**NOTE** *Internal Medicine*

# Mixed Feed Containing Dextran Improves Milk Production of Holstein Dairy Cows

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ABSTRACT. Total 37 Holstein daily cows (body weight: 631.76 ± 18.45 kg, age: 5.47 ± 1.94 years, parturition: 3.71 ± 1.76 times) which became pregnant and gave birth to calves in the same season and lactated continuously were selected for this study. They were randomly divided into two groups: Group A—control, Group B—fed with 30 g/head/day of mixed feed containing supplemental dextran for one year from October 2001. After supplementation of the mixed feed, milk yields and components (fat, protein and solid non-fat) of Group B were compared with those of Group A in the 8th, 10th and 11th months (May, July and August of 2002). Milk yields of Group B were greater than the yields of Group A. In particular, there was a significant difference ($p<0.001$) between these groups in the July and August values. Milk components of Group B slightly differed from those of Group A before the supplementation, but after the supplementation, concentrations and total amounts of fat, protein and solid non-fat significantly increased more in Group B than in Group A. Thus mixed feed containing dextran can increase the milk production of Holstein dairy cows in the hot season.
KEY WORDS: cattle, dextran, milk production.

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The dairy industry has long worked to improve both the quantity of milk produced and its quality. The effects on milk production of many growth hormones and antiparasitic agents have been investigated [3–6, 14, 17]. Recently, attention has been focused on oligosaccharides as intestinal regulators to improve both human and livestock health. For example, fructooligosaccharide, xylooligosaccharide, galactooligosaccharide and others are widely known and called "prebiotics". Dextran, which is a glucose polymer and well known as a plasma expander has recently been under investigation as a prebiotic. Concrete benefits have been observed: mixed feed containing dextran inhibited *Salmonella* contamination [1], improved egg production in chickens, and prevented diarrhea while increasing weight gain in calves and piglets [7, 11, 12]. Because dextran can promote the growth of beneficial lactic acid bacteria in the intestines, it can be speculated that this effect promotes the health and productivity of poultry and livestock. The purpose of this study is to evaluate the effect of mixed feed containing dextran on the milk production of Holstein dairy cows.

The experiment was carried out at a stock farm in Gifu Pref., Japan from October 2001 to August 2002. For this study, 20 Holstein dairy cows for Group A (Control) and 17 Holstein dairy cows for Group B (fed with mixed feed containing supplemental dextran) which produced milk continuously and which became pregnant and gave birth to calves in the same season were selected in order to decrease effects of differences in the lactation phase of cows. Their weights were 646.8 ± 79.1 kg(A group) and 631.8 ± 18.5 kg (B group), their ages were 5.32 ± 2.05 years (A group) and 5.47 ± 1.94 years (B group) and parturition was 3.3 ± 1.5 times (A group) and 3.71 ± 1.76 times (B group)(Table 1). They were fed basic feed of 5.0 kg timothy grass, 7.0 kg lucerne grass and 10.0 kg complete mixed ration, and Group B alone was fed basic feed with a mixed feed containing 2.5% Dextran (Meito Healthy Friend[R]: Meito Sangyo Co., Ltd., Aichi) at a dosage of 30 g/head/day. Their yields of milk and its components, were measured twice each day in May, July and August of 2002 (eight, ten and eleven months after supplementation of the mixed feed)(Table 2) and A and B groups were compared.

Milk yield was measured with a Tru-Test Milk Meter (TRU-TEST, Auckland, New Zealand). Milk components (fat, protein and solid non-fat) were measured with a CombiFoss 6000 (Fujihira Industry Co., Ltd., Tokyo). Statistical differences between Groups A and B were determined with Statcel (OMS, Saitama) and a paired *t*-test for independent samples.

Milk yields of Group B were increased after supplemen-

Table 1. The number of cows and their weights, ages and parturitions

| | Group | |
|---|---|---|
| Group | A | B |
| The number of cows | 20 | 17 |
| Weight (kg) | 646.8 ± 79.1 | 631.8 ± 18.5 |
| Age (years) | 5.32 ± 2.05 | 5.47 ± 1.94 |
| Parturition (times) | 3.3 ± 1.5 | 3.7 ± 1.8 |

Table 2. Feeding periods and kinds of feed

| | Period | |
|---|---|---|
| Group | May 2001~Sep.2002 | Oct. 2001~Aug. 2002 |
| A | Basic feed only | Basic feed only |
| B | Basic feed only | Supplemented dextran |

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Table 3. Effect of mixed feed containing dextran on yields and components of milk[a)] (Comparison of Holstein dairy cows in Group A and Group B at a stock farm in Gifu Pref., Japan)

| | Period | May 2001 | Aug. 2001 | May 2002 | July 2002 | Aug. 2002 |
|---|---|---|---|---|---|---|
| | Group | | | | | |
| Milk yield | A | 30.6 ± 5.9 | 28.3 ± 3.4 | 32.1 ± 5.8 | 28.0 ± 5.2 | 29.1 ± 5.0 |
| (Liter/day/head) | B | 34.0 ± 10.5 | 30.7 ± 5.4a | 37.5 ± 10.0* | 36.6 ± 6.7** | 37.6 ± 7.7**b |
| Fat (kg) | A | 1.12 ± 0.22 | 1.04 ± 0.12 | 1.12 ± 0.19 | 0.90 ± 0.24 | 0.96 ± 0.17 |
| | B | 1.29 ± 0.30 | 1.04 ± 0.24 | 1.59 ± 0.48** | 1.17 ± 0.36* | 1.25 ± 0.32** |
| Protein (kg) | A | 1.01 ± 0.15 | 0.89 ± 0.07 | 1.00 ± 0.17 | 0.83 ± 0.13 | 0.91 ± 0.11 |
| | B | 1.16 ± 0.27* | 1.05 ± 0.09** | 1.39 ± 0.45** | 1.14 ± 0.28** | 1.24 ± 0.23** |
| Solid non-fat (kg) | A | 2.70 ± 0.51 | 2.45 ± 0.25 | 2.75 ± 0.42 | 2.36 ± 0.41 | 2.47 ± 0.40 |
| | B | 3.10 ± 0.88 | 2.73 ± 0.12* | 3.42 ± 0.90** | 3.19 ± 0.56* | 3.33 ± 0.56** |

Group A: Control (n=20).
Group B: Mixed feed containing supplemental dextran was fed from Oct. 2001 to Aug. 2002 (n=17).
a) Random sampling for one day each month.
* $p<0.05$ **$p<0.001$. a, b ; A significant difference between the different symbols ($p<0.01$).

tation of the mixed feed. Notably in July and August of 2002 under heat stress, milk yields of Group A were decreased remarkably but those of Group B were not decreased. As a result, there was a significant difference between Groups A and B (Table 3). Furthermore, there was a significant difference between August of 2001 before supplementation of the mixed feed of dextran and August of 2002 after supplementation in Group B. On the other hand, the all components of the milk in Group B were greater than in Group A despite the increase in milk yield in Group B by feeding the mixed feed containing dextran. In this study, we found that a mixed feed containing dextran could improve yields and components of milk by using selected cows lactation phases of which not uniform. It is very difficult to make lactation phases uniform. Therefore we were compelled to adopt the protocol used in this study.

Many reports have appeared of attempts to improve yields and components of milk, but there are only a few reports of attempts involving carbohydrates, oligosaccharides and polysaccharides. It has been reported that feeding diets higher in fermentable carbohydrate to prepare dairy cows might increase milk yield [2], and sucrose has been shown to enhance rumen microbial protein synthesis [16]. Generally speaking, oligo- and polysaccharides, recently called “prebiotics”, enhance the growth of lactic acid bacteria, which improves the microflora in the intestines. As a result, host poultry and livestock are healthier and more productive.

Nevertheless, there are many reports that under stress (crowding, handling, fasting, heat, humidity, transportation, etc.) the number of *Lactobacilli* decreased [8–10, 13, 15]. In order to avoid this, diets containing *Lactobacillus* culture have been added to feed, resulting in improved immune response and weight gain in broilers [18]. The results of the current study show that mixed feed containing dextran increases milk yield, especially in the hot and humid season in Japan. Dextran was not found to be digested in rumen juice and calf rumen (data not shown), so that unaltered dextran is expected to reach the intestines and promote the growth of lactic acid bacteria there, thus decreasing the impact of any stress.

Thus we conclude that mixed feed containing dextran can increase milk production in Holstein dairy cows in the hot and wet season.

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