

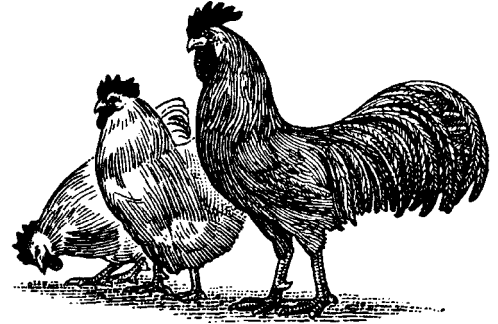
Broiler Production

Complexed Trace Minerals and Broiler Skin Quality

Broiler skin quality has been an issue for most of the history of the integrated broiler industry. Significant downgrading problems over the years have included scabby hip syndrome, oily bird syndrome, and skin leukosis. More recently, skin scratches and sores have become a transient problem causing downgrading in the processing plant as bird sizes increase and as more birds are placed from slow feathering stocks. Product trim and slowed line speeds become expensive for a broiler operation when skin blemishes become excessive. In addition, skin scratches incurred in the house and during transport can lead to bacterial invasion. Organisms associated with skin sores, gangrenous dermatitis, or cellulitis

(IP) can gain entry and become established, significantly worsening the potential downgrading problem.

Many factors must be considered in troubleshooting skin quality problems. Environmental factors frequently associated with skin defects include overcrowding, inadequate feeder or waterer space, feed or water outages that force birds to crowd the feeders all at the same time, meal feeding, or inadequate control of environmental temperature so that birds voluntarily synchronize their feeding and watering habits. One period frequently difficult to keep birds in a comfort zone is in the warm spring and summertime. Broiler operations often report a rise in skin defect-associated problems during these seasons.



Warm weather effects on feathering and temperature-related concentration of feeding activity probably contribute to this yearly problem.

Complexed trace minerals, particularly those containing zinc compounds, have shown benefits in reducing skin defect-related problems in the field. It is believed that zinc complexes allow for increased absorption and incorporation of zinc into the bird's systems, providing extra zinc at the site of scratch or wound healing. In addition to being associated with wound

healing, zinc can strengthen the skin and improve feathering to resist skin defects. Research has also shown that zinc optimizes humoral and localized immunity so that associated diseases such as cellulitis can be reduced.

These complexed mineral sources are added to broiler feeds at relatively low levels and may prove to be cost effective ways to reduce the impact of skin defects on processing plant efficiency. Research at Auburn University is attempting to determine whether mineral complexes, in conjunction with increased feed levels of vitamin E, are able to significantly impact the development of cellulitis (IP) in broilers.

This information was provided by J. B. Hess, K. M. Downs, and S. F. Bilgili of the Auburn University Poultry Science Department.

AU Notes

Universities occasionally go through periods of soul-searching when administrators and faculty review programs and prioritize activities within the various academic colleges and departments. For some time, Auburn University has attempted to identify programs in the university with potential for recognition both in Alabama and nationally. We are pleased to announce that the Poultry Science Department at Auburn University has been identified as one of seven priority programs considered by the administration to have potential for national prominence. This program support, as well as the improved facilities of the Poultry Science Building currently on the drawing board, will allow the Poultry Science Department to increase service to the poultry industry through the three major functions of a land-grant university—teaching, research, and extension.

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Controlling Fecal Contamination

Effective May 5, 1997, zero tolerance policy regulations (381.65e) of the FSIS/USDA now require all processing establishments to prevent poultry carcasses contaminated with visible fecal material from entering the chill tanks. Visible fecal material on the carcass is considered by the FSIS to be an indicator of microbial pathogens and, hence, an important source of cross-contamination in the chilling system. The zero fecal tolerance regulations as well as the Pathogen Reduction-HACCP System related process control requirements (i.e., *E. coli* testing) have become important food safety and process control standards in poultry plants.

Currently, inspection personnel perform at least two IO-bird checks at each evisceration line per shift by visually examining the carcasses before they reach the chiller. The carcasses are examined for fecal material on the interior and exterior surfaces. The zero fecal tolerance policy does not apply to ingesta, therefore, care must be taken to separate fecal material from ingesta or other extraneous materials. Although open to frequent criticism and much

debate in the field, the FSIS training programs identify ingesta and fecal material based on color, consistency, and composition.

Critical control points or limits to prevent and eliminate visible contamination are not defined by the FSIS. Rather, they are left to the plant's hazard analysis and HACCP plan. In conducting HACCP activities, FSIS utilizes ISP 03 procedures 01 (random sample to review regulatory HACCP features) and 02 (examination of entire process, through pre-shipment review, for specific production to determine if the HACCP plan prevented distribution of adulterated product) to determine the monitoring, verification, and record keeping activities of the plant. In case of deviation from a critical limit, unforeseen hazards, or positive salmonella results plant corrective actions will be verified and the plan will be reassessed by the FSIS. During the HACCP verification process, fecal contamination found on a prechiller test is considered a deviation from a critical limit. Each plant's HACCP plan should identify the corrective actions to be followed and assign responsibility in response to a deviation

from a critical limit. These corrective actions should include:

- a. Identification and elimination of the cause(s)
- b. Assurance that the CCP is under control
- c. Determination of measures to prevent recurrence
- d. Prevention of an adulterated product from entering commerce

Carcass contamination with ingesta or fecal material during processing is expected and frequently attributed exclusively to field or plant causes. Most experts agree, however, that both field and plant factors are usually involved. An increase in carcass contamination rate during evisceration can increase not only the reprocessing rate (washouts) but also the likelihood of failing the fecal checks. By the same token, lack of excessive contamination and reprocessing can never guarantee compliance with the zero fecal tolerance regulations.

Consequently, most plants have modified the evisceration process to include additional carcass sprayers, scrubbers, washers, disinfectants (including on-line reprocessing), and house inspectors to be able to comply with the regulations. Plant causes of contamination problems that are either equipment, process control or personnel related are not included in the scope of this presentation and will not be discussed here.

Preslaughter Feed and Water Withdrawal Programs

The type, amount, location, and consistency of digestive tract contents in a broiler at slaughter are directly related to feed and water intake before and the rate of clearance during feed withdrawal. Feed withdrawal time refers to total time of fasting in the house, in transit, and in the plant in

order to empty the digestive system adequately (complete emptying is not necessary and must not be the goal), one must control both factors affecting feed and water consumption and those that affect passage through the digestive system.

It is extremely important to maintain a steady-state feed and water consumption and avoid voluntary fasting as well as meal or binge eating days before feed withdrawal. Factors such as environmental temperature, dietary nutrients, feeding programs (timed or meal feeding), lighting programs (day length), pellet quality, feeder and drinker space, and water availability, quality, and temperature can quite rapidly affect feed consumption patterns of a flock. Feed outages that occur are often due to empty bins (feed delivery problems and empty pans (mechanical breakdowns in the feed delivery system, feed bridging in the bins, etc.) and are probably the most common problems encountered in the field during the last week of grow-out. In all of these cases, return of flock(s) to steady feed and water consumption will not be as quick and can take several days to stabilize before feed withdrawal programs can be implemented consistently. Although the rate of passage through the digestive tract is fairly rapid in poultry, factors such as water intake, environmental temperature, and stresses associated with fasting, catching, confinement, and transportation often slow feed clearance rate.

Since not all the birds eat and drink and void in synchrony, how can we standardize a flock to respond similarly to feed withdrawal? In practice and under a steady-state feed consumption pattern, the

(Continued on page 4)

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Current Concepts In Broiler Production is a publication of the Alabama Cooperative Extension System with the cooperation of the Department of Poultry Science at Auburn University. This publication is designed to provide new and emerging concepts and information to those involved in broiler and breeder production.

Information on management, feeding, and disease will be compiled from research underway at Auburn University, as well as from other sources. New technologies and practices will be highlighted as they become available.

Manure Testing for Fertilizer

Some Alabama livestock producers are faced with mandatory nutrient and waste management planning as a result of impending CAFO (confined animal feeding operations) and AFO (animal feeding operations) regulations. As a result, there will be a greater demand for manure and animal waste testing services. The Soil Testing Laboratory at Auburn University has offered manure testing services since 1991. However, producer demand for these services has been light. On an average annual basis, the lab has run about 80 poultry broiler litter samples, 10 liquid lagoon samples, and 10 other manure samples. In addition, about 50 byproduct and compost samples are tested each year for land application. These numbers are expected to increase dramatically with CAFO regulations.

Sampling, testing, and guaranteeing the analysis are the responsibility of the person who supplies the manure or the person who sells or spreads it for someone else. Landowners should never accept a "free" material or buy manure without first asking for a laboratory analysis from the person who supplied the manure or who distributed the manure.

Broiler Litter

Some manures are more variable than others are. Dry broiler litter is perhaps the most consistent manure produced in Alabama. When it comes out of the house, it has an average fertilizer value equivalent to a 3-3-2 fertilizer. The number of flocks raised on the litter, the type of bedding, and storage and handling facilities can affect the actual analysis of each batch of litter. Producers can do an acceptable job of land application assuming the average analysis of 3-3-2 or 60-60-40

pounds N-P₂O₅-K₂O per ton for fresh litter applied directly from the house (see Extension publication ANR-244). However, if one is buying or selling broiler litter, periodic testing would protect both the buyer and seller and would establish a documented basis for the nutrient management plan. Manure from broiler breeders and layers is handled differently by each producer and integrator. Routine samples taken over a period of time by the producer can establish the variability for each production system.

How Should Manures Be Sampled?

Fresh broiler litter. Take a handful of litter from 15 to 20 spots throughout the house as the litter is being removed. Mix these in a clean plastic bucket and put about 1 quart in a heavy-duty plastic freezer bag to send to the laboratory.

Dry-stacked or stored poultry litter. Using a shovel, dig into the stack 2 to 3 feet and take a handful of litter from within the stack. Repeat this at 10 to 20 spots around the stack. Mix these subsamples in a clean, plastic bucket and put about 1 quart in a heavy-duty plastic freezer bag to send to the laboratory.

Layer and breeder litter/manures. Sample the same as for fresh or stored poultry litter.

Where Can I Send the Sample for Analysis? Soil Testing Laboratory

118 Funchess Hall
Auburn University, AL
36849-5411
Phone: (334) 844-3958
FAX: (334) 844-4001
e-mail: hhbryant@acesag.auburn.edu
Internet homepage:
<http://www.ag.auburn.edu/dept/ay/index.html>

What Should I Expect from a Manure Analysis?

The Auburn University laboratory will give you the following information on the sample as it was submitted:

- Moisture percentage
- Ash percentage, which is the amount of inert material such as soil, that may contaminate the sample—the higher the ash, the lower the fertilizer value
- Dry litter analysis: total N, P, K, Mg, Ca, Cu, Zn, B
- Liquid lagoon analysis: total N, ammonium-N, P, K, Ca, Mg, Cu, Fe, Mn, Zn, B, Mo, Al, Ba, Co, Cr, Pb, Na
- Fertilizer grade expressed as percentage total N-P₂O₅-K₂O

• Total N-P₂O₅-K₂O expressed as pounds per ton or pounds per 1,000 gallons for liquid samples

Certain other analyses can be run on the sample but must be requested. These include total sulfur (S), neutralizing value (lime value), nitrate-nitrogen, and soluble salts. The routine manure analysis is \$25 per sample. Additional analyses are approximately \$5 per analysis.

This information was prepared by Charles C. Mitchell, Extension Agronomist, Auburn University Agronomy and Soils Department and Hamilton H. Bryant, Lab Director, Soil Testing Laboratory. This material was excerpted from Timely Information Bulletin S-03-98.

Research Shorts

Recent research of interest to poultry managers

1. Various, 1999. symposium: Recent advances 'in poultry slaughter technology. *Poultry Science* 78:277-301.

Poultry Science occasionally publishes written proceedings in the journal. These particular symposium proceedings, consisting of six papers, cover topics including slaughter technology, stunning, post-mortem electrical stimulation, and European perspective on poultry slaughter.

2. Czarick, M., 1998. Fewer respiratory problems with better climate management. *World Poultry*, December, 1998, pp. 6-7.

Mike Czarick discusses the importance of consistency of house temperature and airflow on bird respiratory health. He points out

the need for quality ventilation control to reduce stresses that lead to disease.

3. Laster, C.P., F.J. Hoerr, S.F. Bilgili, and S.A. Kincaid, 1999. Effects of dietary roxarsone supplementation, lighting programs, and season on the incidence of leg abnormalities in broiler chickens. *Poultry Science* 78: 197-203.

This paper explores the relationship between several possible contributors to leg problems and season of the year. Although lighting programs did not have a clear effect on leg problems, roxarsone did show some influence on fibrosis of the gastrocnemius tendon and tendon sheath.

in-house feed withdrawal time (with free access to water) is calculated to give those birds in a flock that have just consumed a meal time to clear the crop (usually 4 to 5 hours). This is critical because clearance of feed from the crop requires ample water consumption. If the birds have engorged with feed (excessively full crops can be detected by palpation) before feed withdrawal, then this period needs to be extended to allow crop clearance. In either of these cases, maintenance of a comfort zone is essential in the house (i.e., temperature) to promote bird activity to consume water. On the other hand, if the in-house feed withdrawal time is excessive (this commonly occurs either by design or when the birds voluntarily stop eating before feed withdrawal because of high temperatures) then the birds will consume excessive amounts of litter, feathers, and water.

Field experiences indicate that carcass contamination can take place with either excessively short (less than 8 hours) or excessively long

(more than 12 hours) total feed withdrawal times. The type (feed or litter), amount (full or empty crop and gizzards), consistency (solid or watery), location (upper or lower digestive tract), and color (green discoloration due to bile) of digestive tract contents and the condition of viscera (intestinal shape and integrity, gas formation, mucosal sloughing) assessed, on a flock basis, during processing can be important gauges to evaluate the effectiveness of feed withdrawal programs. Sufficient number of viscera should be evaluated since in the normal variation in any flock of birds some will exhibit signs of a too short or too long feed withdrawal. Frequent or dramatic changes in feed withdrawal programs based on a few extremes in flocks of birds or fecal failure without sound data, should be avoided, especially when the majority of the birds are in an acceptable condition.

Many other live production-related factors, most of which are unique to each complex or company, often contribute to contamination

problems in the plant. These factors must be identified and controlled for consistent and successful implementation of preslaughter feed withdrawal programs.

Examples of these factors are as follows:

- Lack of uniformity in flocks processed, especially the straight-run flocks
- Differences in bird size over time or between the Shifts
- Excessively long plant holding (yard) time and conditions
- Frequent or last minute changes in feed withdrawal and catch schedules
- Communication problems with growers
- Frequent feed outages, especially the last week prior to market
- Lack of synchronization in feed withdrawal and catching in multihouse farms
- Timing of the last feeding and targeted amount of feed left in pans at feed withdrawal
- Policy on fate of leftover feed in pans
- Excessive grower activity in the house during feed withdrawal
- Extremes in house temperatures during feed withdrawal
- Lack of standardization of in-house feed withdrawal time

• Continuation of restricted meal feeding programs or lighting programs until marketing

It should also be pointed out that feed withdrawal programs could also impact carcass contamination rates with foodborne pathogens such as *Salmonella*. The stresses associated with fasting (feed withdrawal), catching, confinement, and transportation before slaughter often increase not only the intestinal shedding of pathogens but also the pathogen carriage rate in live birds due to coprophagy, consumption of litter in the house and intestinal/cecal droppings in crates. Therefore, the potential for microbial contamination of the end product should also be taken into account in carrying out pre-slaughter feed withdrawal programs primarily designed to minimize visual contaminants.

This information was provided by Dr. S. F. Bilgili of the Auburn University Poultry Science Department and is taken from a presentation given at the 1998 Alabama Broiler Industry Seminar.

We would like to compile an updated list of individuals interested in receiving *Current Concepts In Broiler Production* on a regular basis. If others in your organization would like to receive this publication, please fill out this form and return it to:

Joe Hess

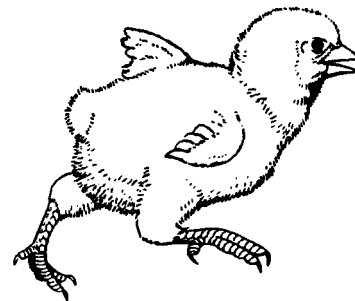
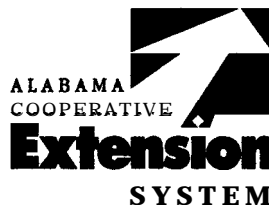
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