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AVIAN

Advice



UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE
Cooperative Extension Service

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Feed Antibiotics - Can We Get Along Without Them?

by S.E. Watkins, Extension Specialist, and F.T. Jones, Extension Section Leader

Introduction

Regulatory, medical and government officials have stated for decades that antibiotics should not be fed to farm animals for growth promotion. While there is still not conclusive evidence that use of antibiotics for growth promotion increases drug resistance among human pathogens, it appears likely that the use of antibiotics for growth promotion will be phased out. The prospect of raising poultry with no feed antibiotics has raised concern in the minds of many growers. In view of this situation, an experiment was undertaken to determine the possible performance and economic consequences of raising broilers without antibiotics.

Procedures

Four broiler houses (40 x 400') were used in this study. Two houses received feed with antibiotics while the remaining two houses received feed that had no antibiotics, but did contain coccidiostat. Birds were placed at approximately the same density in each house and feed treatments were continued for approximately a year (5 flocks). Data were then compiled and averaged.

Findings

Production and economic data obtained from the trial are shown in Table 1. When the treatments were compared, no statistically significant difference was found between any of the variable examined. In fact, the no antibiotic

group was numerically better than the antibiotic treated group. These data illustrate the fact that, with careful management, feed antibiotics may not be necessary.

A technical service manager for a pharmaceutical company visited the farm during one of the flocks. The company that employed the manager manufactured the antibiotic being fed. When asked to identify which group of animals was receiving feed antibiotics, the manager could tell no difference between the birds. Someone remarked, "It appears that we don't need this antibiotic at all." The manager replied, "In this particular situation, you may not."

Table 1. Performance of broilers with and without antibiotics.

Treatment	Feed	Livability	Age	Wt	Cost/Lb	Pay/Lb
With Antibiotics	2.13	93.82	53.10	5.69	14.16	3.77
Without Antibiotics	2.09	94.52	52.90	5.88	13.80	4.13

Poultry Production without Antibiotics

Whether antibiotic use in the production of food animals causes bacterial resistance in humans or not, public perception will continue to drive the industry to limit antibiotic use. For many years the industry has benefited from the

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use of antibiotics to promote and maintain flock health and seeing a future without them can be intimidating. However, with careful thought and planning, producers can minimize the risk of disease in their flocks and consequently minimize the need for antibiotics. Minimizing the use of drugs is not only a more effective way to produce poultry products, but it also promotes good relations between cautious consumers and food suppliers. The paragraphs that follow focus on areas where producers can strengthen their production practices to minimize the risk of disease making the transition to little or no antibiotic use positive.

Providing new chicks and poults with the right temperature, the appropriate amount of fresh air exchange as well as clean feed and water can greatly reduce susceptibility to diseases.

Biosecurity

This word has been used a great deal in the last few months and with good reason. Limiting the access people have to your operation is extremely important. There should be no exception to the rule with particular emphasis on visitors who may have their own poultry. However, it is also important to limit the access animals have to your operation. Limiting the access that rodents, wild birds, insects and predatory animals such as raccoons and coyotes can be a producer's number one defense against disease invasion. ALWAYS keep poultry houses secure from entry by foreign animals (this would include everything from cats to opossums to birds) to reduce the risk of disease.

Recently a turkey producer had a chronic problem with corona virus. The producer had made a concerted effort to clean up his operation and keep it clean including his dead bird disposal area, which was a composter. However, the producer decided to set traps around the composter. Over a short period of time, the producer trapped numerous coyotes, raccoons, opossums, skunks and rats at the composter. Following disposal of these wild animals, the farm was thoroughly cleaned, the composter area was secured and the disease issues went away. All of these wild animals were probably bringing disease organisms onto the farm and the producer was tracking them into his houses.

One company used drag swabs to test the floors of poultry barns between flocks and discovered an increased incidence of *Salmonella* in one of the barns. It turns out that the producer had failed to shut the end doors a few days after load-out and skunks had been visiting the house, tracking in this and maybe other diseases.

While we may all realize that humans can carry diseases from one poultry flock to another, wild animals may be even more of a disease threat because they are often unseen. The bottom line is don't give potential disease sources an invitation into your facilities.

Provide the right environment

Providing new chicks and poults with the right temperature, the appropriate amount of fresh air exchange as well as clean feed and water can greatly reduce the bird's susceptibility to diseases. Chilled or hot birds are almost guaranteed to become sick, particularly if birds are placed in stuffy, ammonia filled barns. Making sure the litter is the right temperature before birds are placed will get birds eating and drinking quicker as well as stimulating the development of a healthy immune system.

Producers who have a chronic problem with poor performance during the first week, might benefit from taking the time to do a brood area audit. This audit would include examining the following questions about the brood area.

- Are there enough heaters? Are there too many birds per heater?
- Is there adequate brood space?
- Are birds brooded for an adequate period of time?
- How many drinkers are present? Are there enough functioning drinkers so that birds have adequate water?
- What type of drinker is present? Do these drinkers allow young birds to easily access water?
- How is the feeder system set up? Do birds have access to feed without leaving the brooding area?

Write the answers to these questions down on paper and then compare what you are doing to what producers with good starts are doing. This comparison could reveal weaknesses in the brood setup that can be corrected.

An additional action producers could take to get birds off to a good start is to flush the water lines right before bird placement. This procedure will minimize the risk of microbial contamination that might occur in warm, stagnant water lines. Develop a water sanitation program and stick to

it. It is amazing how good water quality remains even at the end of the lines on farms that have consistent water sanitation programs. Some top producers will even chlorinate city water, particularly if they are at the end of the city water distribution line.

Many times producers who struggle with unexplainable poor bird performance have put little effort into water sanitation programs. It has been eye opening to see how much contamination and debris can be found in the water systems of these producers. A few dollars spent on daily water sanitation can save producers lots of production headaches and more than pay for itself in bird performance. Take time to address the little details of water sanitation and the rewards will often be flocks that return profits.

Good litter management can not be emphasized enough when it comes to bird health. Wet litter not only can chill birds, but wet litter promotes the growth of pathogens such as *E. coli*, oocysts (that cause coccidiosis), *Salmonella* and other organisms. In addition, wet litter results in ammonia release which can damage a bird's respiratory tract. Ammonia levels as low as 25 parts per million have been found to damage the trachea, leaving the bird much more susceptible to diseases such as bronchitis. A litter moisture level of 15 to 25% is a good target. Controlling litter moisture through proper ventilation is one of the most critical steps in maximizing poultry health.

Sanitation

House sanitation should include a plan for cleaning between flocks with litter present as well as a total house clean out plan. Cleaning between flocks with litter present should be done in a way that does not lead to excessive moisture levels in the litter. Many producers like to wash down fans, brooders and other equipment with water between flocks. However, if wet cleaning procedure is used it should be done as quickly as possible after the last flock is removed so that the litter has plenty of time to dry. An alternative strategy is to dry clean by using air pressure to blow off equipment. Dry dust promotes the growth of organisms much less than mud or wet litter does. The more often a producer can rest a facility or have a true down time of at least 14 days between flocks, the more chance there will be fewer disease pathogens in the house when the next flock arrives.

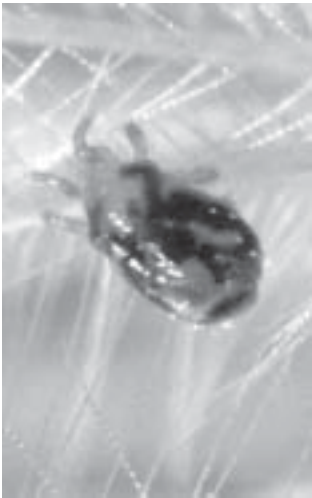
For producers that are completely cleaning their facilities, it is important to get the floor as clean as possible. Field research has shown that the cleaner the floor the more effective the disinfectant. The more organic matter left, the less likely disinfectants are to kill bacteria, viruses, yeasts and molds. Field research has also shown that for maximum pathogen kill floors and facilities should be allowed to dry completely before new litter is placed in the barn. In addition producers should pay attention to sanitation of areas just outside the house. This is particularly true of the area just outside the load-out door. Many times this area contains a great deal of old litter and mud. The new litter truck must pass through this area when delivering a load and may end up tracking pathogens back into the house.



Summary

Although it is difficult to imagine producing poultry without using antibiotics, with careful thought and planning, producers can minimize the risk of disease in their flocks and consequently minimize the need for antibiotics. To minimize disease risks producers should address the following:

- Biosecurity programs which limit the access of humans and wild animals to facilities.
- Allowing birds to grow and develop healthy immune systems by providing birds with the right environment and addressing:
 - Providing new chicks and poults with the right temperature,
 - Providing the appropriate amount of fresh air exchange
 - Providing clean and accessible feed
 - Providing clean and accessible water
- Proper sanitation procedures between flocks.



Biology, Impact on Production and Control of the Northern Fowl Mite

Introduction

The Northern Fowl Mite, *Ornithonyssus sylviarum* (Canestrini and Fanzago), is considered to be the most common external parasite found on a wide variety of domestic fowl and wild birds. Mite populations often reach population levels that cause substantial losses in commercial egg and broiler-breeder egg production. Large numbers of mites cause poor fertility, anemia and frequently death in males. Egg production by hens is reduced from 10 to 20% in most infestations. Conservative estimates of losses in annual egg production are reported to be in excess of \$283 million in the United States. In addition, poultry house workers are often reluctant to perform their duties inside infested facilities so bird management suffers.

Infestation

Northern Fowl Mites can be transported between poultry facilities in many ways. Wild birds, rats, mice and infested pullets have all been implicated in the dissemination of the mites. In addition, personnel moving between poultry facilities, egg crates and flats and vehicles transporting poultry are sources that are known to initiate infestations.

Mite populations increase rapidly after a bird has been infested, especially during the colder months and on the younger birds (18-22 weeks of age) that have just been placed in the facility. Nine to 10 weeks after the birds have become infested, they may support more than 20,000 mites per bird. However, the mite population does not generally become established on the birds in large numbers until the birds have become sexually mature. Although the reason is unknown, birds older than 40 weeks usually do not support many mites.

On female birds mites tend to congregate first in the vent area, then on the tail, back and legs. Mites are more scattered on the male birds. As the mites increase in numbers the feathers become soiled from the presence of mite eggs, cast skins, dried blood, and mite excrement. The resulting soiling of the feathers in the vent area causes the characteristic blackened feathers indicative of large numbers of Northern Fowl Mites.

Impact of Infestation

The impact of northern fowl mite infestation is as follows:

1. In many instances scabs may form in the vent area preventing copulation in broiler-breeders.
2. Death due to the actual anemia caused by continued blood loss is rare. However, birds with heavy infestations of 50,000 mites per bird can lose 6% of their blood on a daily basis. For each 1,000 mites there is a 1-ml of blood loss per day.
3. A 10-20% reduction in egg production by Broiler-breeder hens is common.
4. Caged-layers generally experience up to 15% reduction in egg production.
5. There is decreased feed consumption by infested birds.
6. Feed conversion is generally poorer in infested birds.
7. Roosters generally experience lower body weight and decreased seminal fluid volume.

Life Cycle

The Northern Fowl Mite completes its entire life cycle on the bird host. However, mites can survive off the host for 2 to 3 weeks under suitable conditions. The mite passes through 5 stages during its life cycle. One to 2 days after laying, a mite egg will hatch into a six-legged larva called a protonymph. The protonymph or larval stage develops to maturity in 8-9 hours and then molts into a blood-feeding nymph. The blood-feeding nymph fully matures in 1 to 2 days and molts again. The second stage nymph is called a deutonymph which, like the larva, do not feed before molting into an 8-legged adult mite in less than 1 day. The entire life cycle can be completed within a week under favorable conditions.

Mite Detection and Monitoring

A mite-monitoring program is essential and allows early detection when the initial infestation is at a low level allowing effective and economical control procedures. The early detection of mites is extremely important. For example early detection of the mites in a caged-layer egg production system can allow successful control without the necessity of treating the entire facility. In the broiler-breeder production system the monitoring system should consist of 10 males and 10 females being picked up while walking through the facility and examined. In caged-layer production systems, 10 hens should be examined at random in each cage row in the entire facility. Bird monitoring should be conducted weekly throughout the production cycle.

When the bird is examined, the vent area should be observed with a bright light, and the feathers should be parted to reveal the mites. Single caged birds often have more mites than those caged in groups and because of bird-line variation in susceptibility. One bird may have mites while its cage mates or birds in neighboring cages have no mites. The following rating scale is an effective way to estimate the level of northern fowl mite infestation levels:

Infestation Rating	Estimated Number of Mites on the Entire Birds
0	No mites observed
1	1-2
2	3-9
3	10-31
4	32-99
5	100-300
6	301-999
7	1000-3000
8	3001-9999
9	10000-32000
10	>32,000

An average of 5 or more mites observed on the vent area out of all the birds examined generally indicates the need for treatment procedures.

The decision to treat involves consideration of the flock age, time of year, and distribution of the infestation within the facility. As stated above, because of older birds supporting lower numbers of mites, it is not usually economical to treat these birds. High numbers of Northern Fowl Mites generally build up in young flocks. Mite infestations can increase to extremely high numbers in either cool or warm months. In caged-layer facilities the infestation may be restricted to one part of the house and may not spread, but the infested area must be monitored closely. In broiler-breeder production facilities the detection of mites generally means the entire flock must be treated.

It is highly recommended that all birds and transportation equipment be carefully examined for Northern Fowl Mites prior to movement of the birds to the egg production facilities.

Control Procedures

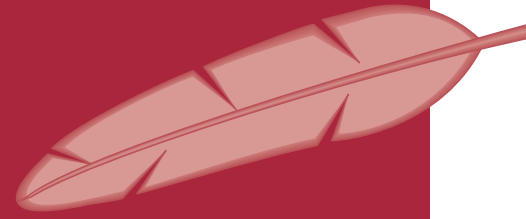
At the present time poultry producers are dependent upon pesticides to manage populations of the Northern Fowl Mite. In caged-layer operations direct pesticide applications are made to the vent region of the hens with sufficient pressure (minimum 100 to 125 psi) to penetrate the feathers. The spray should be directed upwards from beneath the cages to reach the vent. Since water is held better by feathers if they are already wet, a split treatment is recommended to increase effectiveness of the treatment. The split treatment method is done by mixing one-half of the insecticide in the standard amount of water for the first application, spray the birds and then mix the other half of the insecticide in another standard amount of water for the second application. There are also dust formulations available that are ready to use and may be applied with a hand operated crank duster or a power blower.

Resistance to Insecticides

Although currently unpublished, research conducted in California indicates that Northern Fowl Mites collected at over 20 caged-layer farms have developed resistance to Sevin, Permethrin, Rabin and Malathion. In preliminary studies it appears that the mites found on many Arkansas flocks are also resistant to these insecticides. Research is currently being conducted in Arkansas to determine the resistance/susceptibility of the mites infesting broiler-breeders. ■

CURRENT RECOMMENDATIONS:

Insecticide/Formulation	Application/Rate	Restrictions
Sevin (carbaryl) 5% Dust	No mixing necessary. Dust birds thoroughly 1 lb/100 birds	Use no more than every four weeks. Do not contaminate feed, water or eggs. Wait 7 days after treatment before slaughter.
Sevin (carbaryl) (50%) Wettable Powder (WP)	5 lb of 80% WP/100 gal water. 1 gal spray/100 birds. Repeat in 4 weeks if needed.	Wait 7 days after treatment before slaughter.
Permethrin 5.7% or 11% Emulsifiable Concentrate (EC)	1 qt. 5.7% or 1 pt 11%/25 gal water. Apply to vent of birds at 1 gal spray/100 birds	Read label
Permethrin 40% EC	1-4 oz/3.75 gal water, apply to 1,500 birds at 1 gal spray per 100 birds	Read label
Malathion 4 or 5% Dust	No mixing, use directly to dust birds thoroughly at 1 lb/100 birds	Read label
Malathion 0.5% Spray	6 1/2 pt. of 57% EC or 16 lb of 25% WP in 100 gal water. Apply at 1 gal/100 birds	Read label
Rabon 50% WP	8 lb of 50% WP/100 gal water. Apply at 1 gal/100 birds	Do not repeat moer often than 14 days. Spray birds lightly.
RaVap EC	Mix 1 gal Ra Vap/50 gal water. Apply at 1 gal/100 birds	Do not repeat more often than every 14 days.



The Campaign for Quality Drinking Water Continues

Introduction

Public concern over the use of antibiotics in feed animals has forced the poultry industry to limit the use of antibiotics in poultry production. Some companies have even reduced usage of other feed additives such as copper sulfate in an effort to reduce proventriculitis (gizzard erosion) and feed costs. As the use of antibiotics decreases in daily production, the emphasis on a healthy rearing environment for optimum bird performance will increase. One critical aspect of a healthy environment is high quality drinking water. Water comprises 70 % of the bird's body and it is essential for virtually every bodily function.

Nature designed the chicken and turkey to swallow whole seeds and bugs. Swallowed materials collect in the crop where they become softened by water before moving into the proventriculus or true stomach and on to the gizzard to begin the grinding process. When seeds are whole the outside protective coating prevents it from being attacked by bacteria so that a limited number of bacteria would develop within the crop. However, most feed today is ground and easily digested by both bird and microbes. Thus, feed can encourage bacterial, mold or yeast growth in the crop, particularly if the water supply is contaminated. This extra microbial growth may reduce performance and could increase contamination rates. This is just one of many reasons why a producer should continuously strive for good water quality.

Water Quality Problems – More Common than You Think.

As the modern broiler has been bred for more and more efficiency in growth and feed conversion, birds have become less and less tolerant of stressors. What might have had no impact on birds fifteen years ago could be devastating for the bird of today. The industry's evolution towards enclosed water systems might result in a false sense of security about the quality of drinking water over the life of production facilities. The reality is that when birds activate nipples there can be some backflow of water in the compartment above the nipple. Water in the backflow may contain whatever infection or contaminant the birds drinking have, including bacteria and viruses. To make matters worse, any loss in pressure in the water system can result in water recirculating back as far as the well or municipal water line. If this happens, contamination can exist not only in the drinkers, but also throughout the entire system. If no action is taken to maintain adequate levels of sanitizer in the water supply then over time, given the warm stable environment of the water system, a film of bacteria can build up where harmful pathogens can survive for days if not months. *Bordetella* has been isolated (which causes turkey coryza) from the inside of nipple drinkers and from the rubber seal in the water line regulator in houses from *Bordetella* positive turkey flocks.

Recent Field Findings

• Bacterial contamination in closed water lines

Years of testing and numerous water quality evaluations for poultry producers have produced surprising results. Regularly we have found high levels of aerobic (meaning oxygen requiring) bacteria in closed water lines. Up to a million bacteria per milliliter (ml) have been found in contaminated water, when acceptable levels are 100 bacteria/ml. While performance may or may not be poor on farms with this level of bacteria, the situation makes the water system a potential disaster because if a harmful organism does get in, there are now so many hiding places in the water system that drastic sanitation measures will be required to get rid of the problem. Remember organisms such as *E. coli* can multiply into trillions in only a few hours given the right conditions.

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- **Contamination in Well or Municipal Water**

Extensive testing has shown that many water sources such as wells or municipal supplies at the farm are contaminated with bacteria. This finding further stresses the need to have back flow protectors to prevent pulling water from poultry houses back into clean systems. Should a well turn out to be contaminated, the best solution is shock chlorination between flocks. Instructions on how to accomplish this are listed at the end of this article. It is important to note that drinker manufacturers do not recommend running high levels of bleach through drinker lines because it can be damaging to the equipment. Therefore, a shock chlorinated well should not be flushed through the poultry house. Instead, after the well has been cleaned, follow up with line sanitation using an approved cleaner and disinfectant. Bacteria tests conducted on contaminated wells that have been properly shock chlorinated have shown a dramatic reduction in bacterial count.

- **Mineral Build-Up**

Minerals such as iron tend to build up in water lines. This is particularly true in drinker lines that have never been flushed properly. This has been documented by measuring mineral levels at the source (the well or medication room) and then at the end of the drinker line. Since mineral build up (sediment) provides harmful organisms with food and a place to hide, prevention of mineral sediment alone is an adequate reason for high pressure flushing. However, many producers may not have the proper regulator bypass flush systems or water pressure to get a good flush. Producers who have drain lines that run up into the ceiling before exiting the house may not have adequate pressure to achieve a strong flushing action in the line. It might on occasion help with flushing to drop these drain lines onto the floor and let the water run out a door. Certainly it is worthwhile to check with the manufacturer of your water system to determine if it is designed properly for high pressure flushing.

- **Coping with High Sodium and Chloride Content**

Producers who have high sodium and chloride (salt) levels in the water seem to minimize flushing in their birds when water sanitation is excellent. Producers with high salt levels and poor sanitation almost always suffer from poor flock performance. Since there are no economical solutions for high salt content in the water, everything a producer can do to minimize its impact can only benefit bird performance.

- **Too Much Sanitizer**

Not only is a water sanitation program important, but also the proper use of sanitizers is essential. Recently we tested the water on a poultry farm that had suffered poor performance flock after flock. The birds not only did not grow and convert well, but also had pasty coloring. A test on water taken at the end of the line revealed a chloride level of over 600 parts per million (ppm). It turns out that the producer had improvised chlorination utilizing a system that had not been designed for delivering this sanitizer. After the equipment was disconnected the total water chloride levels dropped to less than 7 ppm and flock performance improved.

- **Testing for Water Problems**

If a producer suspects that a water supply might be the cause of chronic flock problems such as feed passage, poor weight gains or poor feed conversion, then it is important to have the water tested for both minerals and bacteria. The Center of Excellence for Poultry Science is currently equipped to conduct pH and mineral testing (with the exception of nitrates and sulfate), as well as aerobic bacteria counts for a small fee. The contact number is 479-575-3250 for more information about water testing.

A Procedure for Shock Chlorinating Wells¹

For shock chlorination, the goal is to achieve 200 parts per million (ppm) chlorine in the system. Remove any activated carbon filters that might be in the system to prevent filter damage. Household bleach can be used for shock chlorination. Approximately 3 pints per 100 gallons will give a 200 ppm solution. Caution should be used when handling chlorine compounds and minimize human exposure to chlorine fumes in confined areas such as well houses.

WATER - continued on next page

STEPS FOR SHOCK CHLORINATING WELLS:¹

Step 1. Determine the depth of water in the well. It might be necessary to contact the company that drilled the well to get an exact well depth and water level.

Step 2. Determine the volume of water in the well. Measure the inside diameter of the well and then refer to Table 1 to determine gallons per foot of water depth.

Table 1: Volume of water contained per foot of well depth

Well casing diameter (Inches)	Water volume (Gallons/foot of water depth)
4	0.65
6	1.47
8	2.61
10	4.08
12	5.88
18	13.22
24	23.5
30	36.72
36	52.87

Step 3. Estimate the volume of water in the distribution system and then calculate the total amount of water in the system. Plan for at least 50 gallons in the pipelines and also calculate how much is in hot water heaters, holding tanks etc.

Step 4. Determine the amount of chlorine product required for a 200 ppm solution for all of the water in the system.

Step 6. Pour the chlorine mixture into the well and distribution system. Dissolve the amount of chlorine solution needed into a clean 5 gallon plastic bucket and then slowly pour this into the well but splash it onto the well casing when possible. It is recommended that a hose be attached to a nearby water hydrant and this be allowed to drain back into the well. This will help mix the bleach with the well water. Once the solution has been placed in the well, then turn on hydrants and let run until a strong bleach smell is observed. Turn off hydrants and let bleach stand in system for 2-3 hours or overnight if possible.

Step 7. Flush the system to remove the chlorine. The entire system must be emptied of chlorine and thoroughly flushed. Do not put the chlorinated water into a septic system. Drain the water where it will have a minimal impact on vegetation and animals.

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¹ Adapted from Anon. 2002

Egg Shell Mottling and Hatchability

Recently, there has been an apparent increase in the incidence of egg shell mottling.

Hatchability Problems

Hatching egg quality parameters have become increasingly important as commercial broiler breeder producers attempt to maximize hatchability. The egg pack can be easily monitored and growers held responsible for sending too many poor quality eggs to the hatchery. However, even good quality eggs can be mishandled. When care is not taken the incidence of otherwise good hatching eggs sent to the hatchery in the form of upside-down, or filth covered eggs, which may cause contamination, or even slab sided eggs, will also reduce hatchability.

When troubleshooting hatchability problems, traditionally producers have placed the blame in one of three areas, fertility, hatchery (incubation) conditions, or egg handling. Obviously most of the attention is usually turned to the males in the breeder house and overall flock fertility. This is normal considering that the majority of actual hatchability related problems are directly related to poor fertility. Additionally, poor fertility is correlated with increased early embryo mortality which results reduced hatchability. A second area often responsible for poor hatchability can be directly linked to actual hatchery or incubation conditions. Even with the modern technology available today, hatchery equipment can, and does, wear out and malfunction over time. Equipment maintenance is often more than a full time job when trying to manage a hatchery for optimum production. A third area often responsible for reductions in hatchability is egg handling conditions and procedures. While it is obvious that we have much to learn in this area and that our 'tried and true' methods for egg handling may not be the best, that will be the focus of future articles. The purpose of this article is to address another area that is sometimes blamed for poor hatchability, namely egg shell quality.

Egg Shell Mottling

Recently, there has been an apparent increase in the incidence of egg shell mottling. Egg shells that are mottled appear as a thinner, weaker portion of the egg shell. It has been postulated by many commercial hatchery personnel that eggs with mottled shells cause reduced hatchability and increased moisture loss. Many integrators have spent time and money on products in an attempt to reduce or eliminate shell mottling with the hopes of improving hatchability. Therefore, a study was conducted to identify if, and to what extent, shell mottling affects hatchability and potentially chick quality.

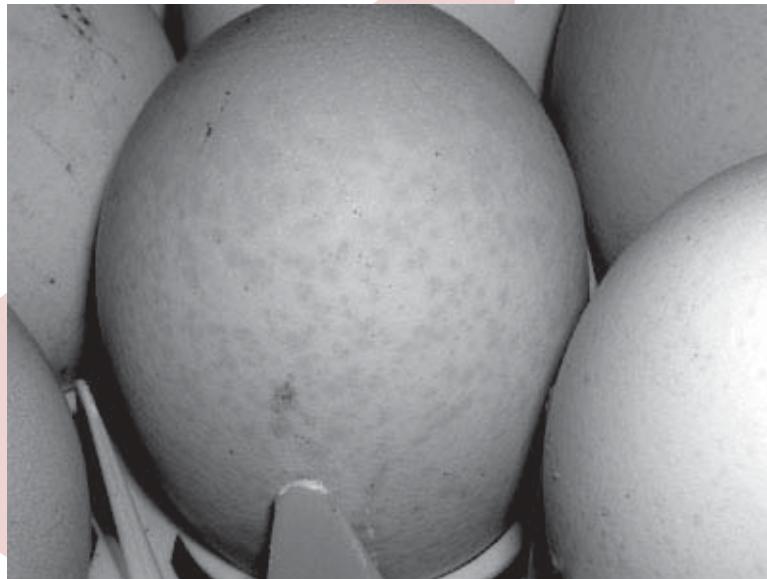
Setting up a Field Study on Egg Shell Mottling

Four flocks of broiler breeders were chosen ranging from 37 to 55 weeks of age, with a different flock selected for each of the four replicate trials. Hatching eggs from the egg storage room from two commercial hatcheries were candled and sorted into two groups; one group contained eggs with extreme cases of shell mottling, and another group contained eggs with no visible shell mottling. All eggs in each individual trial were laid on the same day and stored and handled as normally mandated by company protocol. Each replicate trial consisted of three trays of 154 eggs per tray for each of the mottled and non-mottled egg shell groups. In each trial, each tray of eggs was weighed prior to placement in the commercial setter and weighed again at transfer at 18 days of incubation to determine percent moisture loss. Following transfer to the egg hatching baskets, each of the three trays of eggs from each group was pulled from the hatchers following normal company procedures after 21 days of incubation to determine percent hatchability. These trials were spread out throughout the year to eliminate any potential seasonal effect.

EGG SHELL- continued on next page

Field Study Results

The results of this study were somewhat surprising. Moisture loss was 13.16 % for the mottled, or windowed eggs and 13.71% for the control eggs or eggs without any apparent shell mottling. The moisture loss data was very consistent in the four separate trials with no significant difference in any trial. Hatchability for the two groups of eggs was 78.79 % for the mottled eggs and 72.73 % for the non mottled eggs, respectively. In three of the trials hatchability was numerically higher for the mottled eggs and nearly identical in the fourth trial. Although these hatchability data were not significant due to the fact that we had a wide range in hatchability values with a low of 58.4 % (control) and 61.0 % (mottled) for set number one (oldest flock) and high percent hatch of 90.28 % (control) and 90.33 % (mottled) in set number four, the numerical results indicate that shell mottling did not cause losses in hatchability. Furthermore, specific gravity was used to estimate shell quality in a different group of mottled and non-mottled eggs with no correlation there either.



What causes the appearance of some eggs' shells, like the one shown above, to change resulting in these 'windows' or mottled looking eggs? The discoloration results from a slight separation of the underlying egg shell membrane from the shell itself.

Conclusion

So, what is causing the appearance of some eggs shells to change resulting in these 'windows' or mottled looking eggs? Apparently the discoloration results from a slight separation of the underlying egg shell membrane from the shell itself. This occurs in pockets which then become discolored giving the appearance of a thinner portion of the shell often called 'windows'. From this study and discussions with at least one other hatchery who conducted a similar type trial, egg shell mottling does not affect percent moisture loss or hatchability in commercial broilers. Although the appearance on the shell can be somewhat alarming, particularly if hatching eggs are sold on the open market, it does not negatively affect hatchability. ■

Applied Broiler Research Unit Performance Report

Unit Description

The first flock at the Savoy Broiler Unit was placed on November 19, 1990. The unit contains four 40 x 400 foot broiler houses. Each house contains Cumberland pan feeders, Ziggity nipple waterers and about 1.5 million BTU propane heating capacity for brooding. Each house is equipped with a computer controller which controls fans, brooders and curtains for temperature control. Houses are also equipped with temperature monitoring equipment (about 80 sensors per house), an electronic water flow monitoring system, weigh bins for feed delivery to the house, sensors for the monitoring of fan run time and devices to determine gas flow from storage tanks.

Information Key

Variable	Units	Explanation
HSE	No.	House number
FEED CONV	LB/LB	Feed conversion or pounds of feed per pound of gain
HEAD PLACED	No.	Number of chicks place in the house at the beginning of grow-out.
HEAD SOLD	No.	Number of birds sent to the processing plant
LIV	%	Livability or Head sold/Head placed * 100
AGE	D	Age of birds at processing in days
AVE BIRD WT	LBS	Average live bird weight at processing
COND	%	Percentage of birds condemned by the government inspector at the plant. Condemned birds are not fit for human consumption.
FEED COST	\$	Feed costs in dollars
CHICK COST	\$	Chick costs in dollars
MED COST	\$	Medication Costs in dollars
TOTAL COST	\$	Total costs in dollars
COST/LB	Cent	Total costs per pound of live bird weight in cents per pound
PAY/LB	Cent	Payment received from the poultry company in cents per pound.
F.A.	\$	Fuel allowance-a payment provided by the poultry company to help defray heating fuel costs
GAS USAGE	GAL	Propane usage in gallons
ELECT	KWH	Electrical usage in kilowatt hours

REPORT - continued on next page

Houses 1 and 2 were built with steel trusses with R10 insulation in the ceiling while houses 3 and 4 were constructed with wood trusses, R19 ceiling insulation and drop ceilings. Houses 1 and 3 are conventionally ventilated with misters for summer cooling, but 2 and 4 are tunnel ventilated. House 2 contains a “sprinkler” cooling system for summer cooling. The system was developed at the University of Arkansas and utilizes a landscape sprinkler system to deliver a coarse, cooling mist to the backs of the birds. House 4 utilizes evaporative cooling pads to cool the inlet air.

PRODUCTION SUMMARY: FLOCK 64 (December 21, 2001 - February 6, 2002)

HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	HEAD SOLD (No)	LIV (%)	AGE (D)	AVE BIRD WT (LB)	COND (%)	FEED COST (\$)	CHICK COST (\$)	MED. COST (\$)	TOTAL COST (\$)	COST/LB (Cent)	PAY/LB (Cent)	F.A. ¹ (\$)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.10	24580	23237	94.54	47	4.52	0.22 ²	11009	4179	41.82	15229	14.540	3.2883	444.01	2152	2754
2	2.21	24579	23822	96.92	47	4.45	0.22	11732	4179	41.82	15953	15.076	2.7527	444.01	2640	2622
3 ³	2.66	24542	15002	61.13	47	5.13	0.22	10235	4172	41.82	14449	18.803	-0.9742	444.01	2521	1732
4	1.99	24576	23609	96.07	47	5.08	0.22	11966	4178	41.82	16186	13.513	4.3157	444.01	2372	2649
FARM	2.20	98277	85670	87.17	47.00	4.76	0.22	44943	16707	167.28	61817	15.182	2.8000	1776.04	9685	9757

¹ F.A. - Fuel Allowance

² Condemnation percentage could not be divided by house

³ 8800 birds lost to asphyxiation in House 3 on January 29 due to controller malfunction.

Comments on Flock 64

Placement was 24,600 birds per house resulting in a stocking density of 0.65 sq. ft. per bird. Condemnation percentage was low at 0.22 %, but will likely increase as more flocks are grown on the same litter. Mortality at harvest was: House 1 - 1343; House 2 - 757; House 3 - 9540; and House 4 - 967. On the night of January 29, the controller on House 3 malfunctioned preventing the sidewall exhaust fans from running for some period of time during the night. When the problem was discovered at 5:30 am, approximately 8800 birds had succumb to what we believe to be asphyxiation. The electricity was never off and the house temperature did not overheat but the humidity was extremely high. Since there was inadequate air exchange in the house because the curtains were up and the exhaust fans were not running, we theorize the birds utilized the oxygen available at bird level. We believe that the problem occurred sometime well after midnight because had it occurred earlier in the night, death losses would likely have been much higher. Because of these losses, we were on the bottom of the settlement sheet for this flock. Down time between flocks was 14 days. Caked litter removal after harvest was as follows: House 1 - 11 loads; House 2 - 12 loads; House 3 - 8 loads; and House 4 - 9 loads. Propane usage for the flock was high, totaling 9,685 gallons.

PRODUCTION SUMMARY: FLOCK 65 (February 15, 2002 - April 1, 2002)

HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	HEAD SOLD (No)	LIV (%)	AGE (D)	AVE BIRD WT (LB)	COND (%)	FEED COST (\$)	CHICK COST (\$)	MED. COST (\$)	TOTAL COST (\$)	COST/LB (Cent)	PAY/LB (Cent)	F.A. ¹ (\$)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.01	25509	24368	95.53	45	4.31	0.48 ²	10540	4337	59.14	14936	14.305	3.8550	0.00	1931	2579
2	2.00	25360	24320	95.90	45	4.46	0.48	10839	4311	59.14	15209	14.105	4.0547	0.00	2418	2703
3	1.98	25519	24598	96.39	45	4.51	0.48	10995	4338	59.14	15393	13.949	4.2114	0.00	2255	1739
4	2.09	25051	23511	93.85	45	4.46	0.48	10965	4259	59.14	15283	14.653	3.5066	0.00	2583	2402
FARM	2.02	101439	96797	95.42	45.00	4.43	0.48	43339	17245	236.56	60820	14.248	3.9124	0.00	9187	9423

¹ F.A. - Fuel Allowance² Condemnation percentage could not be divided by house
Comments on Flock 65

Placement was 25,500 birds per house which tightened the stocking density to 0.627 sq. ft. per bird. Condemnation percentage was 0.48%. Mortality at harvest was: House 1 - 1141; House 2 - 1040; House 3 - 946; and House 4 - 1540. Ranking was 9th out of 14 growers with House 3 performing the best followed House 2, House 1, and House 4. Propane consumption remained high, totaling 9,187 gallons. Down time was 9 days. Caked litter removal after harvest was; House 1 - 10 loads; House 2 - 8 loads; House 3 - 8 loads; and House 4 - 11 loads.

PRODUCTION SUMMARY: FLOCK 66 (April 11, 2002 - May 28, 2002)

HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	HEAD SOLD (No)	LIV (%)	AGE (D)	AVE BIRD WT (LB)	COND (%)	FEED COST (\$)	CHICK COST (\$)	MED. COST (\$)	TOTAL COST (\$)	COST/LB (Cent)	PAY/LB (Cent)	F.A. ¹ (\$)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.05	25175	24790	98.47	47	4.90	0.57 ²	12458	4280	41.82	16780	13.897	3.8352	0.00	948	2444
2	2.01	25220	24754	98.15	47	4.74	0.57	11789	4287	41.82	16118	13.807	3.9249	0.00	521	2832
3	2.04	25175	23918	95.01	47	4.49	0.57	10937	4280	41.82	15259	14.283	3.4488	0.00	788	1646
4	2.05	25162	23980	95.30	47	4.72	0.57	11616	4278	41.82	15935	14.173	3.5597	0.00	928	2913
FARM	2.04	100732	97442	96.73	47.00	4.71	0.57	46800	17124	41.82	64091	14.032	3.6999	0.00	3185	9835

¹ F.A. - Fuel Allowance² Condemnation percentage could not be divided by house
Comments on Flock 66

Placement was 25,200 birds per house resulting in a stocking density of 0.63 sq. ft. per bird. Condemnation percentage was 0.57%. Mortality at harvest was: House 1 - 385; House 2 - 466; House 3 - 1257; and House 4 - 1257. Ranking was a disappointing 7th out of 13 growers on this flock with House 1 outperforming all other houses based on monetary return even though House 2 had a better feed conversion. Based on pay, House 2 was second, followed by House 4 and House 3. Down time between flocks was 10 days. Caked litter removal was: House 1 - 6 loads; House 2 - 9 loads; House 3 - 7 loads; and House 4 - 12 loads. ■

Coming Events

Here's what to look forward to this fall:

Annual Nutrition Conference, September 10-12, 2002, Fayetteville Clarion Contact The Poultry Federation (501) 375-8131

Turkey Committee Meeting, September 13-14, 2002, Best Western Inn, Eureka Springs, The Poultry Federation (501) 375-8131

Arkansas State Fair, October 11-20, 2002, State Fair Grounds, Little Rock, State Fair Office (501) 372-8341

Processors Workshop, October 16-17, 2002, Fayetteville Clarion, The Poultry Federation (501) 375-8131

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