

Effects of Subclinical Infections of Internal Parasites on the Production of Beef Heifers

A.F. Loyacano, J.C. Williams, Jeff Gurie and Andy DeRosa, Dean Lee Research Station and Department of Veterinary Science

Findings

- Internal parasites significantly affected the performance of beef replacement heifers.
- Gastrointestinal nematode infections reduced weight gains of heifers and their calves.
- The combined effect of gastrointestinal nematode and bovine liver fluke infections reduced the reproductive performance of first calf heifers.

Introduction

Beef cattle in Louisiana are continuously exposed to infections with parasitic gastrointestinal nematodes (commonly known as roundworms). The life cycle of these parasites is direct; they do not need an intermediate host. Adult worms in cattle shed eggs that are passed in their feces. These eggs hatch and develop into infective larvae that climb on growing forage and are ingested as the forage is consumed. These larvae develop into adults and the cycle is completed within 14 to 60 days.

In some river drainages and the coastal marshes, 50% to 100% of yearling and older cattle may be infected with the bovine liver fluke, *Fasciola hepatica*. This parasite requires an intermediate host, a semi-aquatic snail that thrives only in shallow water with muddy boundaries in certain soil types (shallow ponds, ditches, marshes). Fluke larvae penetrate the snails, multiply and mature in the snails and then are shed as infective larvae that encyst on vegetation. These encysted larvae are consumed by cattle and migrate through intestine and body cavity to the liver, where they mature and begin to shed eggs in eight to 12 weeks. Flukes damage the liver tissue and bile ducts, which results in a reduction in liver function and liver condemnation at slaughter.

The Dean Lee Research Station is located in the drainage of the Red River where the topography, soil types, vegetation and rainfall patterns are conducive to the maintenance of significant populations of parasitic nematodes and bovine liver flukes. Young, growing animals, including replacement heifers, are the most susceptible to production losses as a result

these parasites. Studies conducted to determine the effect of various anthelmintic treatments on young animals have shown that treatment for roundworms increases weight gain and condition score but not pregnancy rate.

Treatment for liver flukes also has been reported to increase calf gains, but a trial at Dean Lee found that treating weanling calves for liver flukes had no significant effect on steer gains. Treatment for liver flukes also has been reported to have an effect on reproduction in cattle via an increase in general well-being and general body condition.

Some recent studies have suggested that fertility in heifers is reduced because of an interruption of normal sex hormone metabolism in the liver, which results in a delay in sexual maturity. Although nematode infection is almost universal and liver fluke infection rates can approach 100%, parasitic disease is primarily subclinical at this location. This project was conducted to determine if beef replacement heifer gains, reproductive performance and first calf weights are affected by subclinical nematode and liver fluke infections and, if so, to define the losses caused by each type of parasite.

Experimental Approach

Three hundred seventy-two Angus- or Brangus-sired heifers spring born at this location were used over four years to study the effects of gastrointestinal nematode and bovine liver fluke infections on beef replacement heifers. Eighty-four heifers were used in the 1994 trial, and 96 heifers were included in each of the following three years. Weaned heifers were randomly allotted to one of three 20-acre pastures and four treatment groups within pastures in October each year. Pasture groups remained intact until the following fall when they were palpated for pregnancy diagnosis. Pregnant heifers were pooled and remained together in another 40-acre pasture until their calves were weaned the following fall.

Forage swards in each pasture were bermudagrass and dallisgrass overseeded with annual ryegrass each fall. Supplemental bermudagrass hay was provided ad lib when the available forage was deemed insufficient to provide adequate nutrition. A ground corn supplement was fed when deemed necessary for the heifers to reach the target breeding weights of 700 pounds.

Treatment regimens were: Treatment 1, untreated controls; Treatment 2, treated for nematodes; Treatment 3, treated for liver flukes; and Treatment 4, treated for nematodes and liver flukes. Gastrointestinal nematodes were controlled with subcutaneous injections of either Ivomec (Merial) or Dectomax (Pfizer, Inc.) at the prescribed dosage. Bovine liver flukes were controlled with Curatrem (Merial) drench. Fecal samples were collected per rectum to monitor infection rates (eggs per gram) for nematodes and liver flukes. Treatments, fecal collections and weighing were initiated at allotment each year in October. They were repeated at 28- to 84-day intervals depending upon the perceived risk of infection and expected duration of efficacy of treatments until the heifers were palpated for pregnancy diagnosis the following October.

Pregnant heifers were pooled at that time, but remained on their respective treatments at 56- to 84-day intervals throughout the duration of the trial, which ended when the heifers' first calves were weaned each year. Calves received no treatment for internal parasites before weaning. Treatments were in excess of recommended intervals. The objective was to minimize parasite effects in treated animals and determine the total effects of the parasites. Heifer weights were recorded at all treatment dates, and calf weights were recorded at birth, at 205 days of age and at weaning. Subjective condition scores (CS) from 1 (emaciated) to 9 (excessively fat) were assigned by treatment blinded observers.

Fecal egg counts were collected only to document that infections were present. Egg count data and year and pasture effect data were significant, but because of space limitations are not presented here.

Results and Discussion

Heifers: Treatment significantly affected heifer performance (Table 1). At breeding, heifers with untreated nematode infections (TRT 1 and 3) were lighter and had gained less than heifers treated for nematodes (TRT 2 and 4). This weight relationship persisted until palpation. Heifers with untreated nematode infections also had lower CS scores than treated heifers. At the end of the breeding season, heifers that were continuously infected with both classes of parasites (TRT 1) had significantly lower CS than heifers that were treated for liver flukes only (TRT 3). Heifers treated for flukes only had significantly lower CS than the heifers treated for nematodes. At palpation, TRT 1 heifers had lower average CS than TRT 2 and TRT 3 heifers. TRT 4 heifers had the highest CS. Untreated heifers had significantly lower pregnancy rates than heifers that were treated

for both parasites. Treating for nematodes did not significantly increase pregnancy rates. Heifers treated for liver flukes only did not have significantly higher pregnancy rates than untreated control heifers or heifers treated for nematodes only. Their pregnancy rates, however, were not significantly lower than those of heifers that were treated for both parasites. These data indicate that neither nematodes or liver flukes alone significantly affected pregnancy rates. The combined effect of the two parasites did decrease pregnancy rates.

Calves: Treatment affected all calf production traits (Table 2). Calves from untreated dams were lighter at birth than calves from heifers that had been treated for both types of parasites. Calves from heifers infected with nematodes were lighter at weaning than those from heifers that were treated for nematodes. When weights were adjusted for calf age (205 days) and sex, calves from heifers treated for only flukes were not significantly heavier than calves from untreated heifers nor significantly lighter than calves from heifers treated for nematodes only.

Summary: Under the conditions of this study, gastrointestinal nematodes and liver flukes significantly affected growth and production in replacement heifers. Nematodes primarily affected animal weights, and flukes affected reproductive performance, probably by altering steroid hormone metabolism in the liver. Nematode infections in first calf heifers resulted in lower weights in their calves. Gross returns per heifer exposed were calculated by multiplying the weaning weight per heifer exposed (shown in Table 2) by \$95/cwt. Untreated control heifers grossed \$252 per heifer exposed. Treating for only nematodes yielded an increase of \$64. Treating for liver flukes yielded an increase of \$69, and treating for both parasites yielded an increase of \$153. Total treatment costs were approximately \$20 for nematodes and \$15 for liver flukes. The treatments were cost effective in this trial and would be a sound management practice wherever these parasites are present.

Table 1. Effect of parasites on heifer weights (lb), gains (lb), condition scores (CS) and pregnancy rates (%)

Treated for:	Initial	Breeding		Breed end		Palpation		Total gain	Preg. rate	
	Wt	Wt	CS	Gain	Wt	CS	Wt			CS
1. No treatment	526	640 ^a	4.9 ^a	117 ^a	730 ^a	4.9 ^a	812 ^a	5.0 ^a	286 ^a	54 ^a
2. Nematodes	528	695 ^b	5.2 ^b	167 ^b	783 ^b	5.3 ^c	880 ^b	5.4 ^b	352 ^c	63 ^a
3. Liver flukes	528	649 ^a	5.0 ^a	121 ^a	744 ^a	5.0 ^b	834 ^a	5.3 ^b	304 ^b	67 ^{ab}
4. Nematodes and flukes	521	700 ^b	5.3 ^b	172 ^b	794 ^b	5.4 ^c	902 ^b	5.6 ^c	375 ^d	78 ^b

^{abcd} Means with the same superscript are not different (P<.01).

Table 2. Treatment effects on calf weights (lb)

Treated For	Birth weight	Wean weight	Adjusted wean weight	Wean wt. per heifer exposed*
No Treatment	70 ^a	431 ^a	491 ^a	265
Nematodes	75 ^{ab}	471 ^b	528 ^{bc}	333
Liver Flukes	70 ^a	438 ^a	504 ^{ab}	338
Nematodes and Flukes	77 ^b	484 ^b	546 ^c	426

^{abc} Means with the same superscript are not different (P<.05).

* Calculated value- not statistically analyzed.

