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## ***BROILER TIP . . .***



### **INFLUENCE OF AMMONIA ON BROILER PERFORMANCE**

How many times have we all been in a broiler house when the chicks were being unloaded from the chick bus or a few days after chick arrival and detected the strong smell of ammonia? High levels of ammonia adversely affect bird health, live weight, feed conversion, carcass quality, carcass yield, and can cause blindness. Reducing ammonia concentration in the house could be the difference between a below average and a high performing flock on the grower's settlement sheet.

Ammonia is a colorless gas produced by microbial decomposition of nitrogenous compounds (protein, amino acids, and non-protein nitrogen) in the litter. Litter contains a diverse population of microorganisms that produce the enzyme urease, which converts the nitrogen into ammonia. Moisture, temperature, and pH of the litter also play an important role in the conversion of nitrogen into ammonia.

The most common problem with ammonia in broiler production is decreased health status of the birds. Reduction in growth rate may be secondary. The trachea contains hairlike projections called cilia, which prevent dust and pathogens from entering the respiratory tract of the bird. High ammonia impairs the cilia of the trachea and damages the tracheal lining. Once the lining of the trachea has been damaged, *E. coli* and other pathogens enter the respiratory tract causing a higher incidence of respiratory infections that could lead to condemnations.

It is recommended that ammonia concentration during brooding be maintained at approximately < 25 ppm and the amount of ammonia should not exceed 50 ppm from four weeks age until the end of the growout for optimum bird performance (Reece *et al.*, 1980). However, as someone is constantly exposed to ammonia their sense of smell at detecting ammonia decreases. For example, with time most growers are not able to detect ammonia by sense of smell until the ammonia concentration in the broiler house has reached 50-60 ppm or higher. By this time, chick performance can be severely affected.

What is the impact of ammonia production on broiler performance? The USDA Poultry Laboratory at Starkville, Mississippi, recently evaluated the effects of ammonia production on broiler performance (Miles *et al.*, 2002). A total of 480 Ross x Ross 508 chicks was randomly placed into five environmental chambers with two chambers at 0 ppm, whereas 25, 50, and 75 ppm ammonia was represented in one chamber. Anhydrous ammonia was metered into each chamber at either 0, 25, 50, or 75 ppm. At 28 days, all birds were

#### **PUTTING KNOWLEDGE TO WORK**

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moved from the chambers and placed into floor pens until the end of the growout. Each chamber contained fresh pine shavings, tube feeders, and nipple waterers. Ammonia content decreased live weight at the end of the seven week study (0 ppm = 6.74, 25 ppm = 6.55, 50 ppm = 6.24, and 75 ppm = 6.23 lb). The variation in body weight was more prevalent with increasing ammonia as measured by coefficient of variation (0 ppm = 12.1, 25 ppm = 13.2, 50 ppm = 14.2, and 75 ppm = 16.8%). The reduction in live weight carried over to a decrease in the amount of breast meat yield. As expected with the high ammonia concentrations, chicks exposed to 50 and 75 ppm of ammonia had more severe eye lesions than the chicks subjected to either 0 or 25 ppm of ammonia. Field observations have shown that chicks subjected to a high ammonia content often become blind due to eye lesions.

What is the economic impact of ammonia production to growers? In the Mississippi study, the difference in body weight from birds exposed to 25 ppm vs. 50 ppm ammonia was 0.31 lb/bird. Let's assume a six house farm with 25,000 birds/house with an average live weight of 4.0 lb. Increasing ammonia content from 25 to 50 ppm will result in a reduction of \$2,250 to the grower based on the results from this study. As long as we are producing broilers, ammonia production will be a concern. Therefore, we must seek methods to minimize ammonia. The goal of growers should be to maintain ammonia below 25 ppm especially during the first couple weeks of the growout.

How does a grower determine what level of ammonia is in the broiler house? Most of the instruments to measure ammonia directly can be cost prohibitive. A dragger tube to measure ammonia cost about \$300, whereas the accuracy of some of the inexpensive methods are questionable. An indirect method is to use a relative humidity meter. Relative humidity should be in the range of 50-70%, but as relative humidity increases above 70% ammonia can become a problem.

### **Management Tips to Minimize Ammonia Production**

1. When cleaning out between flocks, remove the caked litter. Caked material prevents the wet litter below the cake from drying.
2. Prior to bird placement, ventilate the house to remove high ammonia levels. If you wait to the chicks arrive to properly ventilate, excessive ventilation may be necessary to reduce the ammonia but in the process the chicks may become chilled.
3. Fix all water leaks and drips as soon as possible to minimize caked litter.
4. The best method to minimize ammonia during the growout is to properly VENTILATE.
5. Litter treatment amendments can be an effective management tool to reduce ammonia, but they are not a substitution for ventilation. Some growers have experienced variable results with litter amendments among flocks. The variation is partially attributable to not heating the house prior to applying the litter treatment. If the ammonia is not removed before applying the litter treatment, then the product will be tied up with the existing ammonia. Thus, a reduced amount of litter treatment will be available for the ammonia generated by the birds. Also, some litter treatments require a certain amount of moisture for activation.

### **References**

- Miles, D. M., S. L. Branton, B. D. Lott, and J. D. Simmons, 2002. Quantified deterrent of ammonia to broilers. Poultry Sci. Vol. 81 (Suppl. 1).
- Reece, F. N., B. D. Lott, and J. W. Deaton, 1980. Ammonia in the atmosphere during brooding affects performance of broiler chickens. Poultry Sci. 59:486.

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