

Free Choice Feeding of Phosphorus Containing Minerals

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Topics:

- Introduction
- Historical perspective
- Limitations of free choice minerals

INTRODUCTION

Environmental concerns with phosphorus (P) have forced the animal industry to re-evaluate the levels formulated in diets. It has been demonstrated in numerous research trials that excess P intake equates to excess P out in the manure. The ideal way of controlling P intake is developing diets that closely match the animal's requirement and implementing feeding management practices to ensure those levels are being consumed. In today's

industry since most dairy cattle are fed balanced amounts of forages, concentrates, and mineral-vitamin mixtures, free choice mineral feeding is unwarranted.

The purpose of this fact sheet is to illustrate the problems producers can face with feeding minerals free choice. Conclusions from research and field trial results will be presented to demonstrate the limitations associated with this management practice.

HISTORICAL PERSPECTIVE

The misconception that animals have an innate sense for a particular mineral began with reports published by South African researchers. In the early 1920s researchers described P-deficient cattle with depraved appetites chewing on bones. Bones contain significant levels of P, and the association was made that animals were able to select feeds to compensate for mineral deficiencies in the diet.

This was followed by additional research in the 1930s that indicated cows and lambs fed P-deficient diets may consume sufficient free choice P to meet their requirements. It was further demonstrated that when intake of P from feed sources increased, less free choice P-sources were consumed.

In the early 1950s, a paper appearing in the British Journal of Animal Behavior measured the preference of P-deficient cattle and sheep for supplemental calcium carbonate alone or combined with an equal part of dicalcium phosphate. Animals did not consume adequate levels of mineral to prevent P deficiency.

The 2001 NRC presents 2 studies conducted in the 1970s that demonstrate no benefit of feeding P free choice. The first study was with dairy heifers fed low or marginally deficient calcium or P. There was little relationship between the animals' requirement for the mineral elements and free choice consumption of dicalcium phosphate or defluorinated phosphate. In the second study lactating cows were fed calcium and phosphorus below requirements for 9 and 12 weeks. There was no evidence that animals consumed free choice minerals to correct the deficiency. Researchers concluded there was no association between appetite for P or calcium supplements and the animals' nutrient requirement.

The studies from the early 1900s dealt with extreme deficiencies, and it is likely that P was not the only nutrient lacking in the diet. In contrast, the ingredients and diets fed to the modern dairy cow provide little chance of a P deficiency. In addition, it has been theorized that domestication has produced an animal that is more responsive to sensory qualities of feed than to its nutritive value.

LIMITATIONS OF FREE CHOICE MINERALS

Offering minerals free choice is appropriate when grazing livestock are not receiving any concentrates or supplemental feeds. However, this is not a typical scenario for the modern dairy operation.

The greatest limitation of feeding minerals free choice is the variation in consumption. The individual consumption of dicalcium phosphate by lactating dairy cattle was measured in a 1972 study. The variation was huge and mineral consumption ranged from zero to two pounds per day.

This same trend was demonstrated with beef cattle in Alberta, Canada. Not only was there a substantial range of intake (minimal to 1.7 pounds per day), but also the number of visits to the mineral feeders varied greatly. The days between visits to the mineral feeder ranged from 1.5 to 4.5 days. The researchers concluded that free choice feeding via a mineral feeder is not an acceptable method of providing minerals on a daily basis.

The approach of a cafeteria-style mineral feeder has been used for dairy cattle, especially animals being intensively grazed. These systems offer a range of 2 to 10 mineral choices. The primary disadvantage of this system is high feeding loss and increased expense. Cows typically do not

consume sufficient amounts of minerals to meet their requirements. Animals are more likely to be influenced by taste or acceptability versus a craving for a particular element.

Controlling the level of P consumed is very important in light of the nutrient regulations being executed. A field trial conducted in Okeechobee, Florida during 1986-87 examined the effect of feeding free choice minerals on P excretion. Rations were formulated so cows would receive 0.52% P. In addition to dietary P, a free choice mineral mix with a minimum of 8.0% P was offered. Cows allowed access to the free choice mineral had a greater concentration of P in the feces. This field trial agrees with the numerous research studies cited in the 2001 NRC, which state that once the cow's requirement for P is met, the excess will be excreted in the feces.

There have not been an overwhelming number of studies addressing free choice feeding of minerals. However, there is enough evidence with various ruminant trials (sheep, beef and dairy) to conclude that free choice feeding has many limitations and in today's environment, there is little to no benefit to this practice for dairy producers.

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