to 500 mg., given orally every six hours for an average of twenty-four days. Two cases followed tooth extractions.

Four of the cases had failed to respond to penicillin treatments which, in 1 case, were combined with sulfonamides and in another case with chloromycetin® (chloramphenicol). However, all showed improvement after a few days' treatment with terramycin and were completely recovered in an average of two to three weeks. One case had a relapse in about three months and was given potassium iodide with the terramycin therapy for about four weeks, after which the case fully recovered. *Actinomyces bovis* was recovered from each case.—*J.Am.M.A., March 21, 1953.*

Pathogenic Virus Lived Many Years

The University of Michigan recently announced that a test tube containing a deadly virus, which had been hunted for thirty-five years, was recently found and the virus killed rats within a few hours. Viruses usually require the presence of living animal cells to survive and most of the 100 known viruses die within a few days or weeks after removed from living cells.—*Lab World, Feb., 1953.*

Rabies in a male beaver, showing furious type symptoms, was diagnosed by histological examination at Columbia, Mo.—*Vet. Bull., April 15, 1953.*