

Fall 2004

## Avian Advice, Fall 2004

Dale Bumpers College of Agricultural, Food, and Life Sciences (University of Arkansas, Fayetteville). Center of Excellence for Poultry Science

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AVIAN

## Advice

U of A

UNIVERSITY OF ARKANSAS  
DIVISION OF AGRICULTURE  
Cooperative Extension Service**Shelterbelts: Has Their Time  
Come for Arkansas Poultry  
Producers?***INSIDE*

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The increasing urban expansion into rural areas creates numerous challenges for livestock producers to various types of farming operations. A strong livestock industry is essential to the nation's economic stability, the viability of many small rural communities, and the sustainability of a healthful, plentiful and high quality food supply for the American public. Farmers and ranchers view odors and dust associated with livestock as part of production agriculture and have come to accept them as part of their way of life. However, as urban dwellers are less likely to accept dust or odors, differences in lifestyles between farmers and city folks are becoming increasingly apparent. Although there will probably always be some odor and dust issues associated with animal production units, there are some simple, economical methods of reducing the frequency of complaints.

For poultry producers, shelterbelts offer an opportunity for poultry growers to be proactive in demonstrating good neighbor relations and environmental stewardship. Shelterbelts are typically vegetation (most often trees and shrubs) planted in purposeful rows to alter wind flow in order to achieve certain objectives. Planting trees and shrubs as screens around poultry houses will help remove them from public view (perhaps also the public's mind) and buffer odor, dust and noise.

**Livestock Production**

In the United States about 130 times more animal waste is produced annually than human waste. Livestock in the U.S. produce more than 1.4 billion tons of manure annually (U.S. Senate Committee, 1997). Livestock production in the U.S. is characterized by fewer yet much larger production facilities. USDA data indicate that nationwide about 85% of estimated 450,000 agricultural operations with confined animals have fewer than 250 animal units (GAO, 1995).

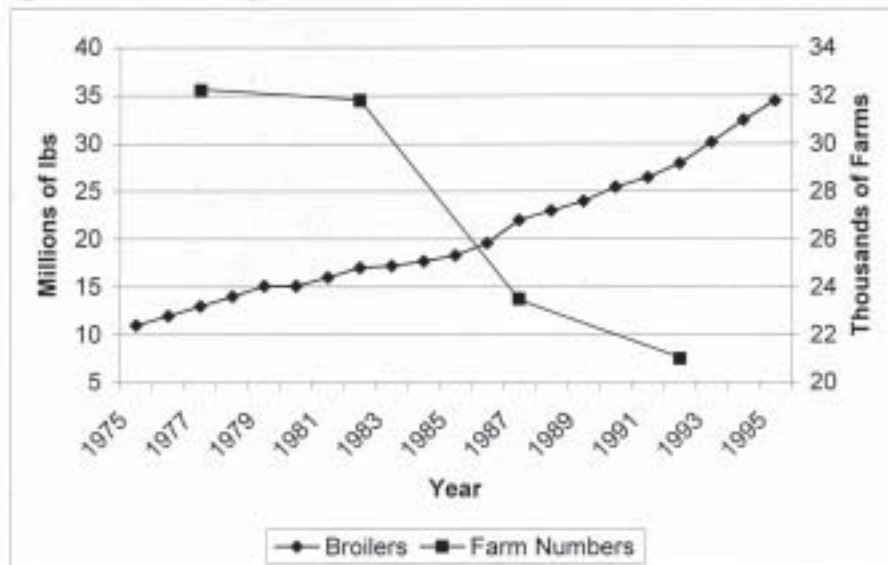
Therefore, only about 15% of farms house the vast majority of the animal units nationwide. USDA estimates that only about 6,600 animal feeding operations nationwide have more than 1,000 animal units (GAO, 1995). From 1978-1992, the average number of animal units per facility increased by 56, 93, 134, 176, 148 and 129% for cattle, hogs, layers, broiler and turkeys, respectively, while during the same period the number of facilities dropped by over 40% in the cattle industry, and over 50% in the dairy, hogs and poultry industries (USDA and EPA, 1999). Figure 1 demonstrates the increase in broiler production and decrease in broiler farm numbers from 1975 to 1995. Increased size of production facilities and greater numbers of livestock at each facility has meant larger amounts of animal waste, concentrated into relatively smaller geographic areas. This concentration of animals has increased the

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*... helping ensure the efficient production of top quality poultry products in Arkansas and beyond.*

intensity, duration, and timing of odor events. The control of livestock odors has become of paramount concern for the public and livestock producers.

Figure 1. U. S. broiler production (lbs) and number of farms, 1975-1995<sup>1</sup>.



<sup>1</sup>Source: United States Senate Committee on Agriculture, Nutrition, & Forestry, 1997.

### Understanding Odor Events

A recent survey of Iowa farmers found that 46% of rural residents were within a half mile or less of a livestock facility. In the same survey 71% of residents were within one mile of a livestock facility (Lasley and Larson, 1998). This finding is consistent with the average separation distances nationwide (Tyndall and Colletti, 2000). Odor compounds may be transmitted as gases, aerosols (a suspension of relatively small solid or liquid particles in gas) or dust (relatively large particles in gas or air). Efforts to control odors from animal production units fall into three basic strategies (Tyndall and Colletti, 2000):

1. Prevent odors from forming
2. Capture or destroy odorous compounds and
3. Collection, dispersion or dilution of odor compound.

In most cases the third strategy is the easiest and most economical procedure to implement in animal production units. In operations without protection wind or breezes often transmit odors gases, aerosols and dust to neighbors. Shelterbelts hinder this transmission, by trapping odors, redirecting air or creating turbulence so that odor compounds are diluted.

### Odor Control using Shelterbelts

The source of animal odors is near the ground and tends to travel along the ground (Takle, 1983), shelterbelts can intercept and disrupt the transmission of these odors (Heisler and DeWalle, 1988; Thernelius, 1997). Shelterbelts also reduce the release of dust and aerosols by reducing wind speed near production facilities. Wind tunnel modeling of a three-row shelterbelt quantified reductions of 35% to 56% in the downwind transport of dust. However, shelterbelt density determines the degree to which dust and aerosols are reduced.

Density is a simple ratio of the porous area (the areas wind can pass through) to the total area of the shelterbelt. A density of approximately 40-60% is the most beneficial (Brandle and Finch, 1991). The trees or shrubs chosen for the shelterbelt and the spacing of those plants will determine the overall density. Remember that deciduous species tend to be more open closer to the ground and conifers have branch cover close to the ground (Griffith, 2001).

Shelterbelts physically also intercept dust and other aerosols. A forest cleans the air of micro-particles twenty-fold better than barren land. Leaves with complex shapes and large circumference to area ratios collect particles most efficiently. Shelterbelts attract and bind the chemical constituents of odor. Volatile Organic Compounds (VOCs) have an affinity to the cuticle of plant leaves. Microorganisms on plant surfaces can metabolize and breakdown VOCs.

Finally, shelterbelts provide a visual and aesthetic screen. A well-landscaped livestock operation is much more acceptable to the public than one that is not. Shelterbelts should be designed for the specific location, according to the expected and experienced odors, so that the tree and shrub species chosen can provide year round interception of odors and aerosols (Griffith, 2001).

### Why Shelterbelts Now

Although shelterbelts have been used for many years in the Midwest to modify wind flow; control wind erosion, increase crop yields, protect farm buildings, and protect livestock, few in poultry producing areas considered their use. However, urban encroachment is forcing changes in how poultry growers manage their operations and tunnel ventilated houses have made the use of shelterbelts feasible. Few

recommended planting trees around poultry facilities for fear of blocking air flow through conventionally-ventilated houses, but today, with the poultry industry shifting to tunnel-ventilated, solid sidewall poultry houses, restricting natural air flow is much less of a problem.

Trees have a pleasing image across a large cross section of the American population. Planting trees around poultry houses may help foster a positive image of your farming operation. In addition, as the trees mature, less of your agricultural operation will attract attention, your farm takes on a more attractively landscaped appearance, and property values increase for both you and your neighbors (Malone and Abbott-Donnelly, 2001).

### Plants used in Shelterbelts

Dense evergreen trees are perhaps the best choice for the tunnel fan end for maximum filtering during summer and screening year round. For greatest emissions scrubbing, shelterbelts should be as close to the tunnel exhaust as possible. As a general rule, to not interfere with fan efficiency, no trees should be planted closer than a distance of five times the diameter of the fans (Malone and Abbott-Donnelly, 2001). Check with your integrator before constructing a shelterbelt. Take into account the width of the shelterbelt at maturity and how this may affect roads, loadout areas, or chick delivery areas.

There are a variety of trees and shrubs suitable for Arkansas conditions that would work well to screen poultry houses. White pine, properly spaced, creates a dense shelterbelt, grows rapidly and is reasonably priced. Virginia pine and loblolly pine also do well. Various cedars also form a dense mat; however, some consider certain varieties a nuisance and the berries may attract wild birds. A variety of hollies and other ornamental shrubs such as Red Tip Photinia form highly effective screens and have a beautifying effect on the surrounding landscape. The plants you choose will depend on the site, soil conditions, available space, number of plants required, growth rate of plants, personal preference for landscaping effects and cost of the plants. For more information on trees and plants that do well in your area, contact your local county Extension office, local Conservation District, Arkansas Forestry Commission or a professional landscape nursery/garden center.

Air quality issues surrounding poultry production facilities are no longer a matter of "if", but "when." Arkansas poultry producers should take proactive steps to plan for management changes these issues will bring. The planting of trees in strategic locations around poultry houses is one method to help address these issues before and as they arise. In addition, research has shown that shelterbelts can reduce heating costs 10-40% and reduce cooling costs as much as 20%. Strategically placed trees can also reduce wind speeds by 50%, adding protection from spring and fall storms. The leaves of trees physically trap dust particles that may be laden with nitrogen, and root systems will absorb up to 80% of the nutrients that might escape the proximity of the poultry operation (Stephens, 2003). Cost-share assistance for planting

a shelterbelt is available in some states; unfortunately, Arkansas is not one of these states at the present time.

### Barriers to Shelterbelt Adoption

Although shelterbelts around the perimeter of poultry houses offer many advantages, there are some barriers to adoption and some negative aspects to consider. For example, Malone and Abbott-Donnelly (2001) indicate:

- A limited amount of land will be taken out of production to support the shelterbelt
- There will be cost associated with purchasing the trees, labor for planting and maintenance
- You will encounter a restricted view of your houses access will be limited to designated roadways trees will create a potential habitat for wild birds.

### Summary

Air quality issues will become an increasing concern to production agriculture with continued urban encroachment into previously rural, agricultural areas. Shelterbelts offer one method by which poultry producers can take proactive steps to address the issue; demonstrating good public relations efforts and environmental stewardship by buffering odor, dust and noise emissions from their facilities while improving farm aesthetics and property values. Dense shelterbelts may detract attention from farming operations and help reduce air emission concerns surrounding poultry facilities by capturing dust particles and ameliorating odors. Consult your integrator concerning placement before constructing a shelterbelt. Select trees or shrubs suitable for your area. Your local Extension office, NRCS office, Arkansas Forestry Commission or local landscape nursery can be of valuable assistance on species information. If planted during warmer weather, be sure to provide plenty of water to assure successful establishment. A well-landscaped livestock operation is more pleasing to the public than one that is not. A shelterbelt used as a pollution control device is visible proof that producers are making an effort to control what leaves their operation. This could prove valuable in the court of public opinion and perhaps reduce tension levels between farming and non-farming segments of the population.

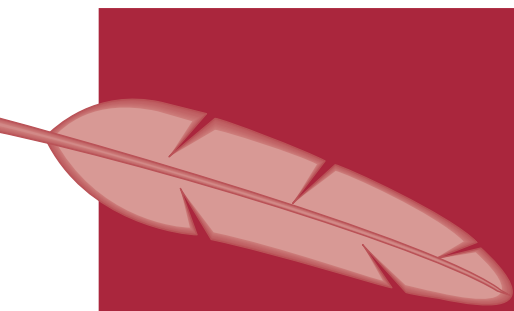
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# Effects of Water Acidification on Broiler Performance

## Introduction

*Which water pH level is optimum for broiler performance?*

Acidifiers such as sodium bisulfate, citric acid or vinegar are often used by poultry producers to lower the pH of the drinking water they give their birds. Many claim that adding these products results in an increase in water consumption, less feed passage or firmer droppings from the birds. While the manufacturers of these products provide mixing instructions, there is no guarantee of the final water pH mainly because of the broad diversity of water pH found in nature. A report from North Carolina State University several years ago claimed that a water pH of less than 5.9 was harmful to bird performance (Carter, 1987). However this report was based on field observations where unknown factors other than naturally low water pH could have contributed to the poor performance. Low pH water is aggressive and can actually dissolve metal pipes releasing lead, copper and other minerals into the water. While the use of PVC pipes minimizes the concern of mineral leaching, the question still remains. Which water pH level is optimum for broiler performance? Therefore, two trials were conducted to study the impact of different water pHs on broiler weight gains, feed conversion, water consumption and livability. In addition, this experiment addressed adjusting the water pH on a continuous or intermittent basis to determine if this could also have an impact on performance.



## Trial One

Trial one was conducted during the summer months when the outside daily temperatures exceeded 90° F, particularly late in the grow-out cycle. The effects of heat stress were reduced through the utilization of tunnel ventilation and spray on fogger pads.

Twelve hundred male broiler chicks were randomly placed into 24 floor pens to give 50 birds per pen at a density of .85 square feed per bird. There were three pens per treatment. Each pen was equipped with two hanging tube feeders and one Val nipple drinker line complete with regulator and six nipple drinkers. Flow was adjusted weekly to provide the milliliters/week of age recommended by Lott et al. (2003). The formula for determining rates added 7 ml/week of age plus 20 ml, so that, for example, a 21 day old broiler received 3 x 7=21 ml plus 20 for a total of 41 ml. Each pen had its own water supply via a 5- gallon poly-bucket reservoir. Table 1 denotes the treatments. PWT®, which is sodium bisulfate, was used to adjust the pH. Fayetteville, Arkansas municipal drinking water was used as the control and the average initial pH was 8.3. All water and feed added to the pens was weighed. Birds received diets formulated to meet their nutrient requirements. In Trial one, Coban® was used for coccidiosis control. Also the growth promoter BMD was used in all the feeds.

**Table 1. Water Treatments**

Treatment Label	Water pH	pH Frequency
Control	(8.3)	Continuous
6C	6	Continuous
5C	5	Continuous
4C	4	Continuous
3C	3	Continuous
5I	5	Intermittent <sup>1</sup>
4I	4	Intermittent
3I	3	Intermittent

<sup>1</sup> Intermittent pH program- First 7 days, 48 hours before and after feed changes, 72 hours prior to end of trial

## Trial Two

Trial two was conducted during January and February when outside daily temperatures ranged from 10 to 45° F. In this trial, two thousand male broiler chicks were randomly placed in 40 floor pens to give five pens per treatment. Four replicate pens per treatment were equipped with nipple drinker lines and the water added to these pens was measured for the determination of water usage. A fifth replicate pen per treatment was equipped with a Plasson drinker. Water consumption was not measured in the pens with the Plasson drinkers. As in trial one each pen had its own water supply via a 5-gallon poly bucket reservoir and two hanging tube feeders. Treatments were identical to trial one with PWT® used to adjust the pH. All feed added to the pens was weighed for determining feed conversion. Birds received the same diets as in trial one. In this trial, the coccidiostat Sacox® was used. No growth promoting antibiotic products were used.

At day forty-two, 10 birds per treatment were killed with carbon dioxide gas and the pH of the crop and gizzard contents was determined.

## Both Trials

In both trials the birds were group weighed by pen at day 1 and on days 7, 21, 35 and 42. On day 42 birds were individually weighed. Feed and water consumption were determined for each of these time periods. Water usage was measured at each feed change.

## Results

The results for the two trials were combined because there were no differences in the way birds responded to the treatments for the two trials. The average weights of the broilers for the different ages evaluated are shown in Table 2. The statistical analysis indicates that while there may be slight numerical differences in the average weights of the broilers receiving the different treatments, there was no advantage or disadvantage for the broilers receiving different pH drinking water as compared to birds receiving the control water. The closer the P value is to one, the more statistically similar the results. Table 3 shows the average feed conversions (adjusted to account for the weight of the dead birds). Cumulative feed conversions for days 7, 21 and 35 were not statistically different. The feed conversions at day 42 show birds on the continuous 4 and 5 pH water and the intermittent 3 and 4 pH water had the numerically best feed conversions. However, the conversions were statistically similar to the conversions for broilers receiving the control water. Water usage as shown by milliliters of water used per gram of gain showed that the birds used similar amounts of water regardless of drinking water pH (Table 4). When the crops and gizzards of birds receiving the different pH water were tested for pH, it was found that the birds receiving the pH 3, 4 and 5 water had a significantly lower crop pH than birds receiving the 6 and control pH water (Table 5). No difference was found in the gizzard pH and this would be expected since the bird adds hydrochloric acid to the digestion process.

**Table 2. Impact of Drinking Water pH on Male Broiler Average Weights**

Treatment	Day 7 (lbs)	Day 21 (lbs)	Day 35 (lbs)	Day 42 (lbs)
Control	.359	1.958	4.79	5.85
6 Continuous	.355	1.954	4.79	5.77
5C	.355	1.956	4.77	5.92
4C	.361	1.986	4.75	5.90
3C	.350	1.986	4.80	5.95
5 Intermittent	.346	1.938	4.83	5.90
4I	.350	1.965	4.83	5.89
3I	.355	1.990	4.87	5.97
SEM	.008	.04	.08	.09
P Value	.9678	.9455	.8951	.6428

**Table 3. Impact of Drinking Water pH on Male Broiler Adjusted<sup>1</sup> Feed Conversions-**

Treatment	Day 7 (lb:lb)	Day 21 (lb:lb)	Day 35 (lb:lb)	Day 42 (lb:lb)
Control	.884	1.257	1.473	1.667abc
6 Continuous	.903	1.245	1.482	1.682ab
5C	.930	1.235	1.481	1.643bc
4C	.889	1.242	1.468	1.651abc
3C	.895	1.228	1.498	1.684a
5 Intermittent	.953	1.237	1.470	1.649bc
4I	.916	1.233	1.466	1.633c
3I	.895	1.225	1.469	1.642c
SEM	.029	.001	.013	.013
P Value	.6874	.4794	.7044	.0504

<sup>1</sup> Weight of all dead birds is used to determine the feed conversion

**Table 4. Impact of Drinking Water pH on Male Broiler Average Water Usage-per Gram of Gain**

Treatment	Day 7 (ml:g)	Day 21 (ml:g)	Day 35 (ml:g)	Day 42 (ml:g)
Control	1.054	2.187	4.111	5.261
6 Continuous	1.099	2.217	4.022	5.234
5C	0.977	2.249	4.073	5.327
4C	1.103	2.252	4.102	5.307
3C	1.163	2.313	4.114	5.315
5 Intermittent	1.328	2.317	4.151	5.307
4I	1.078	2.211	3.942	5.029
3I	1.118	2.265	4.087	5.185
SEM	.150	.06	.08	.09
P Value	.8117	.6563	.6490	.2760

<sup>1</sup> The weight of all dead birds was used to calculate milliliters of average water usage per gram of gain

**Table 5. Impact of Drinking Water pH on Crop and Gizzard pH**

Drinking water pH	Crop pH	Gizzard pH
3	4.33c	3.62
4	4.34c	3.72
5	4.62bc	3.70
6	4.96b	3.95
8	5.57a	4.16
SEM	.13	.152
P value	.0001	.1159

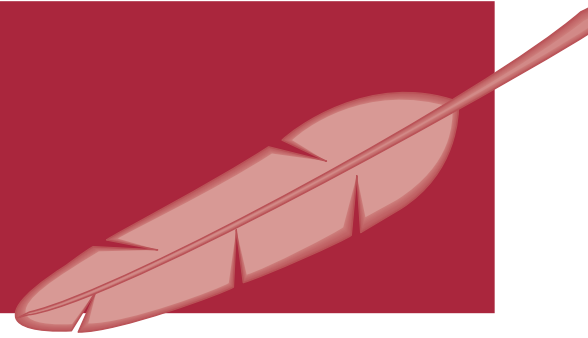
## Comments and Conclusions

This research project found no significant improvement in average weights, feed conversion or water consumption when the drinking water pH was lowered to 3, 4 or 5. The results indicate that birds are very tolerant of a wide range of pH water. The findings that the crop pH was significantly lowered by reducing the water pH might explain why producers have reported that bird droppings become more firm when acidifiers are added to the water. The crop serves as a storage compartment for consumed particles. Nature designed the crop to store whole bugs and seeds, not the finely ground, easily digested feed utilized by broilers for efficient feed conversions. If the crop is full of feed and poor quality water is added, then there is an increased risk for the development of harmful bacterial and mold that could impact the rest of the digestive tract. However, research done in Alabama by Hardin and Roney (no date) found that a pH range of 4 was not favorable for bacteria such as *E. coli*, *Salmonella* and *Clostridium* to grow and thrive. The current research indicates that it is possible to decrease the drinking water pH to a range that would lower the crop pH to almost 4, thus creating an environment that is hostile for undesirable microbes. However, given the diversity of drinking water sources it is a very good idea to measure the pH of the drinking water when using acidifiers at manufacturer's recommendations because the natural buffering capacity of water may result in reduced impact of the acidifier on pH. It may even be necessary to add more acidifier to the stock solution to achieve a lower drinking water pH.

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# The Arkansas Surveillance Program for Exotic Newcastle Disease and Avian Influenza



## Background

In the last few years there have been several outbreaks of foreign poultry diseases in the United States. An outbreak of low pathogenic Avian Influenza in Virginia in 2002 resulted in the destruction of over 4 million birds. The outbreak cost the Virginia poultry industry approximately \$130 million in lost revenue. Eradication and indemnity costs associated with this outbreak were in excess of \$60 million. On October 1, 2002, Exotic Newcastle disease (END) was confirmed in backyard poultry and gamefowl in southern California. The disease spread to commercial chicken flocks as well as numerous other backyard, hobby, gamefowl, and exhibition flocks, resulting in over 18,000 premises being quarantined in California. In addition, infected flocks were detected in Nevada, Texas and Arizona resulting in quarantines in those states. The cost of eradicating the disease was over \$300 million and the associated industry export losses are still being calculated. 2004 Avian Influenza (AI) outbreaks in Texas, Maryland, Pennsylvania, Delaware and New Jersey were not as costly as the 2002 Virginia outbreak, but resulted in quarantines, bird eradication, and monetary losses.

## Project Funding

In late 2003 the United States Department of Agriculture (USDA) made available money to poultry producing states to assist with foreign poultry disease prevention and detection. This money was, in part, a result of the outbreaks of END and AI. States could obtain the money by submitting proposals outlining efforts in the state to promote Biosecurity and detect END and AI. The Arkansas State Veterinarian and Arkansas Cooperative Extension Service Poultry Health Veterinarian developed a proposal that was funded by USDA. The program is a cooperative effort between the Arkansas Livestock and Poultry Commission (ALPC) and the Arkansas Cooperative Extension Service aimed at educating backyard, hobby and exhibition flock owners about disease prevention as well as a surveillance effort for END and AI.

## Project Goals

The purpose of the program is to educate individuals on the threat of diseases and how to implement various Biosecurity measures to prevent diseases in their poultry flock. In addition, the program will test the non-commercial flocks of those who request testing to demonstrate that diseases are not silently lurking in the state of Arkansas.

SURVEILLANCE — continued on page 8



### Educational Efforts

Any person in the state of Arkansas who has a hobby, exhibition, backyard, or gamefowl chicken flock can participate in the project free of charge. The educational portion of the project consists of seminars for flock owners covering the importance of Biosecurity, disease recognition, and Biosecurity measures to prevent disease. The seminar covers various diseases (including END and AI) and also describes the surveillance portion of program. Fact sheets and pamphlets are distributed at the seminar and county agents are encouraged to visit flock owners to document the number and type(s) of birds owned. Data obtained from these visits provide a better understanding of the types of birds in a county so that effective educational materials can be developed. The survey data also provides county agents with the tools needed to alert flock owners about disease threats in the area and ensure that preventative measures are in place.

In addition to the seminar presentations, the program provides educational materials to ALPC inspectors for distribution to poultry owners who sell birds at the various trade days, auctions, flea markets, and swap meets. Inspectors are also available to make farm visits.

### Disease Surveillance

The program also includes actual testing of birds for Exotic Newcastle (END) and Avian Influenza (AI). Flock owners who participate in the program and have their birds tested are provided with New Castle vaccine free of charge.

If a flock owner decides to have birds tested, the county agent or a livestock inspector takes samples for testing. The samples taken are vent (also called a cloacal or rectal) swabs. A metal band is placed on the leg of the chicken and the number of the band is written on the sample. The band is for bird identification only and can be removed after the test results are reported. The collected swabs are refrigerated and immediately transported to the Arkansas Livestock and Poultry Commission in Little Rock for testing. The swabs are tested for only two diseases (END and AI) and the PCR test (Polymerase Chain Reaction) used is extremely specific for those diseases. Once the testing is completed, a letter is sent to the owner documenting the results. The letter can be taken to the office of the county agent and Newcastle vaccine can be obtained. This vaccine is for the type of Newcastle regularly encountered in the United States, not for Exotic Newcastle. However, it was shown in the California END outbreak that birds vaccinated with similar vaccines had less mortality than non-vaccinated birds.

### Expected Results and Assistance

Since there have been no reports of high mortality in flocks in Arkansas or surrounding areas, samples are not expected to be positive for either END or AI and to date all samples have been negative. Nevertheless, the Arkansas Livestock and Poultry Commission diagnostic laboratories at Little Rock and Springdale currently offer routine diagnostic

services free of charge for any hobby, exhibition, or backyard flock that has lost birds.

### Program Future

Currently, the grant funding this program will expire the end of December 2004. Anyone wishing to participate in the survey, testing program, or wanting information should contact their county agent, area livestock inspector or the extension poultry veterinarian. Any person or group that wishes to have an educational seminar on disease recognition (including Exotic Newcastle and Avian Influenza), Biosecurity measures to prevent disease, and what it takes to participate in the surveillance program should contact their county agent or the extension poultry veterinarian.

### Protecting Flocks from Disease with Basic Biosecurity Practices

The best way to reduce the risk of introducing the disease into your birds is by following **Biosecurity** practices (Additional information on Biosecurity is available at <http://www.uark.edu/depts/posc/avianindex.html>). Some examples of such practices are:

1. Do not purchase birds that appear sick or that may have been illegally brought into the country.
2. Avoid sick birds if at all possible.
3. Practice good hygiene principles.
4. Clean and disinfect thoroughly.
5. Do not visit aviaries that have sick birds.
6. Prevent rodents and wild birds from entering the facilities where birds are kept.
7. If you visit a facility with birds that may be suspected of being infected it is important to change clothes, shower, wash your hands and thoroughly disinfect all items taken on the premise before contact with your birds.
8. Report signs of disease immediately and get a veterinary diagnosis immediately.

For additional information or to report disease contact any of the following:

**County Agent,  
Local veterinarian,  
State Veterinarian,  
State Veterinary Diagnostic Laboratory or  
Extension Veterinarian.**



# Strategies for Successful Turkey Production

## Introduction

Over the years, through careful genetic selection, the turkey industry has created a turkey that today is a high-performance protein producing bird, but within a narrow window of conditions. Let's take a look at some key areas critical to successful turkey production including: 1) setting up for a flock, 2) brooding, 2) disease control, and 3) ventilation.

## Setting up for a flock

A poult's performance is dependent on its interaction with the environment. Birds that are started well have a much greater chance of finishing well. Since young birds are generally more susceptible to diseases than older birds and diseases can carry over from one flock to the next, the success of the flock may depend on how completely the house has been cleaned and disinfected prior to the arrival of the new flock. Most integrators have guidelines concerning cleaning and disinfecting which should be strictly followed. If such guidelines do not exist, Lacy and French (1989) outlined the following clean out steps (in order):



1. Decide how and when to treat the house with an approved pesticide to eliminate litter beetles.
2. Remove all the equipment you can from the house.
3. Clean and disinfect the equipment you removed and store it in a sunny location.
4. Remove all litter from the house.
5. Wash down the house the house thoroughly from top to bottom.
6. Disinfect the house and allow it to dry completely
7. Return equipment to the house

Only clean, dry litter material which is absorbent and does not easily cake should be used for turkey houses. Litter should be free of excessive fines, large chunks, sharp edges, and be of a

non-toxic material. Litter should be smoothed and spread evenly throughout the house in preparation for brooder ring set up. Tamping down the litter inside the brooder ring may provide better footing and make it easier for poults to maneuver and find feed, water and heat and will greatly improve their chances of survival during those first important days of life (Nicholas Turkey Breeding Farms, 2000).

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## Brooding

It is of vital importance to light brooders 24-48 hours before poult arrival to warm the litter (not just the air temperature) and prevent poult chilling. If the poult becomes chilled because the floor is cold, its movement level decreases and it will not actively seek out feed or water. Obviously, ample feed and water must be available at all times and integrator guidelines regarding number of feeders and drinkers per brooder or brooder ring should be followed. Feeders and drinkers must be arranged in such a manner within the ring as to allow poults to move unimpeded from the heat source to the edge of the ring. This will help reduce or limit the chance of piling inside the ring. Do not place feeders or drinkers directly under or too near the brooder; poults will not eat or drink feed and water that is too hot. Brooder stove height will vary depending on type being used and integrator guidelines. Lighting must be adequate and should be uniform to reduce incidence of shadows that can frighten poults and possibly cause piling.

## Disease Control

Modern turkeys are geared for growth, not biological warfare. While the bird is capable of reallocating body resources to combat disease challenge, this reallocation usually results in a reduction in growth, activity level, and defenses (Gross and Siegel, 1997). Producers should make every attempt to provide management conditions recommended by integrator technical service representatives that will minimize the disease threat and allow birds to perform to their genetic potential. These efforts should include a strict Biosecurity program that excludes unnecessary visitors from the farm (Tabler, 2004)

There is little disagreement in the turkey industry regarding the harmful effects of ammonia on turkey health. Research has shown what turkey growers already know, that high levels of ammonia can increase airsacculitis and feed conversions, and reduce performance and profitability (Sandstrom, 1990). Whenever the ammonia level in the air exceeds 10 ppm, the turkey's ability to fight respiratory disease is impaired. A minimum litter moisture of approximately 30% is required to support growth of ammonia-producing bacteria and this growth accelerates as moisture levels increase from 30 to 40%. It is very difficult to keep moisture levels below 30% throughout the life of the flock without incurring high ventilation and heating costs or using very low bird densities (Bennett, 2001). However, proper drinker management, which decreases total water spillage, will reduce the total amount of moisture in the turkey house and lower ammonia production in the litter.

## Ventilation

Turkeys are living creatures and must have adequate amounts of high quality air to breathe just like their caretakers. Due to the anatomic structure of their respiratory system, birds are very sensitive to air quality, especially ammonia and dust. Frame and Anderson (2002) noted the main reasons for

ventilating are to:

- Maintain an adequate supply of oxygen
- Remove harmful gases, such as CO, CO<sub>2</sub>, and ammonia
- Control moisture accumulation in the building (i.e., humidity)
- Control temperature
- Remove dust and dander particles

When it comes to ventilating the turkey house, producers have two options: natural or power ventilation. Natural ventilation consists of using the curtains and end doors along with natural wind conditions to move air through the turkey house. If there is any breeze at all this allows a large quantity of air to be moved through the building in a short period of time and requires no electrical power usage because fans are not running. However, in reality, natural ventilation allows producers very little control over the ventilation of their houses. It is difficult to regulate temperature and optimize airflow inside the house. Changing wind speed and direction and outside air temperature only complicates this problem. Turkeys under natural ventilation may be over heated from lack of ventilation or chilled as a result of over ventilation.

Power ventilation allows producers to efficiently move a consistent quantity of air in a given time period and fan run time can be adjusted to control humidity and temperature inside the turkey house. Stirring or re-circulation fans can also be used to move hot air off the ceiling and mix with the rest of the air in the house. Keep in mind that air exchange and air movement are not the same thing. Air movement is the process of relocating air to a different place in the house using circulation fans, while air exchange is the transfer of inside air to the outside and outside air to the inside of the turkey house. Air exchange rate is expressed in changes of air per minute, or in cfm/turkey (Frame and Anderson, 2002).

Proper static pressure is also important when power ventilating turkey houses. Static pressure is the negative pressure created in a turkey house when the exhaust fans are running. The higher the static pressure, the greater the velocity of the air entering the house. A simple rule of thumb is that each 0.05" of static pressure will shoot air about 12 feet. Static pressure in turkey buildings should be maintained between 0.03" and 0.10" (Frame and Anderson, 2002). If the static pressure is too low, cold air will not mix with warm air, but will fall to the floor causing a cold spot that birds will avoid. Many times birds avoid the sidewalls because cold air has fallen to the floor immediately after entering due to inadequate static pressure. If static pressure is too high, fan motors have to work excessively hard, decreasing their life expectancy, without any additional benefit to the turkeys. If ventilation and temperature regulation are inadequate, especially at night, humidity builds up in the turkey house causing house condensation (sweating), damp litter and increased ammonia levels. Frame and Anderson (2002) offer the following ventilation tips:



Air must be controlled as it enters the building. This is best achieved by mounting rectangular vent boxes along the upper part of sidewalls that automatically adjust to variations in negative pressure. Proper installation of vent boxes will direct incoming air slightly upwards where it will mix with warmer air and gently fall to bird level.

Consider using a five minute time cycle rather than ten. Temperature and moisture levels will tend to fluctuate less severely.

Keep inlets, fans, and shutters clean. Brushing off dust accumulated on fan blades, guards, and shutters can increase fan efficiency 12% to 15%.

Adjust building inlet area to number of cfm being moved by fans. Static pressure should optimally be maintained between 0.05" and 0.08". In loose houses this may require sealing cracks and crevices to reduce amount of unneeded air entering the building. As a rule of thumb, one 2.41 to 2.44 ft<sup>2</sup> vent box opening will accommodate 1500 cfm of fan capacity.

Minimum air exchange rate in a brooder house with newly placed poult should be 0.2 cfm/poult.

If brooder house temperature is stable and comfortable, especially from 1 to 7 days of age, wire brooder guards offer better ventilation than cardboard shields. Carbon dioxide levels rapidly build up within cardboard shields. Young turkeys are very sensitive to high levels of carbon dioxide gas. Poults may become lethargic or sleepy when exposed to high carbon dioxide levels resulting in inadequate feed and water intake.

One complete air exchange should occur in turkey growouts at least every 3 to 5 minutes. This air exchange rate will need to be even greater (i.e., every 1 to 2 minutes) during summer months. Plan fan capacity to meet this need.

Use power ventilation in growout houses to first control moisture, then ammonia, and last, temperature. Many growers have a tendency to reverse the order of these priorities. It is important to keep in mind that using additional heat can stabilize temperature during power ventilation. However, moisture and ammonia can only be controlled by sufficient air exchange (i.e., ventilation). Leg problems and airsacculitis caused by wet litter and ammonia are much more economically devastating than a slightly higher gas bill.

### Summary

Proper set up for a flock, correct brooding, rigorous disease control and appropriate ventilation are four areas vital to producing profitable turkey flocks. Birds that are started well have a much greater chance of finishing well. Since young birds are generally more susceptible to diseases than older birds and diseases can carry over from one flock to the next, the success of the flock may depend on how completely the house has been cleaned and disinfected prior to the arrival of the new flock. It is of vital importance to light brooders 24-48 hours before poult arrival to warm the litter (not just the air temperature) and prevent poult chilling. If the poult becomes chilled because the floor is cold, its movement level

decreases and it will not actively seek out feed or water. Modern turkeys are geared for growth, not biological warfare. While the bird is capable of reallocating body resources to combat disease challenge, this reallocation usually results in a reduction in growth, activity level, and defenses. Ventilate properly by:

- Controlling the air as it enters the building,
- Using a five minute time cycle rather than ten,
- Keep inlets, fans, and shutters clean,
- Adjust building inlet area to number of cfm being moved by fans,
- Maintaining a minimum air exchange rate of 0.2 cfm/poultry in the brooder house,
- Using wire brooder guards offer better ventilation than cardboard shields,
- Maintaining a complete air exchange in the turkey growout house every 3 to 5 minutes, and
- Power ventilating in growout houses to first control moisture, then ammonia, and last, temperature.

### References

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### Coming Events:

- Annual Nutrition Conference, September 15-17, 2004, Embassy Suites, Rogers, AR, The Poultry Federation (501) 375-8131
- Turkey Committee Meeting, September 17-18, 2004, Best Western Inn of the Ozarks, Eureka Springs, AR, The Poultry Federations (501) 375-8131
- State Fair, October 8-17, 2004, State Fair Grounds, Little Rock, AR, (501) 372-8341



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