RESPONSES TO MONENSIN AND OESTRADIOL IN STEERS GRAZING TWO TROPICAL PASTURES IN N. E. QUEENSLAND

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Summary

Monensin administered as a slow release capsule to Droughtmaster steers grazing mixed pastures containing *Stylosanthes hamata* or grass pastures fertilized with N, had no effect on growth rate over 111 day period. Monensin significantly increased the level of propionic acid ($p < 0.001$) and decreased the level of butyric acid ($p < 0.01$) in the rumen. The lack of response to monensin was partly attributed to the poor pasture conditions and growth rate of the steers during part of the experimental period.

An implant of oestradiol improved growth rates during the period of poor forage quality and in the subsequent 56 days when pastures were of high quality following rain. Mean growth rates over the entire 157 days for control, monensin and monensin/oestradiol treatments were 0.37, 0.37 and 0.50 kg/d respectively. It was concluded that when pasture conditions are sufficient only for the maintenance of liveweight, production can be improved by an oestradiol implant but not by feeding an ionophore such as monensin.

(Key Words: Monensin, Oestradiol, Tropical Pastures, Beef Cattle)

Introduction

The use of feed additives of antibiotics and other growth promoting agents has become an integral part of ruminant production in North America and Europe for many years (Chalupa, 1984). The more important groups of antibiotic feed additives used are the ionophores (e.g., monensin, lasalocid, salinomycin and ICI 13903) and the glycopepticide, avoparcin (Rowe, 1985). The other group of growth promotants, usually supplied as a sub-cutaneous implant eg. oestradiol, changes the hormone balance and increases the proportion of protein in the carcass. Both groups of feed additives are used in the intensive fattening of cattle and sheep. Much less is known about their value for animals grazing temperate forages (Wilkinson et al., 1980), and even less when tropical pastures are the only source of nutrients.

This paper describes a study designed to determine the response of cattle to monensin and oestradiol when grazing N fertilised tropical grass pastures and tropical legume-grass pastures.

Materials and Methods

The study was conducted at the CSIRO Pasture Research Station, 50 km S of Townsville in N E. Queensland from November 26, 1986 to May 12, 1987. Twenty-one paddocks of an existing experiment were used. Eighteen paddocks contained legume-based pastures which consisted essentially of Caribbean stylo (*Stylosanthes hamata* cv Verano) in mixtures with the grasses *Urochloa mosambicensis* cv Nixon, *Chloris gayana* cv Callide, or native and naturalised grasses (*Chrysopogon fallax*, *Heteropogon contortus* and *Bothriochloa pertusa*). The three remaining paddocks contained either Urochloa, Chloris or native grasses fertilised with 100 kg N/ha/yr in two equal dressings in November and March. Each paddock carried three Droughtmaster steers and was continuously stocked at one of three stocking rates – namely 0.65, 0.95 or 1.25 steers/ha.

There were two replicates of the legume based pastures and one replicate of the N fertilised paddocks. The layout was completely randomised.

Three treatments were allocated at random to the three animals in each paddock – 1. control, no

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treatment; 2. monensin as a slow release capsule estimated to provide 200 mg/day over a 110 day period; 3. monensin as in treatment 2 plus oestradiol. The oestradiol was administered as a Compudose pellet implanted in the posterior median surface of the ear.

The steers were weighed every 28 days over a period of 167 days. The mean weight at the beginning of the study was 369 ± 45 kg (standard deviation). Ticks and buffalo fly were controlled by spraying all the cattle when necessary.

Rumen fluid samples were collected on day 85 of the study from the control and monensin treated steers by stomach tube. The samples were placed immediately into vials and transported to the laboratory in an insulated box containing dry ice. Samples were subsequently analysed for total and individual VFAs (Stobbs and Brett, 1974).

The Monensin and Compudose treatments were analysed as a split plot of the two pasture types and the three stocking rates so that interactions within these variables could be measured.

Results

Pastures

Rainfall was negligible in the first 40 days of the study, restricting pasture growth, and both the legume and nitrogen fertilized pastures contained mainly dead stemmy material. Overall, the seasonal rainfall of 225 mm was only 31% of the average for the December to May period.

Rumen VFA's

Monensin increased the levels of propionic acid ($p < 0.001$) and decreased the levels of butyric acid ($p < 0.001$) in the rumens of treated steers (table 1). The levels of other acids measured were not affected by monensin treatment (table 1).

TABLE 1. EFFECT OF MONENSIN ON THE VFA LEVELS IN RUMEN FLUID OF STEERS GRAZING TROPICAL PASTURES

Variable	Treatment				
	Control	SE	+Monensin	SE	Significance
Total VFA (meq/l)	93.6	(7.88)$^{+}$	80.1	(5.83)	N/S
Acetic (%)	70.9	(0.688)	69.6	(0.836)	N/S
Propionic (%)	13.0	(0.344)	16.5	(0.629)	***
Butyric (%)	11.5	(0.410)	9.3	(0.384)	***
Iso-butyric (%)	1.78	(0.0669)	1.75	(0.0645)	N/S
Valeric (%)	0.87	(0.0692)	0.84	(0.0804)	N/S
Iso valeric (%)	1.96	(0.139)	2.10	(0.196)	N/S

N/S = not significant $p > 0.05$
*** = significant difference at $p < 0.001$
( )$^{+}$ SEM

Weight gains

There were no significant ($p < 0.05$) interactions of the growth promotant treatments with either pasture types or stocking rate. The responses to growth promotants only are therefore presented.

Monensin had no significant effect on the growth of the steers at any time during the study (figure 1). Implanting oestradiol improved the mean growth rate of steers, the margin increasing as the study progressed (figure 1). Mean growth rates over 167 days for the control, monensin and monensin/oestradiol treatments on the legume pastures were 0.41, 0.40, and 0.53 kg/d and on the nitrogen fertilized paddocks were 0.29, 0.29, and 0.41 kg/d respectively.

Discussion

In contrast to most pen feeding studies and grazing studies with temperate grasses (Wagner et al., 1984; Rowe, 1985), monensin administration did not give any positive response in liveweight gain of the steers. The trend was for a lower pro-

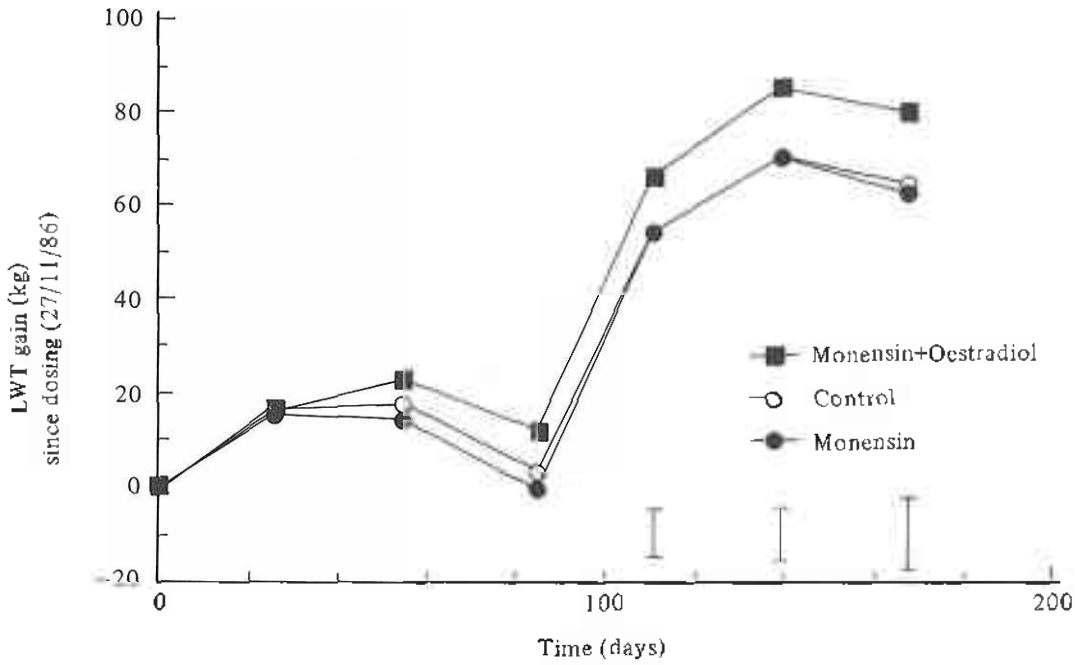

Figure 1. Liveweight gains of steers grazing tropical pastures and given supplements of monensin ●; or monensin + oestradiol ■, compared with controls ○. The vertical bars represent the LSD levels at $p < 0.05$.

duction in the monensin treated animals but this was not significant (figure 1). In most published studies monensin reduces appetite but improves feed conversion efficiency and there is a net improvement in production of grazing animals of 0.1 kg/d (Potter et al., 1976; R. Wilkinson et al., 1980). All these studies were conducted with good quality pasture supplemented with about 1kg/d corn and with growth rates of the control exceeding 0.5 kg/d. Even in the absence of a corn supplement, growing cattle (> 0.6 kg/d) on pasture in England, USA and Canada treated with monensin gained respectively 10%, 7% and 7% more liveweight than control cattle (Buchanan and Dobson, 1986; Parrott et al., 1986; Merrill and Stobbs, 1986). When the ionophore lasalocid was fed to pregnant beef cows grazing winter range of poor quality, all animals lost weight and the lasalocid had no effect on growth rates (Jacques et al., 1987). A similar effect of monensin may have applied to the results for the first 84 days of the experiment. However, for the next 56 days the steers grew at over 1 kg/day but there was still no response to monensin. Lack of response in feed intake to monensin has occurred in other studies in the dry tropics with steers (Lindsay et al., 1982), and in liveweight gain with early weaned calves (Schlink et al., 1988). In both studies the expected increases in propionic acid in the rumen were measured.

In Australia monensin has usually been delivered into the rumen at rates of 200 mg/day for the purpose of bloat control. In most of the studies reported from overseas, rates of 90-110 mg/day have been used to improve liveweight gain. The absence of response at the higher dosage rate of 200 mg/day could be the result of depressed intake at this level. However, responses to rates of 200 mg/day have been measured in cattle grazing the tropical grass *Cynodon dactylon* although the response of 0.15 kg/day was less than the response of 0.22 kg/day at the 100 mg/day rate (Oliver, 1975).

The response to oestradiol was consistent over all pastures at almost 20 kg and is in line with responses in other experiments with grazing steers (Chudleigh et al., 1982; Lindsay et al., 1988) and with suckling calves (Nicol et al., 1984). It is of practical importance that this response occurred when the pasture quality ranged from that capable

of merely maintaining weight to that supporting growth in excess of 1 kg/d.

It was concluded that under the pasture conditions experienced in this study, production can be improved by an oestradiol implant but not by feeding an ionophore.

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