

# *The Poultry Engineering, Economics & Management* **NEWSLETTER**

*Critical information for Improved Bird Performance Through Better House  
and Ventilation System Design, Operation and Management*

Auburn University, in cooperation with the U.S. Poultry & Egg Association

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## Feature article

# Ammonia: Can Cause Serious Losses Even When You Can't Smell It

Spend \$1.00 and get \$2.00 in return or maybe more. Keep reading. What are we talking about? Controlling ammonia in the poultry house. Ammonia is a colorless irritant gas, produced from animal waste by microbial activity, that causes significant dollar losses to poultry growers. Controlling ammonia in the poultry house is not free, but it is relatively inexpensive, and can put those lost dollars back in the grower's pocket.

Many growers, however, do not even know they are experiencing losses to high ammonia levels in the house. A common statement heard from growers is "I have a little ammonia in my house but it's not bad." The truth of the matter is that at levels of 50 ppm ammonia or lower, most growers are not able to smell harmful levels of ammonia in the house. Theoretically, the human nose can detect ammonia at around 20 ppm. The problem is that your nose loses sensitivity to ammonia after repeated or long exposure, so your birds can be suffering before you can detect the problem.

**Bird growth rate  
can be seriously  
hurt by ammonia  
levels growers  
can't detect.**

And, research data going back over 20 years has consistently demonstrated that ammonia levels of 50 ppm in a house will put a serious brake on bird growth. With the larger birds we are now growing, the loss can be on the order of a half pound per bird. New information demonstrates that levels of as low as 25 ppm can also hurt growth: 2002 research trials show a loss of 19 points in a 7-week growout (see chart on page 3).

**Ammonia can also  
produce many runt  
birds – meat that  
cannot be sold.**

Ammonia creates problems other than just reduction of growth rates. How many of you have ever had blind birds and/or had to leave a large number of runt chickens in the house at catch time? On one farm, the ammonia levels were 125 ppm the day of placement and when the birds were sold there were 500 birds left in the house because of runts. Just think how much feed these birds wasted and how many pounds of meat that the grower did not get to sell. This does not even take into account the reduced growth and productivity of the other birds that were processed.

This is not to say that ammonia is the only thing that causes a stunting of the birds, but it is one of the main causes, especially in the colder months when houses are closed up tight. Research has shown that high levels of ammonia will create about 5-10% runts in a flock. With say 10% runts in the house, just visualize what will happen to these birds trying to drink from waterers that are the normal height. The waterers are too high, and the feeders are too high, so these runts don't have a chance to overcome their stunting. They will have no opportunity to grow to a decent size, and cannot be sent for processing.

The reason for this is the problems that arise with processing flocks that have a large variability in size. Equipment in the plant is normally adjusted for a given size bird. With all the variation in size that can occur, one can imagine what a problem it would be to try and process these birds. And when you get through processing, we need a market for these different weights of birds and/or pieces. Most plants have a very definite size of birds to produce. When sizes vary greatly, it presents a problem for sales and marketing.

Another ammonia-related problem is increased disease. The effect of ammonia on bird health has been well documented. When was the last time you heard a bird cough? You didn't. A unique thing about poultry is their inability to cough. The reason is they have no diaphragm like mammals. However, they do have small hair-

like projections in the wind pipe called cilia to help expel foreign material such as dust and bacteria. It is known that ammonia levels of 25 ppm will cause the cilia to have partial paralysis, thereby not removing foreign material from the trachea. At 50 ppm, the ammonia will destroy some of the cilia. This can cause a cascade of events in the bird. For instance, when E. coli gets in the trachea and is not expelled, it continues to grow until there is a full-scale infection of the air sacs. What does this mean as far as the grower is concerned? There will be a loss in productivity (growth) and feed conversion. Research from the 1960s demonstrated that having ammonia at only 20 ppm for 72 hours would double the rate of infection from a Newcastle-bronchitis challenge, as compared to birds that were not subjected to ammonia.

**Another dangerous effect of ammonia is to make birds much more susceptible to disease.**

Now let's talk about how many dollars. Controlled experiments have shown that 50 ppm ammonia will cause about a half-pound catch-time weight loss in a typical 7-week broiler growout. With 20,000 birds in the house and being paid at a rate of \$0.045 per pound, this translates into \$450 loss per house. And dollar losses do not stop here. One poultry research scientist reports an 8-point increase in feed conversion at 50 ppm ammonia. If we consider 6.5-pound birds and \$135 per ton feed cost, an 8-point feed conversion increase over 20,000 birds would waste \$702 in feed.

It is difficult to sort out exact causes, because high ammonia levels come about in poor litter conditions which can also contribute to disease and parasite problems, and contribute to condemnations and downgrades. The same research scientist mentioned above estimates very conservatively that in a 20,000-bird flock the combination of poor litter conditions and high ammonia levels can result in \$160 in losses attributable to disease and parasites, and a \$150 loss in condemnations and downgrades.

**At 50 ppm, which a grower may not be able to smell, flocks may be a half pound lighter per bird at catch time.**

It is obvious, then, that keeping ammonia levels down has a large potential payoff. We must realize, however, that there are very few things in this life that are free. Keeping ammonia levels down in a poultry house is not free. To do an effective job of keeping ammonia levels down, you must use an ammonia-limiting litter treatment and you must pay to run fans for adequate minimum ventilation. These costs are variable, depending on litter and weather conditions. But field experience shows that the expenses involved in controlling ammonia levels

are far less than the losses that are sure to happen if ammonia levels get near or above 50 ppm for any considerable period of time.

### **Litter Management is Key to Avoiding Ammonia Problems**

Ammonia production in the poultry house requires: 1) manure, 2) heat, and 3) moisture. Probably the most important of these factors in litter management is moisture control. Good litter management starts with controlling litter moisture, even before it is put into the house. If litter isn't stored properly and is wet when you spread it in the house, ammonia problems are likely to be difficult to control.

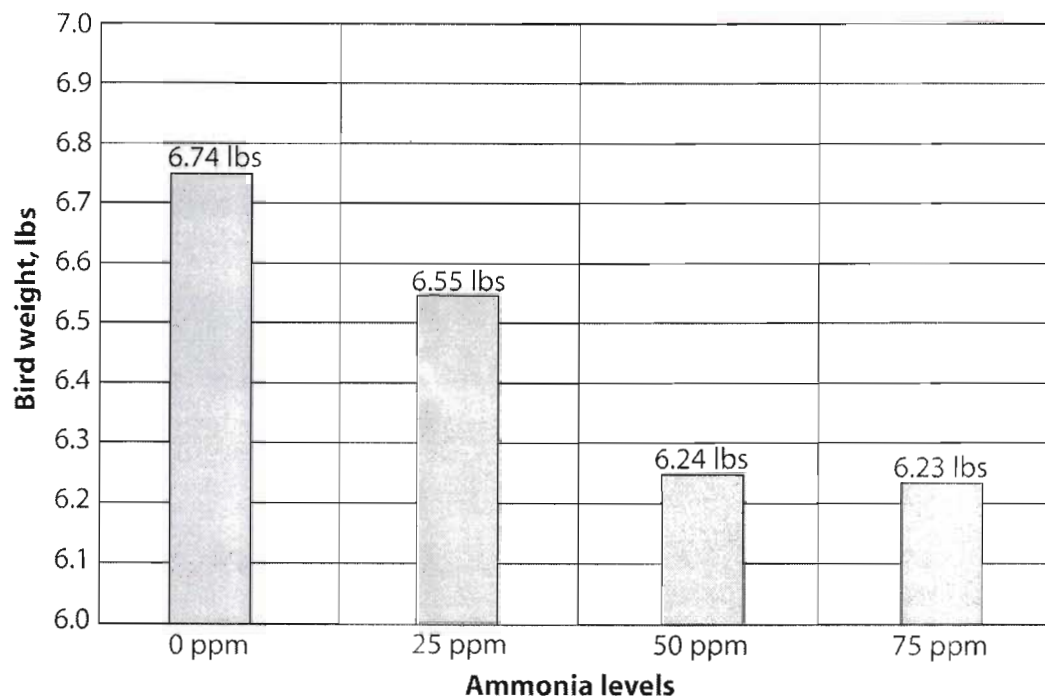
Ammonia-limiting litter amendments have proved very effective and are now widely recommended and adopted by growers. However, moisture control in the litter is also key to the effectiveness of the litter treatment. A common mistake growers make is reducing fan runtime, since (they think) having the treatment means we won't have any ammonia. MISTAKE. Minimum ventilation fan runtimes are carefully calculated to remove enough moisture from the house, assuming litter treatments are used. If we reduce fan runtime below what is recommended, moisture will increase in the house and the litter, which can cause the chemical action of the litter amendment to be used up in a very short time. We may have good ammonia control for the first few days, and none at all when we need it the most. Not running adequate minimum ventilation can lead to having more ammonia with the amendments than without.

**Controlling litter moisture is the most important step in avoiding ammonia problems.**

How much ventilation is needed? In the first week of a growout with fresh litter, most growers probably need to be running minimum ventilation at least 45 seconds out of every 5 minutes. If you have built-up litter, you probably need to ventilate a full minute out of every five to keep moisture and ammonia from going too high. For exact minimum ventilation timings that will be right for your situation, consult your integrator live production specialist.

If you are using built-up litter, it's important to address litter management issues immediately after a flock has been removed from the farm. De-caking the house between flocks will help purge the house of ammonia.

### Effects of Increased Ammonia Levels on Bird Body Weight at 7 Weeks, 2002



#### Key Points for Litter Management to Avoid Ammonia Problems

1. If you monitor ammonia in your poultry house, remember that air samples must be taken at bird level, not at human nose level. For baby chicks, this may be no more than one inch above the litter.
2. Remove cake with a housekeeping machine (rototilling is not recommended) between flocks. Cake removal gets water out of the house and takes pressure off the ventilation system.
3. If you are not putting down fresh litter, run heaters and ventilate ammonia out of the house between flocks.
4. Use a good ammonia-limiting litter amendment. Follow the manufacturer's recommendations exactly. Timing of litter treatment application is critical for good ammonia control.
5. Consider using fresh litter, especially in the brood end of the house, if ammonia problems persist.
6. Maintain adequate minimum ventilation, with high enough static pressure to get good air mixing to keep the house and litter dry. Using a litter amendment does not mean you don't have to ventilate.
7. Check and manage water systems to avoid leaks and spills that would wet litter.
8. Adjust water levels and drinker heights as birds grow, to avoid spills.
9. Check litter regularly for wetness – if a handful sticks together when you squeeze and then release it, it's too wet.
10. Consider using ceiling paddle or other mixing or stirring fans to help circulate house air and get moisture and ammonia out of the house. These fans can also save on heating costs when used properly.



nia prior to chick placement. After removing the cake, keep the sidewall curtains and end doors closed. Maintain litter temperature as long as possible to help release as much ammonia as possible. The more ammonia we can get rid of with no birds in the house, the less ammonia there will be when birds are in the house. We will want to run the fans just enough to keep the house from sweating. Do not wait until the day before chicks arrive to address the ammonia problem.

Another method that is helpful in controlling ammonia is using stirring or mixing fans in the house. These fans help move the drier, warmer air in the top of the house down to the litter level, to pick up moisture and

**Main keys to ammonia control: use a good litter amendment AND maintain proper minimum ventilation.**

allow the minimum ventilation fans to carry it out of the house. To be sure minimum ventilation is working right, check static pressure in the house while fans are running. Minimum ventilation is designed to bring air in through your sidewall or ceiling inlets at high velocity, so it can mix with the warm, dry air in the top of the house, and not drop directly to the floor and the birds. For good air "throw" into the house through the inlets, you need a static pressure close to

0.10, and not below around 0.07, with inlet openings of at least 1 to 1½ inches (see APEE newsletter #4, *What Is the Most Important Part of Your Ventilation System*, March 2000, at [www.poultryhouse.com](http://www.poultryhouse.com)).

### The Bottom Line

The conclusion has to be that for many growers litter management and ammonia control may be the difference between profit and loss from growout to growout. There is no way to predict the exact balance of expense versus cash benefits of ammonia control. But when you consider the cost of losing as much as a half a pound of meat per bird, or anything in the neighborhood of 8 points higher feed conversion, the balance seems clearly on the side of doing everything you can to keep ammonia levels down.

*Note: Some information in this article is drawn from Litter Quality and Broiler Performance, by Michael P. Lacy, Georgia Cooperative Extension Service, Leaflet 426.*

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U.S. Poultry & Egg  
ASSOCIATION

With this issue, the Alabama Poultry Engineering and Economics Newsletter has a new look and a new title. These changes are occasioned in part because our newsletter is now being produced in cooperation with the U.S. Poultry & Egg Association, as part of their commitment to poultry industry education. We are proud of this new association, and know it will help to improve our continuing efforts to bring you the critical information you need to know about poultry engineering, economics and management.

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