

Evaluation of the Impact of the Ivermectin Sustained Release (SR) Bolus on Weight Gain and Parasite Control In Dairy Heifers During Their First Grazing Season

Larry L. Smith, DVM
Research and Development Inc.,
Lodi, WI 53555

Abstract

Thirty-six Holstein heifers, 5-6 months of age were selected and ranked by weight to form 18 replicates of 2 animals each with an average weight of 318 pounds at turn out. The six heaviest replicates were assigned to a paddock block, the next to the second block and the lightest six replicates to the third block. Within replicates animals were randomly assigned to treatment with the ivermectin sustained-release bolus or assigned as unmedicated controls. Two adjacent paddocks formed a block. Each paddock within a block was assigned to a treatment group. During the entire 175 days of the grazing trial, weight gains were recorded and levels of parasitism were determined by EP5G fecal counts and fecal cultures.

Results and recommendations for bovine practitioners will be discussed in this presentation.

Objective

To determine the effects on productivity in first season grazing dairy heifers given ivermectin sustained-release (SR) boluses.

Materials and Methods

Animal Selection and Allocation to Treatment Groups

Forty-seven Holstein dairy heifers were purchased from four different herds. These animals had been raised in a dry lot and never exposed to pasture. Using individual animal weights as the main criteria, on 6 May 1991, thirty-six animals were selected and ranked from the heaviest weight of 372 pounds to the lightest weight of 257 pounds. Using this ranking, the heaviest pair formed replicate 1, the next heaviest pair formed replicate 2, and so forth, until 18 replicates were formed. The six heaviest weight replicates were assigned to two adjacent paddocks (block 1), the next six heaviest replicates to block 2, and the lightest six replicates to block 3. Within blocks of paddocks, each paddock was randomly assigned to an untreated control group or the ivermectin SR bolus group.

All animals were individually double ear-tagged, and each group of six animals received the same color tags.

On 6 May 1991, the 18 animals randomly assigned to the ivermectin SR bolus group were administered one

ivermectin SR bolus orally using a balling gun. All treated animals swallowed the ivermectin SR bolus with ease.

Paddock Design

An electric fencing system was used to divide a 30-acre area into six paddocks designed to have an excess of herbage available for the entire grazing season. To maintain maximum herbage production, each paddock was further divided into 14 smaller cells.

Paddock Management

Initially the group of six animals were moved daily or every other day from one cell to the next within that paddock, thus completing the rotation in 14 to 28 days. An excess of mature herbage was available in late June, thus after grazing each cell, the area was clipped using a rotary mower. The cells within the paddock were too small to negotiate the equipment, so every other electric fence cell wire was removed making each cell twice as large. The animals were moved from one cell to the next every two or three days throughout the remainder of the grazing season. Each cell had a common lane back to a free-choice water tank and salt mineral feeder.

Plant Species

The predominant pasture plant species present were bluegrass and quackgrass with some birdsfoot trefoil and clover.

Previous Parasite History of This Pasture Area

During the previous grazing season the animals grazed on this area were shedding gastrointestinal nematodes and lungworm larvae. The presence of lungworms on these pastures was confirmed by turning out tracer calves the previous fall, then culturing viable lungworms from the calves.

*Addition of *Dictyocaulus viviparus* to Pasture During Grazing Season*

It was anticipated that lungworm larvae would be routinely recovered by trial Day 42 when using the

Baermann technique. When this did not occur, an equal amount of manure containing lungworm larvae from calves with a known viable level of lungworm infection was placed on each pasture five days a week from 17 June through 17 August 1991. This manure was placed in small piles about the same size the animal would normally pass.

Procedures

Weight Gain

All animals were weighed in pounds at trial initiation (Day 0) and thereafter at 14-day intervals until the termination of the trial. The scale (Senstec of Canada) was test weighed before each use.

Fecal Egg Counts Per 5 Gram

Individual egg counts were done on Days 0, 28, and at 14-day intervals for the rest of the study. The fecal flotation egg counting technique used in this study was as follows: the individual rectal fecal sample was well-mixed, 5 g of feces was weighed into a paper cup, 10 ml of water was added, and the feces and the water were well-mixed; the resultant mixture was strained through a strainer into a second cup. This liquid was poured into a 15 ml test tube and spun at 2000 rpm's for 5 minutes. The liquid was decanted and the tube filled one-half full with Sheather's solution. The sediment in the bottom of the tube was well-mixed with the Sheather's solution. The tube was then filled to the rim and a cover slip placed on the tube. The tube was left to stand for more than 30 minutes, then the cover slip was removed by picking it off the test tube in a straight up motion and placed on a slide. The total number of eggs present under the cover slip were counted and reported as eggs per 5 g.

Fecal nematode egg cultures by treatment group were carried out to determine the species of nematode present. The first 100 larvae were counted and reported.

Baermann Technique

Individual Baermanns were done on all animals using 50 g fecal samples through trial Day 42. After this day, a composite sample was taken of 50 g from each animal in each group and Baermannized for lungworm larvae. If any composite sample was positive for lungworm, then individual Baermanns were done on each animal in the group.

Clinical Observations

Treatment of Sick Calves

Animal Number 60: On 14 May 1991, one IVM SR bolus-treated animal was observed to be standing by itself, not eating, so was removed from the pasture to dry lot. It was diagnosed as having pneumonia/hemorrhagic septicemia. It was treated with antibiotics and later was returned to the pasture.

Infectious Keratoconjunctivitis / Pink Eye

Pink eye has been observed during previous years on this farm. Two IVM SR bolus-treated and two control animals were observed with pink eye during the trial and were treated with Pfizer's LA-200 at 9 mg per pound, and the eyes were powdered with Elanco's Tylan-neomycin powder. All animals responded and recovered.

Statistical Methods

The weight gain for each animal was calculated by subtracting the beginning weight from the final weight. The average weight for each group at the beginning and end of the trial was calculated using the same method. The efficacy of ivermectin SR boluses against gastrointestinal parasites was calculated using the following formula:

$$\frac{\text{Geometric mean \# parasite eggs in control} - \text{Geometric mean \# parasite eggs in treated}}{\text{Geometric mean \# parasite eggs in control}} \times 100 = \% \text{Efficacy}$$

Results

Weights

The treated animals had a mean weight gain advantage of 7.06 pounds by Day 56, and on Days 70, 84, 98, 112, 126, 140, 154, 168 and 175, the mean advantage was 8.82, 11.24, 8.60, 11.69, 18.53, 33.30, 33.74, 41.90 and 41.45 pounds, respectively. During the entire 175 days the control groups had a mean weight gain of 276.29 pounds (1.57 pounds per day), while the treated groups gained 317.74 pounds (1.81 pounds per day) or a gain advantage of 0.24 pounds per day.

EPG Counts

Strongylid EP/5G (*Cooperia*, *Haemonchus*, and *Ostertagia*) On Day 0 of the study, only one animal of the treated group and one animal of the control group was shedding strongylid eggs. By Day 28, sixteen of the eighteen controls were positive for strongylid eggs and all eighteen controls were positive by Day 56. The eighteen animals treated with ivermectin SR boluses were free of strongylid eggs on Day 28 and remained so for the entire 175 days. Identification of third-stage larvae from fecal cultures demonstrated that *Cooperia oncophora*, *Haemonchus placei* and *Ostertagia ostertagi* were present in the control animals throughout the trial.

Nematodirus

On Day 0 of the study, one animal was shedding *Nematodirus* eggs in the treated and one in the controls, respectively. Periodically throughout the study, 13 of the 18 control animals were positive for *Nematodirus*,

while the treated animals were negative on Day 28 and throughout the trial.

Trichuris and Strongyloides

One IVM SR bolus-treated animal had a positive *Trichuris* egg count on Day 42 and another IVM SR bolus-treated animal had a positive *Strongyloides* egg count on Day 42. These were the only positive fecal egg counts found in the IVM SR bolus-treated calves for the entire trial. The level of infection of the parasites were too low to evaluate in both the treated and controls.

Dictyocaulus viviparus

Dictyocaulus viviparus larvae were identified in one control animal on Day 28 and another control on Day

42. Throughout the trial, only these two animals showed positive one time. With this low level of infection a statistical evaluation was not done.

Conclusion

In this study, the ivermectin sustained-release bolus was 100% effective against *Cooperia Dictyocaulus*, *Haemonchus*, *Ostertagia* and *Nematodirus* when administered to first season grazing dairy heifers. The animals dosed with the sustained-release bolus gained an additional 0.24 pounds per day or 41.45 pounds for the 175 days grazed. All animals swallowed the ivermectin bolus with ease. No adverse reaction to the ivermectin sustained-release bolus was observed.

Fecal Egg Count per 5gm Trial No. 13524
Cooperia, Haemonchus, Ostertagia, Nematodirus, Strongyloides and Trichuris

Pen Number	Animal#	Day0	Day28	Day42	Day56	Day70	Day84	Day98	Day112	Day126	Day140	Day154	Day168	Day175
Control Pen 1	5	0	18	6	17	60	6	2	0	11	11	3	0	1
	18	1	60	48	18	48	1	3	0	1	33	12	1	0
	20	1	108	18	60	96	9	5	19	18	1	5	4	0
	23	0	12	12	72	23	1	2	1	9	1	0	5	0
	36	8	6	0	1	24	0	1	0	0	0	1	2	0
	38	0	12	24	69	1	0	0	0	1	0	1	0	1
Control Pen 4	14	0	18	36	33	1	11	6	0	18	1	0	1	5
	21	0	18	5	36	150	12	36	11	90	348	13	1	6
	54	2	42	30	72	66	6	6	0	2	26	1	0	1
	55	0	13	24	74	48	30	90	133	3	2	2	0	3
	56	0	4	20	6	36	0	1	0	8	0	0	2	0
	188	0	0	0	1	2	0	1	0	0	9	0	1	0
Control Pen 6	6	0	24	21	14	2	18	7	55	12	24	0	1	1
	8	0	24	33	9	48	3	3	0	2	3	0	0	0
	15	2	22	0	9	1	1	24	49	14	11	1	12	19
	44	0	10	11	8	2	9	11	22	1	2	2	0	3
	50	0	0	12	10	3	13	6	5	0	23	0	0	1
	61	0	5	13	2	23	30	13	15	12	19	0	0	7
Geometric Mean		0.4	12.2	10.5	15.6	14.7	4.1	5.3	3.4	4.6	6.0	1.1	0.9	1.3
Treated Pen 2	19	0	0	0	0	0	0	0	0	0	0	0	0	0
	24	39	0	5	0	0	0	0	0	0	0	0	0	0
	34	0	0	0	0	0	0	0	0	0	0	0	0	0
	43	6	0	0	0	0	0	0	0	0	0	0	0	0
	190	0	0	0	0	0	0	0	0	0	0	0	0	0
Treated Pen 3	16	1	0	0	0	0	0	0	0	0	0	0	0	0
	37	0	0	0	0	0	0	0	0	0	0	0	0	0
	45	0	0	0	0	0	0	0	0	0	0	0	0	0
	53	0	0	0	0	0	0	0	0	0	0	0	0	0
	57	0	0	0	0	0	0	0	0	0	0	0	0	0
Treated Pen 5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0	0	0
	27	0	0	0	0	0	0	0	0	0	0	0	0	0
	39	0	0	6	0	0	0	0	0	0	0	0	0	0
	51	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	
Geometric Mean		0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Weight Gain Average by Pen (lbs.) for Trial No. 13524

Pen Number	Day0	Day14	Day28	Day42	Day56	Day70	Day84	Day98	Day112	Day126	Day140	Day154	Day168	Day175
Control Pen 1	354.12	347.73	387.42	417.41	447.84	462.39	497.89	518.6	536.04	543.31	591.82	624.02	626.22	635.26
Control Pen 4	318.84	316.86	341.33	358.53	390.06	411.23	430.20	465.26	489.51	507.37	558.09	581.68	593.37	603.29
Control Pen 6	282.68	278.27	309.36	328.99	359.86	373.97	395.58	422.70	449.38	454.01	499.21	528.98	545.08	545.96
Mean Weight	318.62	314.43	345.96	368.24	400.43	415.86	441.22	468.78	491.72	501.42	549.71	578.15	588.29	594.91
Gain		-4.19	27.56	49.61	80.70	97.24	122.60	150.16	173.09	182.79	231.08	259.53	269.67	276.29
Treated Pen 2	350.60	352.36	389.18	415.42	436.37	467.02	488.19	501.42	532.51	553.68	601.52	642.10	656.21	657.09
Treated Pen 3	319.95	313.77	350.82	358.97	405.94	410.57	434.16	462.83	489.07	497.01	566.02	594.69	609.90	619.38
Treated Pen 5	282.68	288.86	309.80	332.96	373.97	393.81	432.62	465.03	485.76	506.49	578.81	596.01	622.03	629.97
Mean Weight	317.74	318.40	349.93	369.12	405.50	423.80	451.58	476.28	502.30	519.06	582.12	611.01	629.31	635.48
Gain		0.66	32.19	51.38	87.76	106.06	133.84	158.76	184.78	201.32	264.68	293.27	311.57	317.74
Increased Gain of Treated vs. Control		+4.85	+4.63	+1.77	+7.06	+8.82	+11.24	+8.60	+11.69	+18.53	+33.30	+33.74	+41.90	+41.45