

Effect of a progesteron-oestradiol implant and or a lasalocid-sodium supplementation on performance, carcass- and meat quality characteristics of finishing bulls

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Summary

During the last 3 months of the indoors finishing period of a beef production trial with thirty-eight Belgian white-red bulls, studying the effect of a lasalocid-sodium supplementation, both groups (control and antibiotic), were split up in order to investigate the effect of an anabolic implantation. Thus four groups were formed : 1) untreated control, 2) lasalocid-sodium supplementation (65 ppm in the concentrate), 3) progesteron-oestradiol controlled release implant, and 4) lasalocid-Na combined with the progesteron-oestradiol implant. The diets consisted of maize silage fed ad lib., supplemented with a protein rich concentrate (daily allowance : 0.75 % of the liveweight). The experiment was carried out within the 531-656 kg liveweight interval. On average, the bulls were implanted 96 days prior to slaughter.

The addition of lasalocid-Na in the feed, the progesteron-oestradiol implant and the combination of the two treatments, resulted in a mean daily liveweight gain of the bulls of 1.28, 1.31 and 1.21 kg respectively, in comparison with 1.17 kg for the untreated animals ($P > 0.05$). Carcass blockiness and dressing percentage were not significantly different and varied between 2.81 and 2.89 kg/cm and 60.6 and 61.7 % respectively. Carcass meat and fat content were also similar for the different groups.

Meat colour, tenderness, waterholding capacity, as well as the chemical composition of the L.D.-muscle were not affected by the implant and or the supplementation of the antibiotic compound.

Introduction

The effect of anabolic agents on the performance of fattening cattle has been studied more intensively with steers and heifers than with bulls (Heitzman, 1978 ; Johnson et al., 1986). Although the effect of implants such as trenbolone acetate and oestradiol, was much higher in steers than in bulls (Galbraith and Topps, 1981 ; Berende and Ruitenbergh, 1983), it could improve bull performance (Gielen et al., 1982 ; Gill et al., 1983 ; Johnson et al., 1983 ; Fabry et al., 1984). Improved bull beef production was also demonstrated by Lambot et al. (1982), even when the anabolic agents were injected.

To safeguard public health, implants are preferred above injections. For the same reason,

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xenobiotic anabolic agents are less appropriate.

Antibiotics are often incorporated in finishing diets to promote animal performances, e.g. monensin-Na, avoparcin, flavophospholipol, ... Other compounds became available for further research such as lasalocid-Na. Owing to the ionophore properties, it improves feed efficiency in beef cattle (Owens, 1980 ; Owens and Gill, 1982 ; Plegge et al., 1983 ; Horton, 1984a). Moreover results of Hanson et al. (1981), indicated that lasalocid-Na is about 7 to 10 times less toxic in horses than monensin-Na.

This report discusses the effect of lasalocid-Na and or a progesteron-oestradiol implant, on bull performance and carcass and meat quality.

Material and methods

A beef production experiment was conducted with 38 tied Belgian white-red bulls to study the efficacy of a lasalocid-Na supplementation. After 211 days of the indoor fattening period, half of the control animals, as well as half of the "lasalocid-animals" were designed for an anabolic implant. Thus 4 treatments were formed : 1) control, 2) lasalocid-Na (65 mg per kg concentrate), 3) progesteron-oestradiol controlled release implant and 4) lasalocid-Na plus implant. The implant contained 200 mg progesteron and 20 mg oestradiol-17 β and was administered subcutaneously in the ear. Implants were not removed prior to slaughter, but the ears with the implant have been destroyed. All animals received a maize silage diet ad lib., and concentrates amounting to 0.75 kg per 100 kg liveweight. Initial liveweight varied between 513 and 546 kg. The experiment lasted 95 to 112 days. A detailed study of Basson et al. (1985) indicated that a single progesteron-oestradiol implant in steers was fully efficacious for approximately 84 to 100 days.

The effects of the antibiotic supplementation and or the anabolic implant on growth rate, carcass characteristics and meat quality were studied.

Carcass quality characteristics, such as dressing percent and blockiness (Van de Voorde and Verbeke, 1979) and carcass composition, assessed via an 8th-rib dissection (Verbeke and Van de Voorde, 1978) were determined. Ultimate pH, colour and tenderness of the meat (Longissimus dorsi muscle) were determined as proposed by Bocard et al. (1981), as well as tissue moisture, protein, fat and total collagen content. Waterholding capacity is measured as described by Grau and Hamm (1956).

Results and discussion

Daily gain of untreated control animals amounted to 1.17 kg, and increased to 1.28 kg for lasalocid, 1.31 kg for the implant and 1.21 kg for the combination of both treatments. Improvements were not significant. Liveweights and growth rates are summarized in table 1. Although the implant did not improve daily gain significantly, the effect amounted to 12 % instead of 3 % with a single oestradiol implant (Fiems et al., 1986). Results of Gill et al. (1983), O'Lamhna and Roche (1984) and Renaville (1985) revealed a higher daily liveweight gain

for implantation with progesteron and oestradiol in comparison with a single oestradiol implant.

Table 1. Liveweight and daily gain affected by lasalocid-Na and the progesteron-oestradiol implant ($\pm s_x$)

	Control	Lasalocid-Na	Progesteron-oestradiol-17 β	Lasalocid-Na + Progesteron-oestradiol-17 β
Number of bulls	9	10	9	10
Initial weight (kg)	513.0 \pm 7.9	546.4 \pm 11.9	524.2 \pm 6.5	540.5 \pm 14.5
Final weight (kg)	644.2 \pm 13.8	671.3 \pm 14.6	653.1 \pm 9.1	655.9 \pm 16.8
Experimental days	112.3	97.4	95.3	96.7
Daily liveweight gain (kg)	1.17 ^a \pm 0.05	1.28 ^a \pm 0.06	1.31 ^a \pm 0.08	1.21 ^a \pm 0.06

a, ... means with the same superscript are not significantly different ($P > 0.05$)

Lambot et al. (1983), Paterson et al. (1983) and O'Lamhna and Roche (1984), also established the highest increase of growth rate when bulls were treated with a combined implant of androgens and oestrogens.

The positive effect of lasalocid-Na on liveweight gain (table 1) confirms the results generally obtained with steers (Owens, 1980; Owens and Gill, 1982; Plegge et al., 1983 and Horton, 1984a).

The combined administration of lasalocid-Na and the progesteron-oestradiol implant, did not result in a cumulative effect on the growth rate of the bulls (table 1). With finishing steers however, Adams (1982), Gay et al. (1983) and Lomas (1983) obtained an additive growth effect with the same combination of antibiotic and implant. Analogous cumulative effects on liveweight gain are reported by Horton (1984a) and Horton et al. (1984) with steers receiving lasalocid-Na in the feed and zeranol as ear-implant. In an other experiment with steers, this last combination didn't reveal a cumulative effect on liveweight gain (Lomas, 1981). The failure of another ionophore such as monensin-Na, to increase growth rate in implanted steers and heifers has been clearly demonstrated by Roche et al. (1981).

The impact of lasalocid-Na and a progesteron-oestradiol implant on the carcass quality is given in table 2.

The obtained characteristics concerning carcass quality were not significantly different ($P > 0.05$). Generally, dressing percentage is not affected when anabolic agents were used (Gielen et al., 1982; Gill et al., 1983; Lambot et al., 1983). Also lasalocid has no significant effect on dressing percent (Plegge et al., 1983; Horton, 1984b). Progesteron-oestradiol implant slightly increased meat content, while carcass fat content was somewhat lowered.

Table 2. Carcass characteristics^a ($\pm s_x$)

	Control	Lasalocid-Na	Progesteron-oestradiol-17 β	Lasalocid-Na + Progesteron-oestradiol-17 β
Number of carcasses	9	10	9	10
Slaughter weight (kg)	630.3 \pm 14.0	658.2 \pm 14.3	638.9 \pm 9.2	642.4 \pm 16.3
Weight loss after 20 h fasting (%)	2.16 \pm 0.21	1.95 \pm 0.13	2.17 \pm 0.17	2.06 \pm 0.25
Dressing percent	61.7 \pm 0.8	60.8 \pm 0.3	60.6 \pm 0.8	61.1 \pm 0.7
Carcass composition (%)				
meat	61.9 \pm 0.7	61.6 \pm 0.9	63.5 \pm 1.3	61.8 \pm 1.1
fat	24.5 \pm 0.8	24.2 \pm 1.1	22.3 \pm 1.5	24.9 \pm 1.3
bone	13.6 \pm 0.3	14.2 \pm 0.3	14.2 \pm 0.4	13.3 \pm 0.4
Carcass blockiness (kg/cm)	2.84 \pm 0.06	2.89 \pm 0.05	2.81 \pm 0.04	2.87 \pm 0.04
EUROP-classification				
U	4	2	3	2
R	5	7	5	7
O	0	1	1	1

a : no significant differences ($P > 0.05$)

Gill et al. (1983) and Johnson et al. (1986) obtained no increase of the rib eye area with implanted bulls. Implanting progesteron-oestradiol in Holstein-Friesian bulls, did not affect significantly the fat and lean percentage (Forrest, 1978). Lambot et al. (1983) found not always a clear effect on meat and fat content in the carcasses of bulls treated with anabolics. Unruh et al. (1986) obtained with bulls slaughtered at 15.7 month, implanted with zeranol, no effect on dressing percentage, nor on rib eye area, and percentage of bone, while fat percentage and fat thickness were significantly higher.

Meat quality parameters are given in table 3. None of the investigated characteristics differed significantly ($P > 0.05$). Colour measured with the Göttinger photometer amounted to about 85. The lightness determined on the Longissimus dorsi averaged 38. Waterholding capacity ranged between 4.0 and 4.3 cm². Shear forces amounted to 4.1, 4.5, 4.4 and 4.6 kg respectively, and indicated no substantial differences in tenderness. Tissue composition (Longissimus dorsi) such as, moisture, protein, fat and collagen content were also similar.

Although literature data concerning the effect on meat quality characteristics of a progesteron-oestradiol implant in bulls are scarce, in general, the observations of table 3 are confirmed.

Table 3. Meat quality characteristics^a ($\pm s_{\bar{x}}$)

	Control	Lasalocid-Na	Progesteron-oestradiol-17 β	Lasalocid-Na + Progesteron-oestradiol-17 β
Number of carcasses	9	10	9	10
pH ultimate	5.53 \pm 0.03	5.53 \pm 0.03	5.49 \pm 0.01	5.52 \pm 0.02
Colour :				
Göfo (reflection)	84.4 \pm 1.9	86.6 \pm 1.7	86.3 \pm 2.1	85.3 \pm 1.0
Lab-Scan* : L value	38.8 \pm 1.1	38.1 \pm 0.7	37.1 \pm 1.8	38.5 \pm 1.0
a value	19.5 \pm 1.1	18.9 \pm 0.7	21.0 \pm 0.9	20.8 \pm 1.1
b value	16.0 \pm 0.7	16.1 \pm 0.4	17.3 \pm 0.6	17.7 \pm 0.6
Waterholding capacity (cm ²)	4.3 \pm 0.2	4.3 \pm 0.3	4.2 \pm 0.2	4.0 \pm 0.2
Tenderness (kg)	4.1 \pm 0.3	4.5 \pm 0.4	4.4 \pm 0.4	4.6 \pm 0.2
Composition (%)				
- dry matter	28.7 \pm 0.7	28.6 \pm 1.1	28.5 \pm 0.6	28.6 \pm 0.4
- protein	22.4 \pm 0.2	23.5 \pm 0.5	22.9 \pm 0.2	23.3 \pm 0.2
- ether extract	3.6 \pm 0.5	3.9 \pm 0.6	3.0 \pm 0.2	3.0 \pm 0.4
- collagen	0.75 \pm 0.04	0.80 \pm 0.08	0.86 \pm 0.15	0.78 \pm 0.04

a : no significant differences ($P > 0.05$)

* : measured on Lab-Scan II in CIE lab/10°/D65

Forest (1975) found no difference in tenderness and juiciness with Holstein-Friesian bulls, but the fat content in the Longissimus dorsi tended to increase after implantation. Paterson et al. (1983) and Johnson et al. (1983) did the same observation with implanted Gelbvieh and Angus bulls ; in both experiments the meat of the implanted bulls contained less moisture. The protein content of the muscle was not affected (Johnson et al., 1986). Single oestradiol implants in beef bulls had no effect on meat quality in experiments of Calkins and Clanton (1984) and Fiems et al. (1986). With a single implant of zearanol in bulls, an increased fat content in the meat was observed (Calkins and Clanton, 1984 ; Staigmiller et al., 1985 ; Unruh et al., 1986). A single zearanol implant in bulls revealed no significant decrease in collagen content in the Longissimus dorsi (Calkins et al., 1986). Degand et al. (1984) however, obtained a significantly lower collagen level in fresh meat of the diaphragm of bulls implanted with trenbolone acetate and oestradiol, while a progesteron-oestradiol implant in bulls resulted in a not significant decrease of hydroxyproline content in cooked meat of the Longissimus dorsi. In steers, a combined implant of progesteron-oestradiol plus trenbolone acetate didn't affect the collagen content in the meat (Roche et al., 1981). No literature is available referring to meat quality parameters affected by combined antibiotic-

anabolic treatments in bulls.

Residue determinations

Samples of urine, kidney (fat and tissue), liver, meat of the Longissimus dorsi and diaphragm of control and treated bulls were taken for determination of the residual amounts of the implanted hormones and or their metabolites by Prof. Dr. ir. R. Verbeke of the Laboratory of Chemical Analysis of Food from Animal Origin at the Faculty of Veterinary Medicine-Ghent.

Conclusions

These results indicate that lasalocid-Na and a progesteron-oestradiol implant or the combination of these treatments did not significantly improve daily liveweight gain, carcass characteristics and meat quality parameters. The available literature data concerning the administration of other implants and other anabolic-antibiotic-combinations in beef bulls, generally do not demonstrate very specific effects on carcass and meat quality characteristics. Based on other reports it can be interesting to look also after some side-effects at slaughtering, such as the thickness and the weight of the hide and the head. Future research may also be extended to other combinations of hormones, e.g. androgenic and oestrogenic agents in finishing bulls.

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