Research Bulletin
Arm & Hammer Animal Nutrition
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DCAD Plus® meets needs of high-producing cows, improves milk production and component levels

Effectiveness of potassium carbonate as DCAD Plus to increase dietary cation-anion difference (DCAD) balance in early lactation

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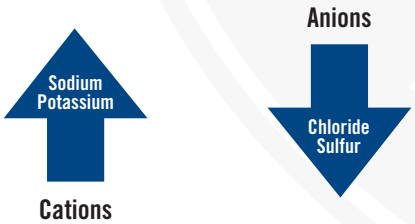
KEY POINTS

- **Fresh cows supplemented with DCAD Plus Feed Grade Potassium Carbonate increased dietary potassium concentration and improved early lactation milk and milk fat production as compared to cows supplemented with potassium through forage sources alone.**
- **Improved fresh cow production resulting in higher peak milk yields, leading to increased milk production throughout lactation and additional producer profits.**
- **Cows fed DCAD Plus displayed measurable improvements in milk and component production that justify the extra feed costs.**

INTRODUCTION

Manipulating the dietary cation-anion difference (DCAD) is becoming standard practice in dairy cattle nutrition to maximize dry matter intake (DMI), performance in the milking string and rumen health. DCAD measures the level of four macrominerals: sodium and potassium, which are cations and carry a positive charge, and chloride and sulfur, which are anions and carry a negative charge. The equation for calculating positive DCAD is:



(sodium + potassium) – (chloride + sulfur) = +DCAD

By manipulating ration DCAD, you can promote optimal DMI to keep cows productive and healthy throughout all phases of lactation. Optimal DCAD is dependent on stage of lactation, production levels and weather conditions. Research shows that lowering or raising DCAD levels during the following scenarios can lead to optimal performance and rumen health.

Negative DCAD Prepartum

Prior to calving, a negative DCAD assists in the bone mobilization process—helping increase the transfer of calcium from bones to the bloodstream—to help prevent hypocalcemia, one of the most prevalent metabolic disorders during calving or postpartum.

Research[1] suggests that feeding BIO-CHLOR® Rumen Fermentation Enhancer can successfully lower DCAD levels to the optimal range of -8 to -12 meq/100g ration dry matter. Feeding BIO-CHLOR also reduces the incidence of milk fever, retained placentas and uterine infections postpartum, while significantly increasing milk production once in the milking string[2].

Positive DCAD Postpartum

After calving, a positive DCAD encourages optimal DMI by helping to buffer the high metabolic acid load occurring with high production demands. It provides macrominerals critical to daily functions,

most importantly milk production. University research[3] demonstrates these results, reporting the addition of DCAD Plus to the ration not only raised DCAD levels to support the potassium needs of high-producing cows, but also improved DMI, fat-corrected milk production and component levels.

Optimal DCAD fights heat stress

Cows in heat-stress conditions lose potassium more quickly through increased perspiration, panting and urination, resulting in less blood-buffering capacity by the cow's body. Hot weather also lowers DMI, rumination and salivary production, all of which adversely influence production and rumen health. DCAD Plus provides the ration with additional potassium to replace levels lost through normal daily functions and act as a blood buffer to help alleviate the effects of heat stress. Potassium is a critical regulator of sweat glands during heat stress, helping keep cows cool and maintain rumen integrity during heat-stress conditions. Further, DCAD Plus does not add any anions, specifically chloride, which can negate the cation benefits potassium delivers.

By maintaining DCAD, you can promote optimal DMI to keep cows productive and healthy throughout all phases of lactation.

STUDY OVERVIEW[4]

Thirty commercial Holsteins used for this trial were divided into two groups which were balanced by lactation number, expected calving date and Predicted Transmitting Abilities (PTA). Cows were placed in the two groups at 15 days in milk (DIM) and remained on their respective diets through 100 DIM. The study took place from mid August to December 2007.

Feeding Rates and DCAD levels

Based upon nutrition recommendations, the control group was fed potassium through forage sources only at the rate of 1.2 percent dry matter, resulting in a ration DCAD of 21.5 meq/100g ration dry matter. Treatment cows were supplemented with DCAD Plus Feed Grade Potassium Carbonate at the rate of 0.7 lbs. per day, resulting in ration DCAD of +43.7 meq/100g ration dry matter, as shown in Table 1. Apart from supplementation with DCAD Plus, ration composition was similar for each group.

The two groups were fed individually using Calan gates once per day. Rations were formulated for high-producing cows in early lactation using CPM-Dairy. Feeding took place following morning milking, permitting measurement of DMI for individual cows.

Milk Production and Collection Data

Cows were housed in freestall facilities bedded with composted manure and milked twice daily. Weekly morning and evening composite milk samples were collected and sent to Minnesota DHIA for analysis. Additional milk samples were collected at weeks two, five, nine and 12. These samples were frozen immediately following collection and later analyzed for potassium and magnesium levels.

Blood samples were drawn at weeks two, five, nine and 12 to measure glucose, potassium and magnesium levels.

TABLE 1 Feeding rates and ration DCAD levels

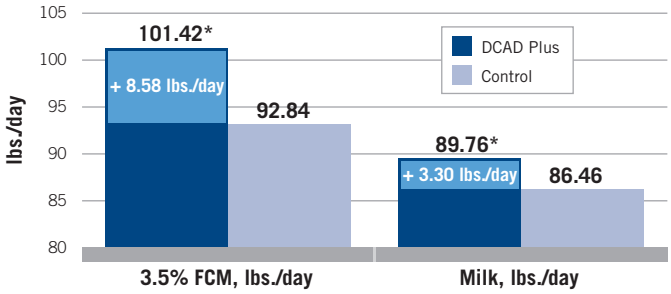
	Control (forages alone)	Treatment (forages and DCAD Plus)
Potassium fed as % dry matter	1.2%	2.0%
Ration DCAD level (meq/100g ration dry matter)	+21.5	+43.7

RESULTS

Improved FCM and Milk Production

- Improved milk *and* fat-corrected milk production by treatment cows over control group
- Significant difference was detected ($P<0.05$) for both milk production and fat-corrected milk production

CHART 1 Improved milk production[4]

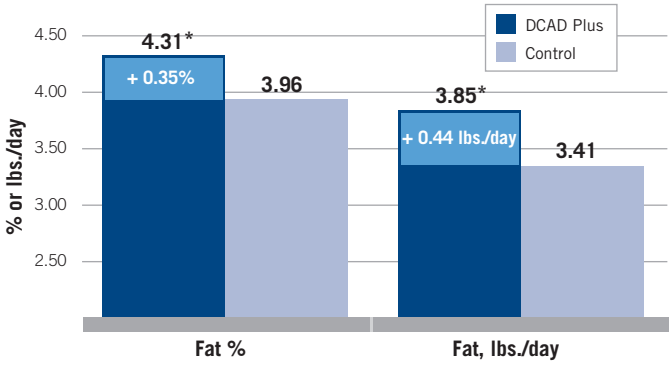


*Differences were significant ($P<0.05$)

Improved Component Production

- Improved butterfat production
- Treatment cows outperformed the control in pounds of fat production *and* milk fat percentage
- Significant difference ($P<0.05$) was detected for both

CHART 2 Improved component production[4]



*Differences were significant ($P<0.05$)

ECONOMIC ANALYSIS

Because of the improvement in both milk (+8.58 lbs. FCM, +3.30 lbs. milk) and fat production (+0.44 lbs.), additional profits could be realized by the treatment group, as compared to the control group, even when considering the additional cost of DCAD Plus and DMI.

DISCUSSION

Previous trials[3] demonstrated increased DCAD levels improved DMI, milk production and component levels. However, those studies were conducted using cows with lower production performance. This study addresses the need for increased DCAD levels postpartum to improve milk production and component levels in high-producing cows.

High-producing cows require higher DCAD levels

This trial confirms that high-producing cows need higher levels of dietary potassium to meet their dietary needs and optimize performance in the milking string. High-quality DCAD Plus Feed Grade Potassium Carbonate is one of the only ways to achieve higher DCAD levels. In addition to the critical role potassium plays in lactating dairy cow performance, this research confirms the important role it plays in fresh cow performance, resulting in optimal peak milk and component yields, helping lead to improved producer profitability.

This study also supports the concept that high dietary potassium levels (higher than NRC recommendations of 1.2 percent of total dry matter) are not detrimental to lactating dairy cows and are, in fact, beneficial to performance.

REFERENCES

1 Giesy JG, Sanchez WK, McGuire MA, Higgins JJ, Griffel LA, Guy MA. Quantifying the relationship of dietary cation-anion difference to blood calcium in cows during hypocalcemia. *J Dairy Sci* 1997;80(suppl):142.

2 Robert Corbett. *Journal of Dairy Science Abstracts,* 2001.

3 Hu W, Murphy MR, Constable PD, Block E. Dietary cation-anion difference and dietary protein effects on performance and acid-base status of dairy cows in early lactation. *J Dairy Sci* 2007;90:3355-3366.

4 White R, Harrison J, Kincaid R, Block E, St-Pierre N. Effectiveness of potassium carbonate as DCAD Plus® to increase dietary cation-anion difference balance in early lactation cows. *J Dairy Sci* 2008;91:Abstr. 106.

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