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*Research Note—*

# Effect of Poultry Litter Treatment® (PLT®) on Death Due to Ascites in Broilers

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SUMMARY. The purposes of this study were to determine the effect of Poultry Litter Treatment® (PLT®) on levels of litter moisture, litter nitrogen, atmospheric ammonia, and death due to ascites. Data were collected from chicks raised in containment conditions that resembled commercial settings.

The ascites death rate (5.9%) in broiler chicks on PLT-treated litter was significantly ($\chi^2 = 15.5$, df = 1, $P = 0.001$) lower than that (31.5%) in broiler chicks raised on untreated litter. Likewise, atmospheric ammonia levels in pens that had been treated with PLT were significantly ($P < 0.05$) lower than those in pens that received no treatment. Under the conditions of the present study, litter moisture and litter nitrogen levels were not different ($P > 0.05$) among treatments at any sample interval.

RESUMEN. *Nota de Investigación*—Efecto del producto para el tratamiento de la cama de aves (PLT®) sobre la mortalidad debido a ascitis.

El propósito de este estudio fue determinar el efecto del producto PLT®, para el tratamiento de la cama, sobre los niveles de humedad y nitrógeno de la cama, amonio atmosférico y mortalidad debido a ascitis. Los datos fueron tomados de pollos criados bajo condiciones de confinamiento que simulaban condiciones de campo. En los pollos de engorde criados en cama tratada con PLT®, el porcentaje de mortalidad por ascitis fue del 5.9%, que fue significantemente menor ($\chi^2 = 15.5$, df = 1, $P = 0.001$) que el porcentaje obtenido en los pollos criados en cama no tratada (31.5%). Así mismo, los niveles de amonio atmosférico en los corrales que fueron tratados con PLT® fueron significantemente menores ($P < 0.05$) que los encontrados en los corrales que no recibieron tratamiento. Bajo las condiciones de este estudio, la humedad y los niveles de nitrógeno en la cama no fueron diferentes ($P > 0.05$) entre los tratamientos en los muestreos hechos.

Key words: ammonia, ascites, broiler chickens, litter

Ascites is a common problem among rapidly growing broiler strains of chickens that are raised intensively in modern microenvironments (2). The etiologies and pathogenesis of the relationship between ascites and ammonia in chickens have been reviewed (2).

Chickens that are sufficiently afflicted with ascites do not thrive, die on the farm, or are condemned at processing; therefore, economic losses are incurred. Reduction of losses due to ascites depends upon ascites control and abatement methods (2). Among these methods are the use of agents that may reduce the exposure of broilers to excessively high atmospheric ammonia levels. A product composed primarily of sodium bisulfate (Poultry Litter Treatment®, PLT®) has been used to reduce ammonia levels in animal confinement units (4). The ability of PLT to effectively reduce atmospheric ammonia levels is attributed to a combination of mech-

Table 1. Comparison of atmospheric ammonia levels in pens given either no treatment or PLT.[A]

| | Interval[B] | | | | | |
|---|---|---|---|---|---|---|
| Treatment | −1 | 0 | 7 | 14 | 22 | 48 |
| None | 96.3[a] | 94.5[a] | 72[a] | 114.5[a] | 114.8[a] | 52.5[a] |
| PLT | 87.5[a] | 5.1[b] | 14[b] | 20.4[b] | 22[b] | 19[b] |

[A]Two-way analysis of variance. Numbers indicate atmospheric ammonia in parts per million (ppm). Twenty pens were given no treatment, in 20 pens were treated with PLT.

[B]Intervals are in days post-treatment. Day 0 is the day of litter treatment and is also the day before chick placement. Numbers in columns with different superscripts ([a] or [b]) are significantly ($P < 0.05$) different from each other.

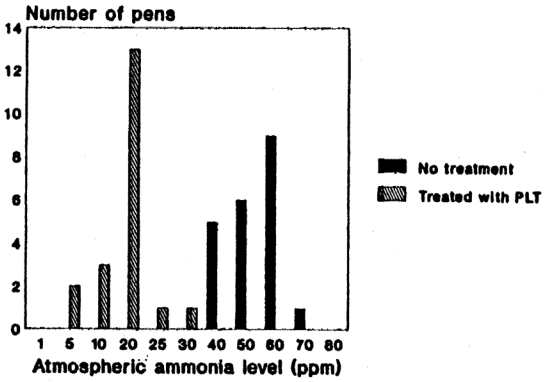


Fig. 1. Atmospheric ammonia levels in chicken pens 48 days after either having no treatment or having been treated with a solitary application of PLT.

anisms, including 1) direct chemical interaction with uric acid, 2) reduction in litter pH, and 3) reduction in populations of bacteria that generate ammonia gas from uric acid excreta. The purposes of the present study were to determine the effect of PLT on levels of litter moisture, litter nitrogen, atmospheric ammonia, and death due to ascites in broiler chickens.

## MATERIALS AND METHODS

**Chicks and husbandry.** Chick housing conditions simulated those found in most commercial settings. Two-thousand-six-hundred-forty 1-day-old male Ross × Ross broiler chicks were housed in 40 wood-and-wire-enclosed pens (66 chicke per pen) with concrete floors that were covered with 4 in. of used poultry litter. Each pen was separated from each other pen by an 18-in.-high plywood barrier. Available floor space was 0.65 ft² per chick. Fan ventilation and space heating also simulated a commercial setting in which excessive levels of atmospheric ammonia are commonly found, and these parameters were the same among treatments.

Chicks were fed a commercial diet and water *ad libitum*. On day 0 in 20 pens, PLT (a proprietary blend of sodium bisulfate and other materials; Jones-Hamilton Co., Walbridge, OH) was applied using a handheld broadcast spreader. The rate of application in these pens was 5 lb per 100 ft². Litter in the other 20 pens received no treatment. Six, 9, 10, 13, and 20 days later, 16 oz of tap water was sprayed onto the litter in each of the 40 pens to promote the production of ammonia gas. Chicks were observed daily.

**Measurements.** Atmospheric ammonia levels were measured using a Matheson toxic gas detector (model 8014KA; Fisher Scientific Co., Pittsburgh, PA) and Precision gas detector tubes (no. 105SC, 5–260 ppm; Fisher Scientific Co.). All measurements were determined at chick eye level in each pen at days −1 (the day before litter treatment), 0 (the day of litter treatment, also the day before chick placement), and 7, 14, 22, and 48 days later (post-treatment; PT). Diagnosis of death due to ascites was based upon finding a typical straw-colored-fluid-filled and distended abdomen (3). Chicks with severe ascites and marked abdominal distention were killed by cerebrocervical dislocation for humane reasons. Ten-ounce samples of litter from six different locations in each of four pens per treatment were collected at days 4, 8, 13, 19, 24, 28, 33, and 48 PT and shipped overnight to MidContinent Laboratory (Memphis, TN) for moisture and nitrogen analysis.

**Biometrics.** The ascites death rate data were analyzed using a chi-square test (6). The atmospheric ammonia level, litter moisture, and litter nitrogen data were analyzed using two-way analysis of variance.

## RESULTS

The death rate due to ascites (5.9%; 4/68) was significantly ($\chi^2 = 15.5$, $df = 1$, $P = 0.001$) lower in broiler chicks raised on PLT-treated litter than that (31.5%; 28/89) in broiler chicks raised on untreated litter. Likewise, atmospheric ammonia levels were significantly ($P < 0.05$) lower in pens that had been treated with PLT than those in pens that received no treatment (Table 1). Figure 1 shows the atmospheric ammonia levels in pens 48 days after having either no treatment or treatment with a solitary application of PLT. Litter moisture and litter nitrogen levels were never different ($P > 0.05$) among treatments at any sample interval (data not shown).

## DISCUSSION

Results from the present study show that atmospheric ammonia levels were significantly lower in pens treated with PLT. In addition, ascites death rates in broiler chicks raised on litter treated with PLT were lower than those in broiler chicks raised on untreated litter. The reason for this finding is not known, but pulmonary disease is a central factor in the pathogenesis of ascites or broiler pulmonary hypertension syndrome (2). Atmospheric ammonia is a pulmonary irritant, and it will increase pulmonary atrial wall thickness (1). Consequently, as atmospheric ammonia increases, atrial wall thickness increases, creating an increased oxygen diffusion barrier and thus limiting oxygen diffusion. Arterial hypoxemia results in pulmonary hypertension and ascites (2).

The foremost practical application of our findings is to perform follow-up studies using PLT in commerical settings where its ability to reduce atmospheric ammonia and ascites death rates may be ascertained. Preliminary results from a field study of chickens in 200 houses indicate that PLT will markedly reduce atmospheric ammonia levels in commercial poultry environments (5).

In this study PLT was found to have no effect on litter nitrogen or litter moisture levels.

In conclusion, the results of this study show that PLT will reduce atmospheric ammonia levels and thus reduce broiler deaths due to ascites. Under the conditions of the present study, PLT had no adverse effect on litter nitrogen or litter moisture levels.

## REFERENCES

1. Al-Mashhadani, E. H., and M. M. Beck. Effect of atmospheric ammonia on the surface ultrastructure of the lung and trachea of broiler chicks. Poult. Sci. 64:2056–2061. 1985.

2. Owen, R. L. A review of the etiology of ascites. Proceedings, Delmarva Nutrition Shortcourse 12 November 1992, Delmar, MD. pp. 1–25. 1992.

3. Riddell, C. Developmental, metabolic, and miscellaneous disorders. In: Diseases of poultry, 9th ed. B. W. Calnek, H. J. Barnes, C. W. Beard, W. M. Reid, and H. W. Yoder, Jr., eds. Iowa State University Press, Ames, IA. p. 839. 1991.

4. Sweeney, C., S. McDonnell, G. Russell, and M. Terzich. Effect of sodium bisulfate on ammonia concentration, fly population, and manure pH in a horse barn. Am. J. Vet. Res. 57:1795–1798. 1997.

5. Terzich, M. The effects of sodium bisulfate on poultry house ammonia, litter, pH, litter pathogens and insects, and bird performance. Proc. 46th Western Poultry Disease Conference, 1–4 March 1997, Sacramento, CA. pp. 71–74. 1997.

6. Zar, J. H. Biostatistical analysis, 2nd ed. Prentice Hall, Inc., Englewood Cliffs, NJ. p. 718. 1974.

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