Student Clinical Report

Fasciola hepatica Prevalence and Management in Kittitas County, Washington, Beef Cow-calf Herds

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Summary

Twenty-three beef cow-calf operations in Kittitas County, Washington were surveyed during October, 1993, for *Fasciola hepatica* and management practices related to its control. Sixteen of the herds were pastured on irrigated valley pastures year-round and 7 herds were grazed on dryland range pastures during the summer months. All the valley pastured herds and 6 of 7 (89%) of the range pastured herds tested positive for fluke eggs. The within-herd prevalence was significantly lower in the range pastured herds compared to the valley pastured herds (19% vs 58%). Fluke control in 1993 (Jan 1 to Oct. 15) was practiced by only two ranches among the 23 surveyed. One ranch used Albendazole the other Clorsulon, but both were *Fasciola hepatica* egg positive.

Introduction

Fasciola hepatica, the common liver fluke, was found to infect 66% of cattle herds on the eastern slopes of the Cascade Mountains of Washington State in a 1984 study.[9] In spite of clear evidence of an endemic fluke problem in this region and the detrimental impacts of fluke infections,[1,5,6,8] anecdotal reports suggested that fluke control was not commonly practiced. Furthermore, the requirement for fluke control was not clear among cattle pastured outside the region during summer months even though they were present in the endemic region during the remainder of the year.

The goals of the present study were threefold:

(1) to determine the prevalence of *F. hepatica* infections in beef cow-calf herds in Kittitas County, Washington.
(2) to determine if range herds, in which cattle were grazed primarily outside the valley irrigation system during the summer months (May 1, to Sept. 1), exhibited a lower prevalence of *F. hepatica*.
(3) to assess the current liver fluke control methods used by Kittitas Valley farmers.

Materials and Methods

A list of owners of cow-calf herds and allied industry people in the Kittitas Valley was obtained from the Kittitas County Cooperative Extension Service. The list was randomized and phone calls were made until 16 owners of cow-calf operations consented to be interviewed and to allow fecal-pat sample collection from their cattle herds. All of these herds were maintained year-round on irrigated valley pastures (IVP) in Kittitas County. In addition, an attempt was made to contact all known operations in which cattle were maintained on rangeland outside the Kittitas Valley during summer months; these were designated range herds (RH). Seven RH operations were contacted and consented to interviews and fecal sample collection of their herds. One rancher operated both a range herd and a valley pastured herd, thus telephone interviews with 22 ranchers were conducted during which a standardized questionnaire was administered. A site visit was made to each herd during which 14 individual fecal-pat samples were collected. The sample size of 14 was selected in order to provide at least a 95% probability of detecting a 20% within-herd prevalence.[3] All interviews and sample collections were done during October, 1993.

Initially 3 samples of feces from each herd were tested for the presence of *F. hepatica* eggs using the Fluke Finder™[a] in accordance with manufacturers directions, and recorded as positive or negative. In herds that had ≤ 1 fluke egg positive sample in the first 3 samples tested, additional samples were tested until a second positive sample was found or until all 14 samples from that herd had been assayed.

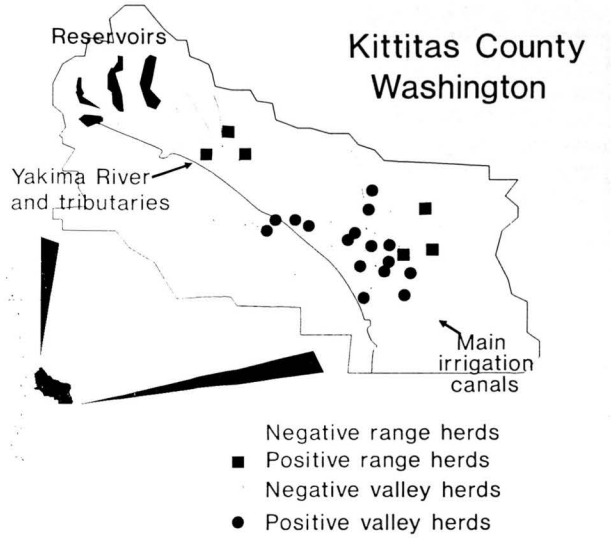
Results

Fasciola hepatica eggs were found in 22 of 23 herds sampled (96%) (Fig.1). Fluke eggs were found in all 16 IVP herds and in 6 of 7 (86%) of the RH (p=.30). Among the first three samples tested from each herd, 28 of 48 (58%) of samples from IVP cattle herds were egg positive while only 4 of 21 (19%) of samples from range herds were positive; this difference was statistically significant (p< .01).

Fluke control in 1993 (Jan. 1 to Oct. 15) was practiced by two ranches among 23 ranches surveyed. One operator used a single dose of Albendazole an all cattle in the herd prior to calving in February, the other used a single dose of Clorsulon on cattle that were perceived as not thriving in June. Both of these ranches were *F. hepatica* egg positive (ranches #2 and 18, Table 1).

a. FLUKEFINDER™ Visual Difference, Richard Dixon, 5051C Old Pullman Road, Moscow, ID, 83843.

Figure 1. Location of herds sampled for *Fasciola hepatica* in Kittitas County, Washington. VALLEY herds were maintained on irrigated valley pastures year-round while RANGE herds were on dry-land range in the summer and on valley pastures the remainder of the year.



Discussion

In order to put the results from the present study in perspective it is necessary to consider the life-cycle of *F. hepatica*, transmission cycle relative to the climatic conditions to which it is exposed, the management of exposed cattle, and economic cost benefit of fluke preventatives.

The life-cycle of *F. hepatica* is well established.[2] *F. hepatica* eggs are shed in cattle and sheep feces. From these eggs the miracidium, a motile larva, hatches and is ingested by a suitable intermediate host snail (most commonly *Lymnaea spp.*). The miracidium's development stages in the host snail are sporocyst, redia, and finally cercaria that are released from the snail in about 6 to 8 weeks under optimum conditions. The cercaria, whose motility is dependent on the presence of water, encysts on vegetation to become a somewhat environmentally resistant stage identified as a metacercaria. The metacercaria is the infective stage of *F. hepatica*. To complete the life-cycle the metacercaria is ingested by cattle or sheep and migrates through the liver for approximately 8 weeks. The migrating immature flukes enter the bile ducts and rapidly mature into adults reaching a peak in egg production in about 8 weeks. The prepatent period is 8 to 10 weeks.

In the Kittitas Valley winter temperatures regularly dip below freezing (0 C) between October and April and extend to below -20C in January and February. According to Hoover *et al.* metacercariae are limited in

Table 1. Summary of *Fasciola hepatica* testing in 23 Kittitas County, Washington cow-calf herds maintained on irrigated valley pastures year-round (VALLEY) or on dry-land range in the summer and on valley pastures the remainder of the year (RANGE).

	HERD #	# OF POSITIVES IN 1ST THREE SAMPLES	# OF SAMPLES TESTED UNTIL 1ST POSITIVE	# OF SAMPLES TESTED UNTIL 2ND POSITIVE	FLUKISIDE USED 1/1/93 - 10/15/93
VALLEY	1	3	1	2	none
	2	3	1	2	CLORSULON
	3	3	1	2	none
	4	2	1	3	none
	5	2	1	2	none
	6	2	2	3	none
	7	2	1	2	none
	8	2	1	2	none
	9	2	1	2	none
	10	2	1	3	none
	11	2	1	3	none
	12	1	2	6	none
	13	1	3	6	none
	14	1	1	4	none
	15	0	4	6	none
	16	0	5	7	none
RANGE	17	2	1	3	none
	18	2	1	2	ALBENDAZOLE
	19	0	6	13	none
	20	0	12	>14**	none
	21	0	6	>14**	none
	22	0	>14*	>14**	none
	23	0	6	9	none

* No positive sample were detected in the 14 samples evaluated.

** A second positive sample was not detected in the 14 samples evaluated.

their ability to survive freezing temperatures;[4] a fact which seemingly eliminates the potential for transmission of *F. hepatica* during the winter months. As temperatures rise in the spring and summer, patent infections are the primary source of continued transmission of the parasite.[4]

In addition to the temperature extremes, the Kittitas Valley is considered a semi-desert receiving less than 10 inches of total precipitation per year. Because metacercariae do not survive desiccation, hay and dry-grass pasture would seemingly not act as a mode of transmission for liver flukes. This indicates a primary role for recently irrigated forage and for waterways in the transmission of *F. hepatica*.

The 100% herd prevalence in the IVP herds confirmed the efficiency of liver fluke transmission in the Kittitas Valley. Although 1 of the 7 (14%) RH were negative for fluke eggs in this study, and although the within-herd prevalence was lower in RH, the results of the present study indicated that even herds in which cattle are maintained on range during the summer months are likely to have flukes. Thus, it appears that fluke control could be justified for all cattle in the Kittitas Valley--even those cattle which are present in the valley for only part of the transmission season.

Ranch environment is highly variable depending on the availability of irrigation water, drainage of the soil, and the amount of movement including summer range pastures and winter crop-aftermath pastures that lie outside of the Kittitas Valley. Cattle in the Kittitas Valley can be divided into three groups; those cattle that spend the entire year exposed to the irrigated pastures of the Kittitas Valley (group 1), those cattle that spend May to September or October on rangelands and the rest of the year on irrigated pasture in the Kittitas Valley (group 2), and those cattle that spend May to September or October on rangelands, are wintered outside the Kittitas Valley on crop aftermath in the Columbia Basin Reclamation Project, and are only transiently exposed to the irrigated pastures of the Kittitas Valley in the spring and/or fall (group 3). While control on an individual basis in group 1 cattle may prove to be futile because of untreated cattle upstream contaminating the downstream pastures, a cooperative effort among cattle producers using similar drainages might be effective. Cattle in group 2 and 3 may benefit from once a year flukicide treatment since transmission peaks when these groups are exposed to irrigated pastures in the fall.[4] It would also be necessary to maintain a closed herd or administer flukicides to new entrants to the herd.

Even though detrimental effects of *F. hepatica* infection--such as decreased weight gains on pasture,[1] decreased weaning weight,[7] decreased feedlot performance and liver condemnation[5]--have been documented, and in spite of the availability of effective flukicides, the present study demonstrated that most of the ranchers in the Kittitas Valley do not practice effective fluke control. Even in the 2 of 23 ranches in the present study which used flukicides, fluke eggs were readily identified (2 of 3 samples and 3 of 3 samples) indicating inadequate or improper usage of the flukicides. This suggests that the effects of *F. hepatica* infections are not recognized as a potential loss of revenue due to reduced performance or that the cash costs of administering flukicides are perceived to be greater than the benefits.

Currently, Clorsulon and Albendazole are the only available anthelmintics approved for the treatment of *F. hepatica* in the United States.[6] Clorsulon is effective against adult *F. hepatica* infections and late immature infections in the bile ducts. At the time of the present study, Clorsulon was available to Kittitas Valley ranchers at $2.95 per 1000# oral dose or $5.45 per 454 kg (1000 pound) dose as an injectable form with ivermectin.

Albendazole, a broad spectrum anthelmintic effective against *F. hepatica* adult infections, was available at $2.80 per 454 kg (1000 pound) dose during the current study. Rickard *et al.* demonstrated that a precalving drench with Clorsulon in an Oregon cow-calf herd significantly increased weaning weights.[7] The 20 kg average increase observed by Rickard translates to a return of at least 10:1 at prices which were current at the time of this study.

Other putative benefits of fluke control include calving percentage, value at sale, and mean loss of body condition score during maximum winter stress.[8] These seem to be based on conjecture or have not been quantified sufficiently to use in cost benefit computations. However, if the benefits from improved weaning weights were verified under local conditions, this alone would justify regular fluke control in Kittitas County.

References

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D.D. Charlton, Washington State University is awarded the first prize of $200.00 for this report.