

# Effect of Sodium Bisulfate on Ammonia Levels, Fly Population, and Manure pH in a Horse Barn

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Sodium bisulfate applied to horse bedding decreased ammonia levels, manure pH, and the number of flies when compared to a control period without sodium bisulfate. Behavior typical of ponies being bothered by flies (tail swishes, head tosses, and kicks or strikes) was also decreased when sodium bisulfate was used. Authors' address: New Bolton Center, University of Pennsylvania, 382 West Street Rd., Kennett Square, PA 19348. © 1996 AAEP.

## 1. Introduction

Several chemicals have been tested for their ability to reduce ammonia release from poultry litter<sup>1</sup> and to decrease flies. One such chemical is sodium bisulfate (NaSO<sub>4</sub>). Because of its effectiveness in poultry facilities, we thought that NaSO<sub>4</sub> might be effective in controlling ammonia levels in horse barns. The objective of this study was to evaluate the effectiveness of NaSO<sub>4</sub> in decreasing ammonia levels and flies in a horse barn.

## 2. Materials and Methods

The 4-week study used four ponies housed in box stalls. Weeks 1 and 3 were control weeks when no sodium bisulfate<sup>a</sup> was applied. On weeks 2 and 4, sodium bisulfate was applied at 4.5 kg/9.3m<sup>2</sup> and 2.3 kg/9.3 m<sup>2</sup>, respectively. On day 1 of weeks 2 and 4, NaSO<sub>4</sub> was applied to the floor and then covered with a normal amount of straw. On days 2-7, NaSO<sub>4</sub> was applied daily to the top of the bedding, and one flake of straw was spread on top. Ponies were kept in the stalls 24 h/day and the stalls were

not cleaned. All procedures were the same during the control week except for the NaSO<sub>4</sub> application.

Testing on day 7 included ammonia levels, manure pH, fly counts, and fly behavior measures (tail swish, head toss, kick or strike frequency, and total fly evasive behavior) determined from a 9-h video taping. Ponies were observed daily for cutaneous lesions or signs of lameness.

## 3. Results

Ammonia levels were decreased ( $p = 0.0016$ ) following NaSO<sub>4</sub> treatment. No ammonia was detectable in any of the four stalls following 4.5 kg of NaSO<sub>4</sub> and in three of the four stalls following 2.3 kg of NaSO<sub>4</sub>. Manure pH levels were lower ( $p = 0.0009$ ) during the NaSO<sub>4</sub> treatment periods than during the control weeks. Fly evaluation: fly numbers were decreased ( $p = 0.009$ ) during both NaSO<sub>4</sub> treatment periods when compared to those of the control weeks. Frequency rates for tail swish and total fly evasive behavior<sup>2</sup> were decreased ( $p = 0.0058$ ) during both NaSO<sub>4</sub> treatment periods. While the difference for head toss and kicks or strikes was not statistically

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## NOTES

significant, the data show a strong trend toward a decrease in each activity during  $\text{NaSO}_4$  treatment.

No signs of cutaneous lesions or signs of lameness were seen during the study. The ponies' eating habits usually resulted in spreading the hay placed on the floor around 25% of the stall over the soiled manure. No cutaneous muzzle lesions were present, nor were any gastrointestinal signs noted during the study.

Though we were not blinded to the application, it was our subjective impression (including that of the barn manager, who had operated the barn for 15 years) that during the treatment weeks the barn was free of typical pungent ammonia odors. All individuals noted that the barn smelled sweet, i.e., more similar to the odor of a dairy barn than to a horse barn using deep littering of bedding. After the end of the study, the stalls were not cleaned out for 7 days and remained sweet smelling and basically free of flies. This unplanned opportunity to evaluate the effect of the  $\text{NaSO}_4$ -treated horse stall surprised all of us who are familiar with the usual results of leaving dirty, wet horse stalls not cleaned in the summer weather.

#### 4. Discussion

Ammonia is a known respiratory irritant in humans, rats, cows, pigs, turkeys, and chickens. Although

the levels of ammonia in most horse barns may not be toxic, it is known that the horse's environment of straw bedding and hay as a foodstuff already provides a respiratory challenge to all horses and is responsible for numerous airway disorders including chronic obstructive airway disease. Controlling ammonia will only be of benefit.

Horses owners are concerned as more nonhorse owners voice displeasure over manure odors and flies associated with nearby horse farms. Flies serve as a nuisance to horses and to people working with the horses.

Our findings suggest that  $\text{NaSO}_4$  may be an effective method of decreasing ammonia levels and controlling flies in horse barns.

#### References and Footnotes

1. Carlike FS. Ammonia in poultry houses: a literature review. *Worlds Poultry Sci J* 1984;40:99-113.
2. Dougherty CT, Knapp FW, Burrus PB, et al. Behavior of grazing cattle exposed to small populations of stable flies (*Stomoxys calcitrans* L.). *Appl Anim Behav Sci* 1995;42: 231-248.

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