A stainless steel-plastic tube that slowly released deworming medication was effective in heifers grazing arid irrigated pasture

Sustained-release bolus for deworming dairy heifers

Thomas A. Shultz ❑ E. Michael Huffman ❑ Norman F. Baker

A major source of gastrointestinal worm infestation of grazing heifers is larvae that have survived the winter on pasture grass. When these larvae are swallowed and mature inside the heifer, they produce eggs that are shed in the feces, resulting in a higher pasture contamination later in the grazing season. To break this recycling of pasture worm infestations, multiple deworming is needed. This adds labor and other costs, since the heifers are on pasture and may not be easily accessible.

The intensive dairying practiced in California's Central Valley depends on raising healthy herd replacement heifers with an acceptable rate of body weight gain. Various reports from humid-temperate regions of the midwestern and southeastern United States indicate that deworming can improve growth of pastured heifers. Limited information suggests that the arid conditions of the Central Valley may reduce pasture worm infestations. Results from studies at the University of California at Davis, however, have shown some benefit in deworming beef animals with a sustained-release bolus containing morantel tartrate (Paratect) during dry summer weather.

The bolus, a 4-inch-long by 1-inch-diameter cylinder administered via the mouth with a balling apparatus, remains in the heifer's reticulum (second stomach) indefinitely. The deworming agent, morantel tartrate, is mixed in an inert polyethylene glycol carrier and diffuses over at least a 90-day period at a rate of about 1 cc per 23 pounds liveweight. Diffusion occurs through a permeable polyethylene disc at each end of the cylinder.

To observe the effects of the deworming agent on pastured dairy heifers, we conducted three separate trials in the spring and summer of 1983, 1984, and 1985 in the Tulare area of the San Joaquin Valley. Holstein heifers (four head per acre) grazed irrigated clover and mixed grass pastures and received a daily supplement to ensure that minimum nutritional requirements would be provided for a desirable daily weight gain.

An unusually high rainfall of 20 inches occurred during the winter months preceding the 1983 trial. The four-month grazing period had no precipitation, and temperatures were 100°F or higher on 26 days, which was below average. All animals grazed a common pasture. Twenty-four heifers received morantel tartrate in a crumbles form mixed with their supplement on the first day of the trial; 24 others were given this treatment on days 1 and 21; and 24 others received a supplement without the deworming agent.

The product lowered fecal worm egg counts in 1983 (table 1). The improvement in body weight gain seen during the first 60 days of the trial was reduced, however, possibly by reinfestation of treated animals by untreated heifers in the common pasture during the second 60 days of the trial.

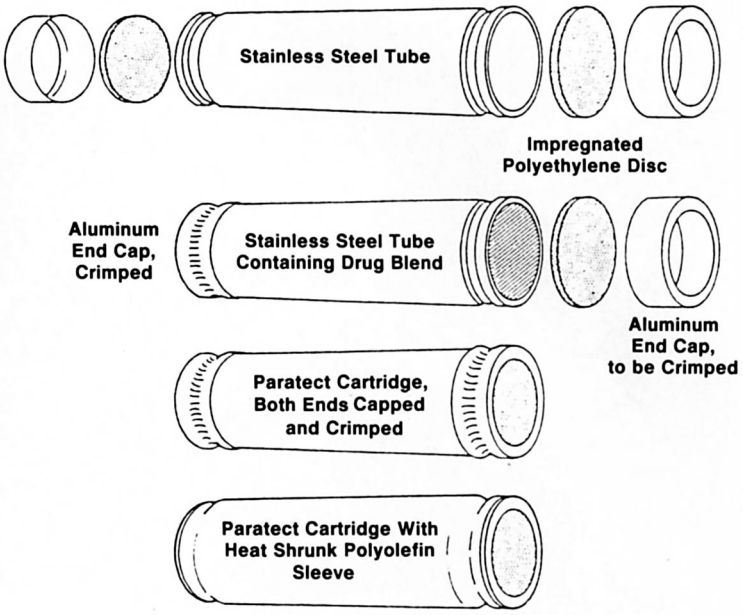
The pre-grazing period in the 1984 trial had only 10 inches of precipitation, and no rain occurred during spring and summer grazing. This summer had 50 days of 100°F or more, and an average 28 percent daytime humidity. In this trial, 25 heifers received the sustained-release bolus con-

TABLE 1. Fecal counts and bodyweight response, 1983

Item	Deworming* None	Day 1	Day 1 + 21
Fecal counts (eggs/g dry matter):			
Day 1	907 m	759 m	1006 m
Day 30	253 an	131 abn	23 bn
Average body weight (lb):			
Initial	411	407	398
Gain/day, day 60	1.48 a	1.73 b	1.82 b
Gain/day, day 120	1.16	1.22	1.25
Final	550	554	548

NOTE: Averages of 24 heifers
* Row values (ab) and column values (mn) followed by unlike letters differ significantly ($P<.05$).

The deworming bolus, 4 inches long and an inch in diameter, is administered by mouth and remains in the heifer's second stomach (reticulum), where it gradually releases morantel tartrate, a deworming agent, over a period of at least 90 days.



The stainless steel tube contains the deworming medication in an inert polyethylene glycol carrier, which is released through permeable polyethylene diffusion discs at each end. The entire device is enclosed in a heat-shrunk polyolefin sleeve.

taining morantel tartrate and grazed an adjacent separate pasture, while 25 animals served as nontreated controls.

Fecal egg counts were relatively low in both groups and remained so throughout the trial (table 2). Worm-free tracer calves, placed in each pasture for two-week periods during the trial, were autopsied for total gastrointestinal infestation. These counts were erratic and declined as the summer progressed (table 2). Average daily weight gain reflected a slight treatment response during this apparently mild infestation.

The 1985 trial was preceded by an 8-inch rainfall, while the grazing season had no rain and averaged 29 percent in daytime humidity. Thirty heifers in the pasture that had been grazed by treated animals in the previous trial were administered a bolus on day 1. These heifers were compared with a group of 30 that were injected on day 1 of the trial with another dewormer product of known activity and grazed the pasture previously occupied by the non-dewormed heifers.

Despite the relatively low fecal egg counts, the animals treated with the sustained-release bolus outgained the injected heifers (table 3). Labor for bolusing or injecting heifers at the beginning of the trial was similar, and no animal health problems were encountered.

The trial results indicate that pasture worm infestation can negate earlier treatment weight gain benefits. Morantel tartrate appeared to be an effective deworming agent, and the sustained-release bolus performed as desired. Deworming responses were affected by levels of exposure to pasture larvae, which apparently increased with relatively wetter winters and milder spring-summer grazing seasons.

Dairy heifers grazing irrigated pastures during the arid spring and summer in California's Central Valley may thus benefit from deworming. An improvement is more probable if pre-grazing weather is wetter than the average, or if previously pastured animals appeared to be worm infested. The cost effectiveness of using a sustained-release bolus method of treatment would depend on comparative product and labor costs, as well as on the logistics of animal handling.

TABLE 2. Fecal and gastrointestinal tract counts and weight response, 1984

Item	Deworming	
	None	Bolus
Fecal counts (eggs/g dry matter)*:		
Day 1	6	14
Day 56	30	5
Day 112	12	6
GI tract counts†:		
Day 30	2650	245
Day 60	535	425
Day 90	45	370
Average body weight (lb)*:		
Initial	440	438
Gain/day for 112 days	1.68	1.82
Final	628	642

* Averages of 25 heifers.
† Averages of 2 calves/observation of total gastrointestinal tract.

TABLE 3. Fecal counts and body-weight response, 1985

Item	Deworming*	
	Injected	Bolus
Final counts:		
Day 1	87	67
Day 56	10	7
Day 112	7	41
Average body weight (lb):		
Initial	453	447
Gain/day at day 56	1.30a	1.65b
Gain/day at day 112	1.20a	1.50b
Final	590	616

NOTE: Averages of 30 heifers.
*Row values (ab) followed by different letters differ significantly ($P<.05$).

Thomas A. Shultz is Dairy Advisor, Cooperative Extension, Tulare County; E. Michael Huffman is a veterinarian in private practice, Visalia-Hanford, California; Norman F. Baker is Professor of Microbiology, School of Veterinary Medicine, University of California, Davis. *The authors thank D. J. Walstrom and W. S. Swafford, Pfizer Inc., for technical assistance and research funds, and the J. Ruch and A. Van Groningen Dairies of Visalia for providing animals and facilities; and they wish to acknowledge the use of data presented at the 81st Annual American Dairy Science Association Meeting, 1986.*