Observations on the Use of a Long-Acting Oxytetracycline for In-Contact Prophylaxis of Undifferentiated Bovine Respiratory Disease in Feedlot Steers under Canadian Conditions

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Introduction:

Respiratory diseases are the most common causes of mortality in the feedlot (5,6). Often, mortality alone is not the most important component of health costs but added to this must be the cost of morbidity (treatments, prophylaxis and reduced feed efficiency) (1,4). Traditionally, the cattle marketing system in Canada mixes cattle with different levels of stress, different micro-organisms in number and amount and different nutritional backgrounds. Unless significant changes in patterns of cattle marketing occur, the incidence of respiratory disease will still remain the feedlot industry's most costly health problem (2,3). The purpose of this project was to study an outbreak of naturally occurring undifferentiated respiratory disease in feedlot steers under feedlot management conditions which was curtailed by using the principle of mass individual treatment.

Materials and Methods:

The trial was conducted in a commercial feedyard in East Central Saskatchewan. A total of 781 feedlot steers, each weighing approximately 300 kg, were allotted to six pens in a manner common to feedlot management in Canada. Upon arrival, two or three truckloads of cattle, usually from one sale yard, were processed (Table 1) and assigned to pen. Cattle were treated for shipping fever or undifferentiated bovine respiratory disease based on the following signs:

a) elevated temperature $> 40.0°C$
b) anorexia
c) increased respiratory rate
d) depression

When the incidence of shipping fever in that pen reached 6-10% (ie, pulled for respiratory disease treatment) the animals in that pen were run through a chute and each alternate animal was treated with Treatment A (Long-acting Oxytetracycline @ 20 mg/kg)[a] or Treatment B (control placebo @ 1 ml/kg) and identified with corresponding numbered ear tags. Previously treated animals were excluded from the test. The long-acting oxytetracycline formulation without the oxytetracycline was used as the placebo.

The feedlot personnel were not told which treatment contained the Liquamycin/LA. The treatment groups were group weighed separately on Day 0 (treatment) and at the end of the test. During the test period the two groups were housed in their original pen together to ensure complete contact. This would ensure the Liquamycin/LA treated

Table I: Administrations and Procedures to New Arrivals at an East Central Saskatchewan Feedyard

Procedure	Detailed
1. Identification	a) Branded with owner identity
	b) Branded by pen number
2. Treatment	a) Pour on insecticide (organo-phosphate)
	b) Injectable Levamisole
	c) Vitamin ADE
3. Vaccination	a) Intranasal IBR
	b) Intramuscular B.V.D.
	c) Clostridial vaccination (2-way)
4. Implantation (growth)	a) Progesterone/Estradiol Benzoate

a. *Liquamycin / LA - Rogar / STB, Box 2005, London, Ontario.*

Table II: Incidence of Undifferentiated Respiratory Disease, Number of Days, Morbidity and Mortality of other Diseases in Long-Acting Oxytetracycline (A) and Placebo (B) Treated Groups Subsequent to Initiating the Study.

Pen	Treatment Group	No. of Head	Respiratory Disease			Other Diseases	
			Morbidity	Treatment Days	Number of Chronics	Mortality	Morbidity
1	A	100	1	3	0	0	1[c]
	B	99	5	22	2	1[a]	1[c]
2	A	63	0	0	0	1[b]	0
	B	69	3	13	2	0	0
3	A	71	0	0	0	0	0
	B	67	5	15	0	0	0
4	A	48	1	3	0	0	0
	B	44	3	13	1	0	1[c]
5	A	63	2	6	0	0	1[c]
	B	64	4	13	0	0	0
6	A	45	2	10	0	0	0
	B	43	6	19	1	1[a]	0
Total	A	395	6***	22	0	1[b]	2[c]
	B	386	26***	100	6	2[a]	2[c]

a Mortality due to anaphylactic reaction to placebo
b Mortality due to bloat
c Morbidity due to footrot
*** $X^2 = 12.22$, $P > .001$*

cattle had maximum desease exposure by being housed with the control animals. During this test period the cattle were fed a silage and concentrate adjustment ration devoid of other medication.

The two treatment groups were evaluated with respect to:

a) number of cases of undifferentiated respiratory disease treated (pull rate)
b) treatment days
c) number of cattle died
d) number of cattle chronically affected with respiratory disease
e) group average daily gain

Animals pulled for respiratory disease during the test were also treated according to the routine protocol previously employed at this particular feedlot. All treatment was done with products other than tetracycline. The daily treatments and their responses were recorded on the feedlot's individual treatment cards. Once recovered, the animals were returned to their test group. Animals not recovering after prolonged treatment were diagnosed as non-responsive respiratory disease, placed in a "chronic" pen for a time and eventually slaughtered. Animals that died were presented to the Diagnostic Laboratory at the Western College of Veterinary Medicine in Saskatoon.

Results:

There were six animals treated in treatment group A and 26 treated in group B. In group B, six of the 26 were non-responsive to treatment and were eventually slaughtered and some value realized. There was no mortality due to respiratory disease in either group. A significant[b] reduction in the number of cattle treated for undifferentiated respiratory disease occurred in treatment group A (Table II). This reduction in morbidity meant the total number of treatment days was reduced as well. The number of non-responsive cattle (chronics) was not tested statistically

b. X^8 ($P > .001$)

Table III: Difference in Average Daily Gain Between the Long-Acting Oxytetracycline (A) and Placebo (B) Treated Groups

Pen	Days of Test	Treatment Group A **		Treatment Group B **	
		Mean Initial Wt. KG (n)	Mean Average Daily Gain (kg)	Mean Initial Wt. KG (n)	Mean Average Daily Gain (kg)
1	32	397.3 (100)	2.539	391.2 (99)	2.176
2	37	293.5 (63)	2.079	296.3 (69)	2.174
3	31	306.5 (71)	2.164	308.9 (67)	2.165
4	36	282.1 (48)	1.934	282.1 (44)	1.899
5	30	286.6 (63)	2.555	295.5 (64)	1.822
6	29	288.4 (45)	2.002	289.3 (43)	1.220

** *Difference in ADG = t(P > .05, 5df)*

because of limited observations in some of the replicates.

In four of the six treatment replicates (pens) the long-acting treated group (A) gained more per day than did their placebo treated counterparts (Table III). A significant[c] overall 13% improvement in group average daily gain occurred during the trial period. Lack of individual weights under commercial feedlot conditions did not permit more precise statistical computations.

Reactions immediately subsequent to initiating the study occurred in three oxytetracycline and four placebo treated steers. All recovered with immediate routine treatment except two placebo steers that died.

The costs of managing respiratory disease by these two methods was estimated based on the information of this study and is presented in Table IV. When the cost of a reduced group average daily gain is included, the long-acting oxytetracycline treated group (A) shows a sizeable financial advantage over the placebo treated group (B).

Discussion:

The underlying purpose of mass individual medication is to prevent, in a cost-effective way, an excessive incidence of undifferentiated bovine respiratory disease. When mass individual medication has been studied previously, it was generally included in the processing precedure (7,8,9), however, investigations into mass individual chemoprophylaxis initiated once a pre-determined morbidity level is reached, have been limited. The effectiveness of mass individual treatment in reducing the morbidity rate possibly depends on how effective the triggering "pull rate" reflects an escalating respiratory episode in a pen of cattle. The time at which treatment is initiated, which in this case is determined by the pre-determined 6-10% pull rate, may account for the efficacy of long-acting oxytetracycline prophylaxis in reducing the morbidity rate. While the number of chronics increased as the number of cattle treated increased, the prophylactic use of a long-acting oxytetracycline may have reduced the incidence of chronics by treating inapparent respiratory disease that would subsequently have become clinically obvious and of which a portion would have ended as non-responsive to treatment.

The average daily gain in the placebo treated control groups was possibly reduced because of the "shrink" associated with an increased respiratory disease morbidity. Although many animals affected with respiratory disease will probably recover this weight loss in a compensatory fashion, this is not always reported to be the case (4).

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c. + *(P > .05)*

Table IV: Estimated Costs of Two Methods of Treating an Outbreak of Undifferentiated Bovine Respiratory Disease under Commercial Feedlot Conditions.

TREATMENT A		
Prophylaxis		
395 treatments of Oxytetracycline/LA @ $1.30/gm		$3081.00
Therapy		
22 treatments @ $2.00/treatment		44.00
	TOTAL	$3125.00
TREATMENT B		
Prophylaxis		--
Therapy		
100 treatments @ $2.00/treatment		200.00
Cost of cattle culled		
$607.43 (purchase price) x 6 x 50% loss		1822.29
Loss in ADG		
.303 kg x $1.32 (cost of gain) x 32 days x 386		4940.00
	TOTAL	$6962.31
ADVANTAGES OF TREATMENT A OVER TREATMENT B		$3837.30

The results of this study show that once the morbidity of undifferentiated respiratory disease exceeded 6-10% in a given pen, the subsequent incidence of the disease was significantly reduced $x^2(P > 0.001)$ and the average daily gain significantly increased ($P > 0.05$) in the group of animals prophylactically treated with a long-acting oxytetracycline. The cost benefit of this procedure was determined to be considerable, based on the results of the described 32-day trial. Whether a single injection with an oxytetracycline other than one with a sustained action or other anti-bacterial would exert a similar morbidity sparing effect if used in a similar fashion remains to be determined.

Summary:

A long-acting oxytetracycline was used to treat approximately 50% of all the 781 in-contact yearling cattle when the morbidity rate reached 5-10% in feedlot pens under Western Canadian conditions. The other 50% were treated with a placebo containing only the oxytetracycline carrier. No mortality due to respiratory disease occurred in either group, however, the morbidity rate was significantly reduced and the group average daily gained was significantly increased in the long-acting oxytetracycline treated group over the period of the test. There was an apparent reduction in the total number of treatment days and in the number of chronically ill in this group as well. The procedure described provided a considerable financial benefit.

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