Effect of sub-therapeutic antibiotics and auction exposure on health, performance, and feeding behavior of weaned calves

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Gibb, D. J., Schwartzkopf-Genswein, K. S., McAllister, T. A., Genswein, B. M. A. and Streeter, M. 2006. **Effect of sub-therapeutic antibiotics and auction exposure on health, performance, and feeding behavior of weaned calves.** Can. J. Anim. Sci. **86**: 457–460. Calves sourced directly from a ranch were heavier initially (273 vs. 258; $P = 0.01$) than calves from the same ranch but processed through an auction barn. For calves fed 6 g head^{-1} d^{-1}chlortetracycline from days 5 to 9, feeding an additional 350 mg head^{-1} d^{-1} of chlortetracycline and sulfamethazine from days 1 to 28 improved gain/feed ($P = 0.03$), but only for the first 28 d of the 84-d trial. Frequency of bunk visits were altered by calf source and antibiotic treatment.

Key words: Antibiotics, auction, calves, feedlot receiving programs

Gibb, D. J., Schwartzkopf-Genswein, K. S., McAllister, T. A., Genswein, B. M. A. et Streeter, M. 2006. **Incidence d'une dose sub-thérapeutique d'antibiotiques et de la vente aux enchères sur la santé, la performance et le comportement alimentaire des veaux sevrés**. Can. J. Anim. Sci. **86**: 457–460. Les veaux venant directement de l'élevage ont un poids initial plus élevé que ceux du même élevage qui transitent par une vente aux enchères (273 c. 258 kg; $P = 0{,}01$). Les veaux recevant 6 g par sujet et par jour de chlortétracycline du 5^{e} au 9^{e} jour et 350 mg supplémentaires par jour de chlortétracycline et de sulfétamine du 1er au 28^{e} jour présentent un meilleur ratio gain/aliment (P = 0,03), mais seulement au cours des 28 premiers jours de cette expérience de 84 jours. L'origine du veau et le traitement aux antibiotiques modifient la fréquence des visites à l'auge.

Mots clés: Antibiotiques, vente aux enchères, veaux, programmes d'accueil au parc d'engraissement

Stresses associated with weaning that have a negative affect on the immune system (Blecha et al. 1984) may be prolonged or amplified with the processing, co-mingling, and feed deprivation that typically occurs at auction barns. Positive correlations between extent of mixing at auction barns and fibrinous pneumonia (Ribble et al. 1995) supports the notion that calves sourced directly from a ranch, may have a lower incidence of respiratory disease than cattle purchased through auction markets (Booth et al. 2002). Aureo S700® (Alpharma Animal Health Inc., Fort Lee, NJ) is an oral antibiotic that contains both chlortetracycline (77 000 mg kg^{-1}) and sulfamethazine (77 000 mg kg^{-1}). Chlortetracycline and sulfamethazine each fed at 350 mg head^{-1} d^{-1} have increased health and gains of recently weaned calves (Woods et al. 1973). Aureomycin® (Alpharma Animal Health Inc.) is a commercial oral-antibiotic containing chlortetracycline that is also commonly used to aid in prevention of respiratory disease in cattle. It is believed by some within the feedlot industry that response to both medications is additive when they are fed in combination. Whether this alleged response is due to the increased levels of chlortetracycline or the addition of sulfamethazine is not known.

To evaluate differences in health and performance between ranch-direct and auction sourced calves, and whether these calves respond differently to different antibiotic therapies, 240 mixed breed steers (265.5 ± 4.8 kg) were either shipped directly from the ranch to the feedlot (Ranch $n = 120$) or to an auction market (Auction $n = 120$) and then subsequently to the same feedlot. All calves were sourced from a single ranch approximately 400 km from the feedlot. Calves that were transported to an auction market were held overnight without feed or water, co-mingled, sorted, run through the auction ring and then transported to the feedlot (approximately 10 km away) to simulate typical auction-related activities. On entry into the feedlot, all calves were

Abbreviations: **ADG**, average daily gain; **Auction,** calves were processed through an auction market; **BRD,** bovine respiratory disease; **Control,** calves received 6 g head^{-1} d^{-1} chlortetracycline from days 5 to 9 of feedlot trial; **DMI**, dry matter intake; **Ranch,** calves were sourced directly from the ranch; **RF,** radio frequency; **Treated,** calves received 6 g head^{-1} d^{-1} chlortetracycline from days 5 to 9 and 350 mg head d^{-1} each of chlortetracycline and sulfamethazine from days 1 to 28 of feedlot trial fed hay and a diet containing 5% supplement, 35% steam-rolled barley, and 60% barley silage (DM basis). All calves were weighed and ear-tagged with a radio frequency identification tag (Allflex USA, Inc., Dallas/Ft. Worth, TX 75261-2266) to enable monitoring of bunk attendance using the GrowSafe™ system (GrowSafe Systems, Airdrie Alberta, Canada; Schwarzkopf et al. 1999). Calves were vaccinated with 2 mL of Somnustar Ph™ s.c. (Novartis, Missauga, ON) for haemophilus, 2 mL BarVac™ 3 i.m. (Boringer-Engelheim, Burlington, ON) for bovine viral diarrhea, and 5 mL Fortress-7 s.c. (Bayer, Toronto, ON) for clostridial related diseases. Boosters of SomnuStar Ph™ and Bar Vac™ 3 were administered 28 d later. All animals were cared for in accordance with the guidelines outlined by the Canadian Council of Animal Care (1993).

Calves were blocked by Ranch and Auction source and were randomly allotted to one of 16 feedlot pens measuring 14 m × 20 m with one water system shared between two pens. Calves were fed the 35:60:5 barley grain/barley silage/supplement diet ad libitum. A mash containing medication was included at the rate of 100 g head^{-1} d^{-1}. Medications were either Aureomycin® to provide 6 g chlortetracycline head^{-1} d^{-1} from days 5 to 9 inclusive (Control) or Aureo S700 to provide 350 mg head^{-1} d^{-1} of both chlortetracycline and sulfamethazine from days 1 to 28 in addition to the Control medication from days 5 to 9 (Treated). These two medications were provided to each of the two sources of cattle (Auction or Ranch) resulting in the following treatment groups: Ranch-Control,; Auction-Control,; Ranch-Treated, Auction-Treated. There were four pens (one of which was a GrowSafe pen) of 15 animals pen^{-1} for each treatment group. Calves started receiving treatment diets 3 d after arrival which was considered day 1 of the experiment. Supplements contained 4.47 kg Bovatec® (Alpharma Animal Health Inc.) per tonne to provide 36 mg lasalocid kg^{-1} of diet DM. Feed was delivered daily to ensure minimal orts while avoiding empty bunks.

Animal weights as well as dry matter intake (DMI), average daily gain (ADG), and gain/feed were obtained at 28-d intervals throughout the 84-d study. Pen was the experimental unit for analyzing DMI, ADG, and gain/feed. The mixed procedure of the SAS Institute, Inc. (1990) was used to compare treatment means. The statistical model included source of cattle, antibiotic fed and their interactions. When comparing DMI, ADG, and gain/feed, initial weight was used as a covariate when it interacted ($P < 0.05$) with main effects.

Each of the four treatments included one pen with the GrowSafe™ system (GrowSafe Systems Ltd., Airdrie, AB), an electronic feed-monitoring system using radio frequency (RF) technology to document the feeding patterns of individuals within large groups of cattle (Schwartzkopf-Genswein et al. 1999). However, the equipment in one of these pens malfunctioned resulting in no bunk attendance data for the Ranch-Treated group. Individual animal was the experimental unit for comparing patterns of bunk attendance between treatments. For each 28-d period, bunk attendance duration and frequency of visits were totalled for each animal for each day (i.e., 10 head in a pen for a 28-d period would result in 280 total observations).

Cattle in all pens were observed daily by experienced animal health technicians to identify sick animals. Technicians were blind to the experimental status of each pen. Animals deemed to be "sick", based on subjective criteria such as general appearance, gauntness, reluctance to move, or nasal/ocular discharge, were removed from their designated pen and presented for evaluation and treatment. A diagnosis of bovine respiratory disease (BRD) was made if the animal had a rectal temperature above 40.5°C with an absence of clinical signs attributable to an organ system other than the respiratory tract.

It was impossible to assess treatment effects on animal health as only two calves were treated for BRD. Due to hardware malfunction in the Ranch-Treated GrowSafe™ pen, medication treatment effect on behavior could only be compared for Auction sourced cattle and effect of calf source on behavior could only be compared for the Control medication. Source x medication interaction could not be determined for bunk attendance.

Compared with Ranch, Auction sourced cattle were lighter (258 vs. 273 kg; $P = 0.01$) at the start of the feedlot trial (Table 1). Weight loss resulting from increased time without feed and water as well as the sorting and handling (Coffey et al. 2001) at the auction barn likely contributed to the lighter initial weights of AU cattle.

During the initial 28-d period, neither source ($P = 0.60$) or medication ($P = 0.30$) affected DMI. However, there was a cattle source by medication interaction ($P = 0.03$) because Ranch Control cattle ate more than Auction control cattle but this effect of source was not significant for Treatment cattle. Medication had no effect on ADG ($P = 0.63$), but gain/feed was influenced by medication (Treated = 0.275, Control = 0.240; $P = 0.03$) with a trend ($P = 0.08$) for Auction cattle (0.287) to be more efficient than Ranch cattle (0.229). The cattle source by medication interaction ($P = 0.01$) was a result of the Treated diet increasing gain/feed for Ranch but not Auction sourced cattle. During this initial period, calves receiving the Treated diet spent less time at the bunk (242.0 vs. 254.3 min d^{-1}; $P = 0.03$) and made fewer daily visits (10.5 vs. 11.7; $P < 0.0001$) than calves receiving the Control diet (Table 1). Increased visits and time spent at the bunk without increased intakes suggests reduced eating rates for cattle receiving the Control diet. Potential effects on eating rates make it impossible to assume DMI is directly related to bunk attendance. The observed differences in feeding behavior may reflect a stimulatory affect of the Treated diet rather than an inhibitory affect of the Control diet as the control medication was included in the Treated diet.

There were no longer differences ($P = 0.54$) in calf weight between Auction (318 kg) and Ranch (312 kg) sourced calves by day 29 of the trial. During the following 28-d period (d 29 to 56), there were no differences in DMI, ADG, or gain/feed due to cattle source ($P > 0.32$). There was also no difference in time spent at the bunk from days 29 to 56 for Auction sourced cattle fed Control or Treated diets (246.1 vs. 249.9 min d^{-1}, respectively; $P = 0.25$), but cattle fed Control made more daily visits to the bunk (11.3 vs. 10.7; $P = 0.002$). Although this observation is statistically signifi-

Table 1. Performance and feeding behavior of ranch or auction sourced calves fed Aureomycin[z] alone or with Aureo S700[y]

Source	Auction	Ranch	Auction	Ranch		Source	Med	S × M
Medication	Control[z]	Control[z]	Treated[y]	Treated[y]	SE	*P*=	*P*=	*P*=
Initial weight (kg)	259*b*	270*ab*	257*b*	276*a*	4.8	0.01	0.66	0.42
Days 1–28								
Visits/d	11.7 ± 0.18*a*	10.7 ± 0.17*b*	10.5 ± 0.17*b*	NA[x]		0.0001	0.0001	NA
Minutes/d	254.3 ± 4.0*a*	249.7 ± 3.9*ab*	242.0 ± 3.9*b*	NA[x]		0.40	0.03	NA
DMI (kg d^{-1})	6.67*b*	7.44*a*	6.41*b*	7.05*ab*	0.19	0.60	0.30	0.03
ADG (kg)	1.81	1.58	1.95	1.73	0.10	0.54	0.63	0.83
Gain/feed	0.270*ab*	0.212*c*	0.304*a*	0.245*b*	0.01	0.08	0.03	0.01
Days 29–56								
Visits/d	11.3 ± 0.14*a*	9.6 ± 0.14*c*	10.7 ± 0.14*b*	NA[x]		0.0001	0.002	NA[x]
Minutes/d	246.1 ± 2.4	247.9 ± 2.3	249.9 ± 2.3	NA[x]		0.57	0.25	NA[x]
DMI (kg d^{-1})	8.44	8.45	8.78	8.59	0.16	0.33	0.91	0.32
ADG (kg)	1.55	1.65	1.48	1.62	0.15	0.65	0.94	0.44
Gain/feed	0.175	0.194	0.169	0.189	0.02	0.76	0.93	0.52
Days 57–84								
Visits/d	11.1 ± 0.16*a*	9.6 ± 0.15*c*	10.7 ± 0.15*b*	NA[x]		0.0001	0.04	NA[x]
Minutes/d	216.5 ± 2.7*b*	227.5 ± 2.6*a*	220.9 ± 2.6*ab*	NA[x]		0.003	0.24	NA[x]
DMI (kg d^{-1})	8.83	9.10	9.18	9.14	0.13	0.13	0.14	0.24
ADG (kg)	1.32*b*	1.49*a*	1.43*ab*	1.55*a*	0.08	0.27	0.33	0.48
Gain/feed	0.15	0.162	0.163	0.162	0	0.22	0.17	0.22
Final weight (kg)	396	397	401	402		0.69	0.97	0.38
Days 1–84								
Visits/d	11.3 ± 0.09*a*	9.9 ± 0.09*c*	10.6 ± 0.09*b*	NA[x]		0.0001	0.001	NA[x]
Minutes/d	238.3 ± 1.8	241.3 ± 1.8	236.9 ± 1.8	NA[x]		0.24	0.61	NA[x]
DMI (kg d^{-1})	8.09	8.38	8.10	8.25	3.0	0.16	0.62	0.04
ADG (kg)	1.52	1.56	1.65	1.64	0.05	0.83	0.76	0.74
Gain/feed[3]	0.192	0.188	0.200	0.198*ab*	0.006	0.75	0.78	0.91

[z]Provided 6 g chlortetracycline $head^{-1}$ d^{-1} from days 5 to 9.
[y]Provided 6 g chlortetracycline $head^{-1}$ d^{-1} from days 5 to 9 and 350 mg $head^{-1}$ d^{-1} of both chlortetracycline and sulfamethazine from days 1 to 28.
[x]Data not available due to equipment malfunction.
a–c Means followed by different letters differ ($P < 0.05$).

cant, it seems unlikely that this small difference would have biological relevance.

There was also little difference in performance (DMI, ADG, gain/feed) due to cattle source ($P > 0.12$) or medication ($P > 0.13$) from days 57 to 84. For Auction sourced calves, medication also had little effect on time spent at the bunk during this period (220.9 vs. 216.5 min d^{-1}; $P = 0.24$) which suggests that all calves had acclimated to the feedlot environment. However, Aucton sourced calves fed Control continued to make more daily visits (11.1 vs. 10.7; $P = 0.04$).

Over the entire 84-d feeding period, neither cattle source ($P > 0.15$) or medication ($P > 0.61$) affected DMI ($\bar{x} = 8.2$ kg d^{-1}), ADG ($\bar{x} = 1.59$ kg d^{-1}) or gain/feed ($\bar{x} = 0.195$). Final calf weights averaged 400 kg and were not affected by calf source ($P = 0.69$) or medication ($P = 0.98$).

Differences in feeding behavior through the whole trial were small. Medication had no effect on time spent at the bunk (236.9 vs. 238.3 min d^{-1} for AU sourced cattle fed Treated and Control, respectively; $P = 0.61$), but cattle consuming Control made more visits to the bunk than cattle supplemented with Treated (11.3 vs. 10.6; $P = 0.0001$). For cattle fed Control, Auction sourced cattle visited the bunk more frequently than Ranch sourced cattle (11.3 vs. 9.9; $P < 0.0001$).

In summary, for cattle receiving 6 g $head^{-1}$ d^{-1} chlortetracycline from days 5 to 9, feeding an additional 350 mg $head^{-1}$ d^{-1} of chlortetracycline and sulfamethazine improved gain/feed, but this effect did not maintain past the period in which it was fed. Any performance effects of processing calves through an auction barn were small and disappeared after the first month in the feedlot. Frequency of bunk visits were modified by both calf source and the dietary antibiotics cattle received.

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