

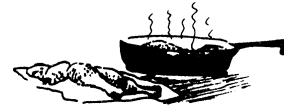


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BROILER TIP . . .

IMPORTANCE OF ADEQUATE VENTILATION ON AIR QUALITY DURING COLD WEATHER

Providing an optimum environment for the chick during brooding is important, as it will have an influence on the performance through market age. Air quality is an issue that many growers and companies have to address at this time of year. Maintaining appropriate ventilation in the house is a major expense for growers, but without it, losses due to poor bird health and performance due to poor air quality can be much more detrimental to net returns. The trend during the winter months is to reduce ventilation rates to reduce the amount of fuel needed for heating the house. The overall goal growers should try to achieve is to have the lowest heating bill while still providing an optimum house environment for the birds. Air quality of the broiler house can have significant impacts on bird performance.

Air quality normally refers to:

- Providing adequate oxygen (O_2)
- Minimizing carbon dioxide (CO_2)
- Minimizing carbon monoxide (CO)
- Minimizing ammonia (NH_3)

Normal concentrations of these gases in the air are:

- $O_2 = 20.9 \%$
- $CO_2 = 0.314 \%$
- $CO = 0.0 \%$
- $NH_3 = 0.0 \%$

The two main ways that O_2 is consumed in a broiler house are through bird respiration and the burning of propane for heating purposes. Currently there are no examples of an instance where O_2 has been reduced to a concentration in a commercial broiler house to affect bird or human health. It is difficult to separate out the effect that O_2 will have on the bird, because in most cases when O_2 decreases some other gas has increased. Oxygen would have to drop well below 18% before chick death occurs. In a study of high O_2 (23%) versus low O_2 (18%), the low treatment resulted in lower

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body weights at the end of 14 days with no residual effect in later weeks (Hurnik et al., 1973). Birds in a low O₂ environment spent more time resting than birds in the high O₂ environment and had no significant mortality. High altitudes and low O₂ concentrations have been associated with increased incidence of ascites, that can have negative effects on bird performance.

Carbon dioxide is a more important issue for bird health because of its possible detrimental effects. The same two events that require O₂ (bird respiration and combustion of propane for heating) are also major producers of CO₂. Concentrations as high as 10,000 ppm of CO₂ have been observed in broiler houses. These values were observed during the preheating period, when no birds were present and no ventilation was provided. Add 22,000 chicks into an environment containing high CO₂ and excessive, as well as, toxic concentrations could be reached. Studies have indicated that a CO₂ concentration of 12,000 ppm is associated with reduced body weights (Reece and Lott, 1980). Not only can these increased CO₂ levels affect bird performance, but also people who enter the broiler facilities and spend long periods of time there, as they could experience nausea and headaches. Running the minimum ventilation fans will improve these conditions making it a better environment for the birds and the people who care for them.


The detection of CO in broiler houses is rare. However, brooders and furnaces that are not serviced regularly can function improperly and produce CO as a result of an improper propane burn. If CO is allowed to accumulate in a broiler house it can be deadly to both birds and humans. Carbon monoxide has a 200 fold binding affinity for hemoglobin, a protein in the blood that carries O₂ to body tissues, as compared to O₂. As CO concentrations increase it will displace O₂ reducing the amount of O₂ reaching the tissues and creating a toxic condition. Concentrations of CO below 200 ppm can cause drowsiness, but the chicks will recover rapidly if the air quality is improved. The longer a bird is exposed to this level, the higher the risk of affecting performance and reducing the chance of recovery. At levels between 600 and 1,000 ppm toe picking, gasping and diarrhea could be observed. At levels above 1,500 ppm death could occur within one and half hours (Carlson and Clandinin, 1963). Carbon monoxide production can be prevented with proper brooder and furnace maintenance. The appearance of a yellow flame on the brooder or furnace can be an indication of improper burning and the brooder/furnace should be cleaned. It should be a common practice to clean the brooders/furnaces after each flock. Minimum ventilation will help alleviate situations where CO could become detrimental to bird health.

Ammonia is the most common gaseous irritant observed in broiler production. Ammonia is produced when temperature and moisture levels in the litter promote microbial growth. These microbes break down fecal uric acid into NH₃ molecules. Ammonia can then have a variety of effects on the bird, including trachea irritation, impaired growth rate, impaired feed conversion, blindness (keratoconjunctivitis), respiratory infection and possibly death. Just as with the gases discussed above, the effects of NH₃ depend on exposure time. Even a low concentration of 30 ppm could have negative effects if young birds were exposed to it for a long period of time. It is recommended that NH₃ concentrations be kept below 25 ppm. The proper use of minimum ventilation during cold weather can help this situation in two ways. First, it helps to remove moisture from the litter, which slows the growth of litter microbes and lowers the production of ammonia. Secondly, it removes the gaseous NH₃ from the building and brings in fresh air, improving air quality in the house.

There are multiple reasons to ventilate properly during cold weather. Though the first response will be to use less ventilation to save gas, one should think of how much money would be lost due to excessive mortality and reduced finishing weights. Adequate ventilation during cold weather will provide optimum environments for the birds and the people that take care of them resulting in maximum earning opportunities.

References

- Carlson, H. C. and D. R. Clandinin, 1963. Carbon monoxide poisoning in chicks. *Poultry Sci.* 42:206-214.
- Hurnick, J. F., J. D. Summers, and B. S. Reinhart, 1973. The effect of hypoxic and hyperoxic atmosphere on some economic traits and behavioral activities in broiler chickens. *Poultry Sci.* 52:728-736.
- Reece, F. N. and B. D. Lott, 1980. Effect of carbon dioxide on broiler chick performance. *Poultry Sci.* 59:2400-2402.


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