# BEEF CATTLE RESEARCH UPDATE

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**Influence of Feeding Direct-Fed Microbial Supplementation on Growth Performance in Naturally Fed and Conventionally Fed Finishing Cattle**

Organic and natural beef production systems are becoming increasingly popular and there is high consumer demand for beef from natural feeding systems (no growth-promoting implants or antibiotics) and retailers are increasingly interested in offering their customers these alternatives in the market place.[1] Feeding high-concentrate finishing diets that do not contain ionophores (monensin) may increase the risk of acidosis. Direct-fed microbials (DFM) are live, naturally occurring microorganisms that can be added to diets to alter the microbial population in the digestive tract which can result in improved digestive health and animal performance. Feeding DFM may have the potential to decrease the length of the dietary adaptation period in the feedlot which would allow for increased consumption of a more energy-dense diet earlier in the finishing period. Supplementation with DFM could be an alternative to the use of ionophores and could potentially reduce the risk of acidosis, modify fermentation, and improve efficiency (G:F, Gain:Feed ratio) in natural feeding systems. Therefore, North Dakota State University researchers conducted a feedlot study to determine the effects of and interactions between 1) conventional (growth-promoting implant and supplemental monensin and tylosin) vs. natural (no growth-promoting implant, no monensin, no tylosin) feeding systems, 2) dietary adaptation period (14 vs. 28 days), and 3) DFM supplementation (no DFM vs. DFM) on growth performance, feeding behavior, carcass characteristics, and liver abscess scores.[2]

In this study, 120 yearling steers (860 lb initial weight) were allotted to 8 treatments (15 hd/treatment) in a 2 × 2 × 2 factorial arrangement of treatments with feeding system (natural vs. conventional), dietary adaptation length (14 vs. 28 days), and DFM supplementation (with or without DFM) as the 3 treatment main effects. Individual feed intake was monitored using the Insentec feeding system. Steers on the conventional treatment were fed monensin (32 grams/ton of total diet dry matter, DM) and tylosin (8 grams/ton of total diet DM) and implanted with 80 mg trenbolone acetate and 16 mg estradiol (Merck Animal Health). For DFM treatments, products from Priority IAC (Manitowoc, WI) were used. Steers were adapted to a high-grain diet by transitioning from a 50% concentrate diet to a 90% concentrate diet over a 14- or 28-day period by increasing the percent concentrate by 10% units twice (14 days) or once (28 days) per week. The final high-grain diet was made up of dry-rolled corn, corn silage, dry hay, dried distillers grains plus solubles, and supplements. After 140 days on feed, steers were slaughtered and carcass data was collected.

The effects of feeding system on feedlot performance and carcass characteristics are shown in Table 1. Conventionally fed steers had greater ($P \leq 0.001$) final body weight (BW), average daily gain (ADG), G:F ratio, carcass weight, and dressing percentage compared to the naturally fed steers. Average dry matter intake (DMI) expressed as either lb/day or as a percentage of body weight/day was not influenced by dietary treatment. These results are similar to results reported previously when conventional and natural feeding systems were compared.[3, 4] These researchers concluded that “together these reports indicate that a significant premium is necessary if implementing natural feeding programs”.

The number of experimental observations relative to the incidence of liver abscesses was low. However, the liver abscess scores were greater ($P = 0.002$) in naturally fed than in conventionally fed steers. This is in agreement with research showing that cattle receiving monensin and tylosin typically have reduced incidence of liver abscesses.[5]

Table 1. Effects of feeding system on feedlot performance and carcass characteristics.

| Item | Conventional | Natural | P-value |
|---|---|---|---|
| Feedlot Performance: | | | |
| Initial weight, lb | 870 | 851 | 0.12 |
| Final weight, lb | 1368 | 1310 | 0.001 |
| ADG, lb/day | 3.58 | 3.19 | <0.001 |
| DMI, lb/day | 25.08 | 24.75 | 0.48 |
| DMI, % of BW/day | 2.22 | 2.23 | 0.10 |
| Gain:Feed | 0.143 | 0.130 | <0.001 |
| Carcass Characteristics: | | | |
| Hot carcass weight, lb | 826 | 778 | <0.001 |
| Dressing percentage | 60.4 | 59.5 | 0.001 |
| Fat thickness, in. | 0.477 | 0.463 | 0.55 |
| Rib-eye area, sq. in. | 11.86 | 11.48 | 0.08 |
| Marbling Score[1] | 470 | 508 | 0.02 |
| Liver abscess score[2] | 0.267 | 0.889 | 0.002 |
| KPH, % | 1.82 | 1.94 | 0.002 |

[1]400 = small[0] marbling; 500 = modest[0] marbling.

[2] Presence of liver abscesses were scored using a 3-point scale [no abscess (0), 1 or 2 small (less than ~2.5 cm in diameter) abscesses or abscess scars (1), 2 to 4 active abscesses under 2.5 cm in diameter or 1 larger (<2.5 cm in diameter) active abscess (2), more than 5 active small abscesses or more than 1 large active abscess (3)].

Adapted from Swanson et al., 2018.

The data showed that conventionally fed steers generally spent less time eating per visit (4.4 vs. 5.4 minutes; P = 0.02) and more time eating per day (96 vs. 90 minutes; P = 0.01) than naturally fed steers. The authors suggested that this potentially could be because of changes in the ruminal environment with the inclusion of monensin in the conventionally fed steers, therefore moderating feeding behavior throughout the day.

Supplementation with DFM did not influence overall growth performance although it did appear to interact with feeding system to influence ADG and gain efficiency (P ≤ 0.02). Conventionally fed steers supplemented with DFM had the greatest (P ≤ 0.05) ADG and G:F. Whereas, naturally fed steers supplemented with DFM had the lowest (P ≤ 0.05) ADG and G:F. Conventionally fed and naturally fed steers not supplemented with DFM were intermediate (P ≤ 0.05). However, the researchers noted that it is unclear as to the biological significance of this finding. Time eating per visit (5.1 vs. 4.7 minutes) and per meal (12.3 vs. 11.5 minutes) was greater (P = 0.05) in steers supplemented with DFM than in steers not supplemented with DFM.

Length of dietary adaptation generally did not influence overall growth performance. However, it was noted that visual observation suggests that there was minimal incidence of subacute or acute acidosis during the dietary adaptation period for steers adapted over 14 or 28 d.

In conclusion, these data indicate that conventionally fed steers have improved growth performance. Whereas, length of dietary adaptation and DFM supplementation had minimal effects on growth performance but did influence and interact with feeding system to influence feeding behavior.

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[5] Nagaraja, T. G., and K. F. Lechtenberg. 2007. Acidosis in feedlot cattle. Vet. Clin. North Am. Food Anim. Pract . 23:333–350.