Litter Management for Improved Health and Welfare

by Blake Gibson

Litter management is an evolving process. Just when we think we’re getting it right, things change. Changes in production, such as different bird sizes, densities and the introduction of more ABF and organic programs, demand a constant review of a litter management program. Without it, producers can easily step back on their litter management effectiveness, which can impact paw quality and overall bird health and welfare.

In every production model, the physical and biological characteristics of litter are ever changing as well. This is important to note since physical characteristics of litter, combined with diet, continues to cause the majority of paw and air quality issues. The physical changes are due to a shift in:

- Housing improvements
- Litter types
- The longevity/quality of the litter

Through the careful management of ventilation, water and litter practices, production can be optimized.
Impact of Ventilation and Waterline Management on Paws

In general, recent industry expansion has improved poultry housing. House designs accommodate better directional airflow in an attempt to maximize air speed efficiencies through better ventilation models. Proper ventilation, along with improvements in monitoring and measuring relative humidity, helps maintain better floor conditions. This is notable because the two factors that need to be present for paw lesion development are substantial levels of ammonia deep in the litter and moisture at the litter surface. Houses with no or low ammonia at bird level can still have a substantial percentage of paw lesions if the litter is damp. This is most commonly seen in brand new houses or on new litter where the relative humidity is high even though the ammonia is not. Litter sticking occurs with ammonia in its liquid state.

The formation of liquid ammonia at the litter surface occurs anywhere there is even the least bit of damp litter. The severity and moistness of the cake present in the house seems to play the predominant role in lesion development. Common culprits are small wet spots under the drinkers (commonly referred to as donuts) and caked areas along the sidewalls. When newly hatched chicks step onto those damp areas, the litter sticks to their feet and ammonia in the litter begins to erode the skin. Visible paw lesions are evident by the time the bird is 7-10 days old and the lesions continue to worsen over time. Early paw scores can raise the red flag for pre-brooding and brooding problems.

Waterline Management BMPs

Waterline management is one of the most critical components of litter Best Management Practices (BMPs). Waterline management has been a topic of discussion since the development of commercial watering systems. With the evolution of the nipple drinker, management of the system has a tendency to be critical only at placement. The weekly turn of the crank to raise the line slightly is seen as mandatory but the importance of micromanaging water pressure, flow and micro-leveling throughout the flock gets minimized.

Without this micromanagement, litter quality diminishes when surplus water, un-level lines and worn out nipples create a wet environment under the water system. That extra moisture combines with ammonia gas to generate liquid ammonia which starts the damage to paw tissue. Wet litter is also a great breeding ground for the bacteria that infect the paw lesions causing even more damage to the bird.

Impact of Ambient Ammonia on Bird Health

While ambient ammonia levels do not seem to influence the development of paw lesions, it does have a significant impact on bird health—reducing food consumption, growth rate and carcass quality at 50-75 ppm, and impacting respiratory functions and eye health at just 25 ppm. Proper ammonia monitoring is crucial to maintain health and performance.

Traditionally, many producers make air quality decisions based on observations about ammonia at five to six feet above ground level and then only at placement. However, we in the poultry industry cannot rely on our senses. Proper ammonia monitoring devices must be used and at the appropriate time and place.

Work done by D. Miles on ammonia stratification (Fig. 1) demonstrated how recorded ammonia levels decreased as readings were taken farther away from the floor. Ammonia concentration at bird level shows the true impact on the flock.

The amount of nitrogen present in the litter is determined solely by the birds’ diet. Every 1% increase in crude protein over basal metabolic needs increases ammonia excretion in litter by 7-10%. This number can be multiplied as consecutive flocks are placed on the built up litter. Then, the amount of ammonia driven from the litter to the air is...
Recent research by Dr. Mike Czarick at the University of Georgia pointed out the impact of nighttime ventilation. Ammonia concentrations are generally proportional to ventilation rates. Air quality is traditionally evaluated during the day; if ammonia levels are acceptable the ventilation strategy remains unchanged. However, if ventilation at night is dictated by interval timers and not temperature, the ammonia concentrations will be twice as high at night than day. If the fans are only operating a third as much at night, ammonia concentrations can be three times as high (Fig. 2).

Ventilation BMPs are just as critical as waterline BMPs. Constant re-education is necessary to ensure producers understand proper air movement and quality in all phases of production. Ventilation will have the greatest impact on how much moisture is able to evaporate off the floor and be effectively removed from the environment. Dr. Mike Czarick at University of Georgia (Fig. 3) demonstrated that water consumption increases greatly throughout the flock. For every pound of feed consumed the bird will drink a quart of water. Only 20% of the water consumed will be retained for growth while the other 80% goes to the floor and the environment. On a flock of 24,000 birds, the total gallons consumed can be in upwards of 50,000+ gallons.

Open vent boxes and rotating fans give no indication of effective ventilation. To compound the problem, dirt on the blades, louvers and screens of the fans will create a deficit of air volume and moisture removal. A loss of more than 30% fan efficiency reduces air exchange and creates higher RH%. At that point, no matter how hard the producer tries to maintain a RH% of 50-70%, it will not be achieved making wet litter inevitable.
Impact of Litter Substrates on Paw Lesions

Growth in the poultry industry has created a challenge in the availability of litter materials and material diversification has ensued. Producers are currently utilizing a variety of substrates including pine shavings, sawdust, rice, oat and sunflower hulls, switch grass and chopped miscanthus grass among others. The impact of litter materials on bird health and performance is currently under review, and the results so far are consistent with what is already known about moisture.

Bedding has been found to influence the incidence of foot pad dermatitis and it was directly linked to litter moisture and caking. Bedding materials that result in drier litter will more than likely have fewer foot pad issues.

Litter Management BMPs

Using the proper amount of the right bedding material at the start is a critical component to the success or demise of a built up litter program. At any time throughout the growout cycle, litter conditions will tell a producer whether they are meeting their waterline and/or ventilation BMPs based on the surface conditions of the litter. If cake is forming on the sidewalls or at the fans, ventilation requirements are most likely not being met. If the cake or wetness forms under the drinker lines, the drinker system is being compromised. The result will be paw and health problems as liquid ammonia creates more volatized ammonia as the flock matures which will exacerbate problems with paw lesions, respiratory distress and potential blindness.

It is vital for the industry to place top priority on litter and litter management—a practice that extends far beyond ensuring proper surface temperature at placement. The litter drives everything in the facility: ventilation, temperature control, waterline and feed line management. It is a living, breathing entity within itself and how it is managed will determine its ecology which ultimately determines the performance of each flock. The importance of paw quality and ammonia volatility goes beyond a paw grader at the processing plant. If the feet of the bird are sore and have open wounds, birds are less likely to eat and drink out of necessity. It is critical to not be one dimensional when it comes to air quality, paw quality and litter management.