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Poultry Housing Tips

Reducing Ammonia Levels During Brooding

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Your chicks have just arrived and the level of ammonia in your house seems a little stronger than you would ideally like it to be. Your serviceman arrives and checks the ammonia concentration with a draw tube and finds that it is over 50 ppm. You are already operating a couple of 36" fans one minute out of five and are not crazy about the thought of increasing your fan run time considering the fact that it is supposed to be below freezing tonight and propane is over $1.50 per gallon. What do you do?

There is no easy answer to this scenario. The fact is that when you have a high level of ammonia with day-old chicks in a house with built-up litter it is often difficult to lower it to acceptable levels, less than 20 ppm, through ventilation alone. This is because the generation rate of ammonia in a house with built-up litter can be very high while ventilation rates are relatively low. For instance, it is not uncommon to find that when timer fans shut off, ammonia levels in a house with built-up litter can increase at the rate of 1 to 4 ppm per minute. When the timer fans do come on, the ammonia concentrations may decrease at a rate of 5 ppm or more per minute. Since we are getting rid of the ammonia faster than it is being generated, ammonia levels will decrease. But, keep in mind that ammonia is being constantly generated and as soon as the fans shut off the ammonia levels will begin to quickly rise again. Since the exhaust fans are typically only operating for a short period, you may never bring ammonia levels down to acceptable levels for extended periods.

It may be best to think of ventilating to control ammonia as sitting in a life boat with a hole in it. Let's say the water is coming in at a quart a minute and you can bail at a rate of one gallon per minute. Every five minutes you bail for 30 seconds. Though you can bail faster than it is coming in you still will not get rid of all the water because you are only bailing for a short period. Yes, you could bail constantly and get rid of all the water but if you did you would quickly wear yourself out and the boat will fill with water and sink. Since this is not a good idea, you tend to bail periodically and live with the fact that your boat will tend to stay half filled with water (ammonia).

The best way to minimize the chance of sinking is not through bailing but to rather plug the leak in the boat as much as possible to keep as little water as possible from coming in to begin with. This holds true when controlling ammonia levels in houses with built-up litter and day-old chicks as well. The best solution is not necessarily increasing ventilation rates when the chicks arrive, but rather reducing the level of ammonia production before they arrive.

Controlling ammonia levels in a house with young chicks should begin a couple of weeks before their arrival. As soon as possible after the previous flock leaves all the caked litter should be removed. The cake contains moisture which is one of the building blocks of ammonia and it is best to get rid of it as soon as possible. Breaking up the cake into small pieces should only be done during warm weather when you are going to have a fairly long downtime between flocks. Breaking up the cake into small pieces significantly increases the ammonia generation potential of the cake which can lead to much higher ammonia levels when the chicks arrive. Next, the house should be kept as warm as possible between the flocks. The ammonia generation process is driven by temperature. The warmer the house is kept, the more ammonia that will be generated between the flocks, which means the less ammonia you will have to deal with

when the chicks arrive. How warm is warm? Ideally, the hotter the better, but it is generally recognized that a house should be kept above 70°F to maximize ammonia production. Though ideally supplemental heat would be used to keep the house warm between flocks during the cold winter months, it is difficult at this time to know if the benefits would offset the additional costs. That being said, even without adding supplemental heat a house can be kept significantly warmer by simply keeping the house closed up between flocks.

Closing up a house doesn't necessarily mean that you shouldn't be ventilating a house between flocks. It is important to bring in some fresh air not only to help remove excess moisture from the house but to maximize the amount of ammonia removed from the litter between flocks. Though the exact mechanisms are not fully understood, it appears that when a house is closed up and not ventilated, that the amount of ammonia removed from the litter quickly decreases over time. It could be that as ammonia concentration rises in a closed up house it somehow affects the generation of ammonia from the old litter. Another possible explanation is that high ammonia levels reduces the rate at which ammonia diffuses from the litter into the air. A third and most likely explanation is that it is a combination of the first two. In any case, it appears that if your objective is to remove ammonia from the litter between flocks, that a little ventilation is required.

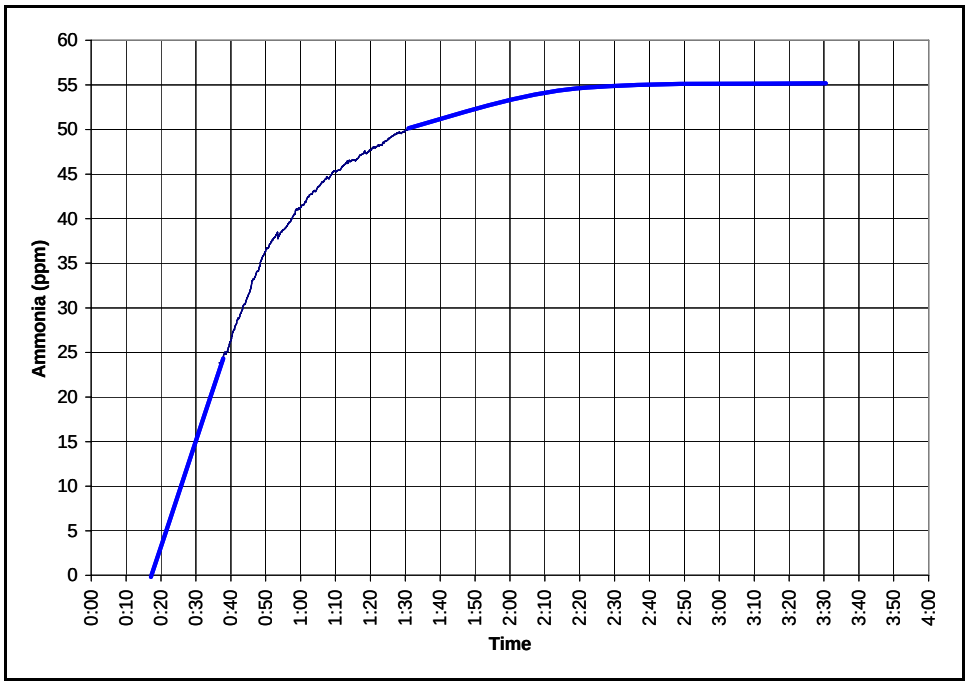

Figure 1. Increasing ammonia levels in a house with built-up litter.

Figure 1 illustrates the concentration of ammonia in a house with a couple inches of built-up litter with no chicks present. The house was heated to 90°F for 18 hours before the study began. Two 36" fans were running three minutes on and 30 minutes off during the preheat time. During the part of the study illustrated above the fans were left off for approximately 60 minutes. The thin black line is the actual measurements taken during the 60 minute test while the blue lines are projections of ammonia levels had the house been ventilated sufficiently to bring ammonia levels down to zero before the test began and had the study continued a couple of hours longer.

Even though the blue lines are projections, it is clear from the collected data that the concentration of ammonia in the house was starting to level off to somewhere around 55 ppm. This same leveling off trend had been seen in other ammonia studies conducted by Extension poultry scientists and engineers at The University of Georgia. The point is that if ammonia levels do not continue to increase over time then the rate at which ammonia is being removed from the litter is decreasing over time.

It is important to note that the point at which the ammonia concentrations will level off when a house is closed up between flocks is not the same for all houses. In some houses ammonia levels may tend to level off at 20 ppm while

others will be well over 100 ppm. The point at which the ammonia will level off is a function of litter quality, litter moisture levels, and temperature. The greater the ammonia generation potential of the litter the higher the concentration at which ammonia levels will tend to plateau. The lower the generation potential of the litter (i.e, drier built-up litter) the lower the point at which ammonia will level off.

Though there needs to be more research done in the area of between-flock litter management, it does appear that if your objective is to "burn-off" some of the ammonia in a house between flocks that not only should a house be kept warm, but also you should be providing some intermittent ventilation to keep the ammonia removal process moving along. It is probably best to think of controlling the environment between flocks like you do when there are birds in the house. Fans should operate off timers to remove the ammonia and moisture from the house. If it gets warm during the day, timer settings should be increased or a few fans should be run continuously. You may even want to operate your timer fans off an outside sensor so that as soon as it gets warm outside the fans will begin to run constantly.

Though keeping a house warm and ventilated between flocks should help to limit the amount of ammonia you have to deal with when the chicks are placed, it will typically not enable you to keep ammonia levels down as low as we would ideally like to see without relatively high minimum ventilation rates. This is where litter treatments come into play. To get ammonia levels down below 20 ppm on built-up litter typically requires the use of some type of litter treatment. The effectiveness of a litter treatment depends on a variety of things. First, it depends on how good of a job you did managing the environment between flocks. If you were able to keep the house warm between flocks and were able to "burn off" some of the ammonia, then the litter treatment will have less ammonia to deal with and as a result you will be able to maintain a lower level of ammonia for a longer period of time. Second, it depends on how good of a job you did following the litter treatments' manufacturers' application instructions. Last, but not least you need to avoid the temptation of ventilating too little after the chicks arrive. Just because ammonia concentration may be close to zero the first few days after the chicks arrive doesn't mean you don't need to be ventilating your houses. If proper ventilation rates are not maintained, moisture will build up in the litter, not only leading to caked litter and increased ammonia production but also a reduction in the useful life of the litter treatment. Again, the key to minimizing ammonia-related problems is prevention...an ounce of prevention is worth a pound of cure.

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