Managing Broiler Litter For Bird Health And Performance

Litter management programs that promote bird health and performance require constant and diligent management on the part of the grower.

by J.B. Hess, K.S. Macklin, J.P. Blake and T. Lavergne

Brown BearR24C attachment on John Deere skidsteer Hagemore Farms, Vinemont, AL.

Bacteria are everywhere in the animal production environment and will remain so, regardless of the techniques adopted by either the individual grower or the integrator. Health maintenance programs must be developed in such a way that normal bacteria are maintained in the animal as well as its environment, while simultaneously eliminating potential pathogens. Such programs are often neither difficult, nor extremely expensive, but do require constant and diligent management on the part of the grower.

Pathogens of all forms (bacteria, fungi, virus, etc.) are most easily and inexpensively reduced by mechanically removing them through the application of practices such as washing housing, equipment, hands, boots and clothing with soap and water. These practices should, where appropriate, be followed by the ap-

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plication of some type of sanitizing agent or disinfectant, used according to the manufacturer's directions and regularly rotated to prevent resistance development. Products have recently become available that act as both surfactants and sanitizing agents, eliminating the need to perform two separate operations.

Organic matter should always be removed from target surfaces prior to the application of any disinfectant, since its presence can neutralize or limit the cidal effect of even the most efficacious compounds. Frequently, the most flagrant violation of this rule occurs with footbaths or buckets containing disinfectant used for cleaning of boots. Improperly maintained, these can serve not only to lull the farmer into a belief of proper biosecurity, but also can, in worst-case scenarios, serve as reservoirs of contamination from one environment to the next. Recent development of a dry, granular bleach product may improve the effectiveness of footbaths of this type.

Normal bacterial levels in litter can be achieved and maintained with good litter management techniques, which serve to manage litter moisture, ammonia levels and pH. During house clean-out, care should be taken to remove all organic matter before washing and disinfecting. It is critical that once litter is removed from the premises that it be handled and disposed of properly. Litter should never be stacked or disposed of near animal housing, even that originating from healthy birds, since this can serve as an attractant for vermin. Litter from birds that have experienced disease problems should be handled particularly carefully and should be disposed of off the property, so as to insure that it does not serve as a source of reinfection. Litter stacked near houses, even temporarily, can allow sufficient opportunity for litter beetles to migrate back into the housing and serve as source of re-infestation. This situation is particularly dangerous if the farm has experienced diseases such as botulism (caused by *Clostridium botulinum*, which may spread to multiple houses through vermin migration.

Water Line Management

Proper water line management should be continuously maintained through the use of chlorination, water acidifiers or other sanitizing chemicals. These programs must be designed to control the bacterial load, while simultaneously preventing the formation of biofilms, which serve to protect bacteria from the action of sanitizing agents.

Medicators should always be maintained according to the manufacturers directions and regularly checked for both function and delivery accuracy. Inexpensive kits are available to insure sufficient chlorination levels (1-3 ppm) and should be used on a regular schedule. Chlorination levels should be checked at several locations to insure comparable levels throughout the system.

Like disinfectants used on surfaces, water-sanitizing agents should be rotated to prevent the formation of re-

sistant populations. Growers in areas of hard water should be particularly careful when using any medications, which can, in some cases, be neutralized by the presence of minerals. Meticulous records should be kept for any products delivered through the water system and all withdrawal periods should be scrupulously adhered to, in order to prevent the presence of chemical residues.

Litter Composting Between Flocks

The benefits of composting as a method of dead bird disposal have been known and practiced for several decades. Monitoring of compost of this type tells us that bacterial and viral pathogens are eliminated or greatly reduced. Others have composted litter to reduce pathogens and produce consumer-friendly fertilizer products. During the last few years, broiler producers have refined methods of in-house litter composting with the intent of using this technique to reduce the house bacterial and viral load between grow-outs.

In most cases, growers have used a box blade to create two windrows in each house to most effectively allow the litter to go through a heat. Creating windrows will require several hours of work per house. Respreading litter after composting will take a similar amount of time. Cake may be left in to provide enough moisture for the bacteria to proliferate if litter moisture is low. Practical trials run by Theresia Lavergne at LSU suggest that 30 percent moisture is necessary for best results. Temperatures of 130 F are created to reduce bacterial numbers and kill the more fragile viral pathogens like LT. The LSU group suggests a 10-day composting cycle for best results.

Auburn research shows that maximum temperatures (130-140 F) are reached within about 36 hours of windrowing, and temperatures are dropping after about 48 hours. This is long enough to kill most pathogenic bacteria and viruses. Based on this, a three- to five-day in-house composting program between flocks would be a useful way to reduce viral and bacterial pathogens and improve bird performance. High temperatures were maintained even longer in compost windrows that were covered. Covering allows all litter (including that on the outside) to compost and holds in any ammonia that is produced. Ammonia kills microorganisms under these conditions.

Although this technique would be useful in times of disease challenge to reduce the risk of disease in the next batch of birds, windrow composting also makes sense from an economic standpoint. Reduced levels of the more fragile organisms such as LT and campylobacter would help to insure optimum bird performance and reduce human food safety concerns. Reduced loads of other harmful bacteria and viruses would allow birds to use feed for growth and performance rather than for fighting off mild (and often unseen) disease challenges. Also, litter ammonia levels would be reduced to start the next batch of birds. Although improvements in performance from in-house litter composting may not mimic total cleanout and sanitation, health and performance improvements should be substantial and pay handsome dividends for the efforts that the grower must invest.

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Litter Treatments

In selecting a litter treatment product, one must identify the goals for application. Litter treatments may be cost-effective and justifiable under one or more of the following situations:

- high fuel prices
- extreme cold weather
- short layout periods
- persistent disease challenges
- severe vaccination reactions
- reduction of ammonia-related stress
- prolonged litter reuse
- increased bird density

In general, the control of house ammonia level is the primary purpose for using a litter treatment. In recent years, the reasons for using a litter treatment and any potential benefits from its use have expanded to include improvements in performance and environmental concerns. Some litter treatments may be used to enhance the composition of the litter as a fertilizer or as part of a best management practice to reduce food-borne pathogens.

Ammonia-reducing litter treatments offer a potentially better in-house environment for the birds. They may also play a role in reducing ammonia and odor emissions from poultry facilities.

Although different litter treatments vary in their ability to control ammonia, each offers a unique set of characteristics that need to be considered in selecting the appropriate product to meet an individual's needs. The litter treatment that offers the best return on investment will depend on the user's ability to select the product that best meets application goals.

Treating Broiler House Floors

In the field, subclinical occurrences of disease have been a common problem where the source of infection is not easily identified, but an apparent decrease in flock performance occurs. The associated decrease is often attributed to underweight, poor feed conversion, higher condemnations, or above average mortality. Some of these problems have been attributed to poor litter management, but also may be due to the conditions of the soil in the poultry house. Birds excrete nitrogenous wastes in the form of uric acid and ammonia (NH_3) is produced as a result of the microbial decomposition of these nitrogenous compounds. Once formed, free ammonia can be absorbed into the soil and long-term accumulation will result in an increased soil pH. In addition, ammonia concentration tends to increase with increasing pH. Liming the pad also produces long-term detrimental effects since it results in an increased soil pH.

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Microorganisms such as bacteria, yeasts, and molds can impact bird performance and disease status. They also have an optimum pH range in which they can survive when given a proper temperature and moisture level. Optimum pH ranges for bacteria (5.5 to 8.5), yeast (2.5-8.0) and molds (1.5 to 8.5) tend to be more alkaline ($pH > 7.0$) than acid ($pH < 7.0$). Optimum pH for viruses has not been determined, but theoretically should be more sensitive to lower pH.

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In poultry houses that have been in production for a prolonged period of time, pH of the soil tends to become alkaline over time and soil pH may range 7.1 to 8.5. This pH range provides an environment for disease-causing microorganisms. Keep in mind that normal soil pH ranges from 5.5 to 6.5 and provides an acidic environment in which these same disease-causing microorganisms do not survive. This is probably why better performance is attributed to new construction and the virgin soil that the birds are reared on.

Sulfuric acid, when applied directly to the soil base in a poultry house, has proven to be effective in lowering pH of the broiler house floor to 5.5. The acid treatment is applied only to bare soil after clean out and before new bedding material is added. Typically, prior to application, strong ammonia odors were very noticeable, but immediately upon application ammonia odors disappear. The use of sulfuric acid can effectively achieve a lower pH of the soil of the broiler house floor, but precautions must be observed for its use. Sulfuric acid is considered a hazardous material and handling and transport of the material must meet strict guidelines. Transfer and mixing requires special precautions, since any accidental spillage may cause severe injury.

Another alternative is to employ a heavy dosing of the soil with one of the commonly available litter treatments at a higher than recommended rate. These rates may vary and could be double or quadruple the normal rate. In field studies, pH reduction of the soil often showed an improvement in performance of subsequent flocks. Overall response to this route of treatment may also be related to the conditions that existed prior to treatment. Keep in mind that soil treatment may not be 100 percent successful and may only account for a portion of the chronic problems that exist for an individual's situation. *PT*

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