

North Carolina Poultry Industry Joint Area Newsletter

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Characterization of *Salmonella* Serotypes, Prevalence, Populations, and Antibiotic Resistance in Commercial Broiler Production

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 Professor and Department Extension Leader

Issue: The growth of animal agriculture over the past few decades has provided a much needed economic boost in many rural areas of the United States. As the poultry and swine industries have expanded, they have also provided steady employment in many areas where employment and economic opportunities were decreasing. However, the continued viability of these two major industries has been questioned in recent years due to the concentration of animals produced in limited areas of the country and their perceived contribution to the pollution of ground and surface waters. More recently, some citizens have questioned the role of these concentrated swine and poultry operations and their waste handling practices in spreading bacterial, viral, and parasitic pathogens that might ultimately affect other animal and/or human populations in the animal production areas. Moreover, the practice of using sub-therapeutic concentrations of antibiotics as animal growth promotants has raised concerns among some scientists, regulatory agencies, and consumer advocate groups over the risk of inducing greater antibiotic resistance in human bacterial foodborne pathogens. Because of these concerns, we conducted a study to characterize the prevalence, populations, serotypes, and antibiotic resistance patterns of different *Salmonella* isolates recovered from poultry litter and feces on commercial broiler farms as a function of environmental factors (i.e., litter pH, temperature, ammonia levels, moisture content, and water activity) and management practices.

What Has Been Done: Composite litter and fecal samples were aseptically collected from three commercial farms (two houses per site) as a function of bird age (1 to 3 weeks, 4 to 6 weeks) and season (summer, winter) and the population of *Salmonella* species enumerated using a 3-tube Most Probable Number (MPN) method. Fifty percent of the litter (n = 24) and fecal (n = 24) samples were *Salmonella* positive. Litter and fecal mean and range of *Salmonella*

populations were 1.70 and <1.0 to 3.6 and 1.57 and <1.0 to 3.1 log MPN/gram of sample, respectively. Fecal *Salmonella* populations were not influenced by season, age, or farm. The highest litter and fecal *Salmonella* populations (3.6 and 3.1 log MPN/gram, respectively) were detected on Farm 2 during the winter months for birds in the 4 to 6 week age category. A total of four different serotypes were isolated from the six broiler houses with *Salmonella* Kentucky and *Salmonella* Heidelberg being the two most common isolates. Both serotypes have been previously incriminated in documented foodborne disease outbreaks. Ninety-six percent (96%), 83%, 78%, 39%, 26%, and 17% of the *Salmonella* isolates were resistant to at least 1, 2, 3, 4, 5, 6 or more antibiotics, respectively. However, none of the isolates were resistant to ciprofloxacin, the antibiotic of greatest concern by human health officials.

Impact: The results of this study indicate that *Salmonella* species populations and their prevalence on commercial broiler farms were not impacted by individual farm, season, or flock age but collectively, they did influence *Salmonella* populations. While we were unable to relate the observed poultry litter properties to *Salmonella* populations, the litter populations on some farms were significantly impacted by season and flock age. Based on data obtained from our grower management surveys, we believe that rearing birds on newer litter and not using litter treatment products may contribute to higher *Salmonella* litter and fecal populations. Efforts to determine the incidence and quantify pre-harvest *Salmonella* populations, such as described in this study, can aid in the development and testing of new and effective on-farm pathogen control strategies. These on-farm control strategies will ultimately lead to a reduction in the flock contamination level entering the processing plant.
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STATE UNIVERSITY, DEPARTMENT OF POULTRY SCIENCE DISTINGUISHED ALUMNI AWARDS, 2004

*Dr. Gerald Havenstein,
Department Head*

Distinguished Alumnus Award

Dr. Robert E. Cook, Raleigh, NC, is a recipient of the NC State Department of Poultry Science's Distinguished Alumnus Award for 2004. This award is given annually to an alumnus of the Department has made outstanding contributions to the North Carolina, national, or international poultry industry. Bob received a B.S. degree in Agricultural Education and his M.S. in Animal Science from West Virginia University. He received his Ph.D. in poultry genetics from NC State University in 1958.

On September 1, 1958, Dr. Cook joined the Department of Poultry Science at the University of Florida at Gainesville. In 1961, he moved to become the coordinator of the

USDA's Southern Regional Poultry Genetics Project at Athens, GA. From 1964-65, he worked exclusively for USDA in Washington, DC, as the Leader of Genetic Investigations. In 1965, he accepted his first university administrative position as the Chair of the Ohio State University Department of Poultry Science in Columbus, OH. In 1969, he became the Head of the Department of Poultry Science at North Carolina State University. During his 16-year tenure as the Head at NC State, he served on numerous state, industry, and national committees, and on a number of Department CSRS Evaluation Teams for the USDA.

In 1985, Dr. Cook was appointed as Assistant Director of the NC Agricultural Research Service. He served in that capacity until 1986 when he was named as Assistant Dean of the NCSU College of Agriculture and Life Sciences. One of his primary duties as Assistant Dean was to work directly with the NC Legislature to address the research and extension needs of the College. Dr. Cook officially retired on September 30, 1992, but he continued to be very actively involved in NC agriculture. In his early retirement years he worked in a number of different capacities for the NC Poultry Federation, and in 1997 was appointed by the Governor of North Carolina to serve as a member of the NC Environmental Management commission. He served tirelessly through 2001 on that Commission to represent agriculture and the perspectives of the NC animal industries.

Dr. Cook has received numerous awards and honors over the years, a few of which include: An Achievement Award from the Ohio Poultry and Livestock Industry, 1969; the Golden Egg Award from the North Carolina Egg Marketing Association, 1974 and 1986; Distinguished Service Awards from the NC Poultry Federation, 1971 and 1983; a Certificate of Merit from Phi Kappa Phi, 1984; the Workhorse of the Year award from the Southeastern Poultry and Egg Association, 1990. He was named a Fellow of the Poultry Science Association in 1981. Bob was also very active in a number of industry and scientific associations, and he served as a Board member and President of the Poultry Science Association in 1976-77, and as a Vice President of the USA Branch of the World's Poultry Science Association from 1984-88.

Dr. Robert Cook, or Bob as he is known to most of us, has been an excellent example to many of us and it is our pleasure to honor him with our NCSU Poultry Science Distinguished Alumnus Award for 2004.

Distinguished Alumnus Award

Mr. Larry Winslow, is the second recipient of the NC State Department of Poultry Science's Distinguished Alumnus Award for 2004. Larry is a native of North Carolina, and received his B. S. degree from the NC State University Department of Poultry Science in 1974. Following graduation he joined Holly Farms as a management trainee in the processing division at Wilkesboro, NC. In 1976, he

joined Country Pride Foods in Gainesville, GA, as a packaging manager. He moved up through the ranks of that organization until he became a Prepack Plant Manager in 1979. In 1982, he joined Perdue Farms as the Prepack Plant Manager at their largest operation in Lewiston, NC. In 1985, he was moved to become a Senior Analyst for Perdue's Southern DELMARVA complex. In early 1986, he was promoted to the position of Production Manager for that Complex, and later that year was named as the Complex Manager for the Company's North DELMARVA Complex. In 1988, Larry was transferred to Perdue's headquarters to become the Vice president and General Manager of the Fresh Poultry Division. He continued in that position until March 1995 when he was promoted to become the Vice President and General Manager of the Cookin Good Division with the responsibility of integrating that \$350 million acquisition into the company. In that capacity he had supervision of 4,800 Perdue associates. In 1996, he was promoted to the position of Vice President of Poultry Operations, Perdue Farms, Inc. That position was responsible for the oversight of the operations of 14 multifunctional production complexes. In 1999, Larry was again promoted to become the Senior Vice President for Supply Chain Management, at Perdue Farms, Inc., with responsibilities for order management, customer service, supply management, transportation, distribution, replenishment center management, and purchasing. He continued in that position until just recently when he retired and moved to the Pinehurst area of North Carolina.

Over the past 30 years, Larry Winslow has been an excellent example of how a talented individual who applies himself can rise to become a real mover and shaker in the poultry industry. It is our pleasure to honor him with our NCSU Poultry Science Distinguished Alumnus Award for 2004.

Distinguished Young Alumnus Award

Charles (Charlie) E. Solomon, Springdale, Arkansas, was named as the recipient of the NC State Poultry Science Department's Distinguished Young Alumnus Award for 2004. This award is given each year to an NC State Alumnus who is under the age of 40 and who has made a significant impact during the early years of his/her career. A 1991 Summa Cum Laude graduate in Poultry Science, Charlie has deep roots in the poultry industry having been raised in Wilkes County, the home of Holly Farms Chicken (now part of Tyson Foods, Inc.). Prior to coming to NC State, he received a BS in Business Administration from Wake Forest University. It is this unique blending of experience, education, and personal characteristics that has served him so well during his meteoric career. Upon graduation from NC State in December of 1991, Charlie joined Tyson Foods, Inc. as a management trainee. He quickly rose to the position of Superintendent of Processing. In 1994 he was promoted to Shift Manager at the Tyson facility in Glen Allen, VA. Approximately six months later he became Plant Manager at the Tyson plant in Boaz.

Shortly thereafter, he was named Manager for the Monroe, NC and Vienna, GA plants. In February 1998, Charlie was promoted to the position of Assistant Manager for Tyson's South Georgia Complex.

In 2000, Charlie took on a new challenge as Senior Product Manager for Tyson's Foodservice Marketing Division. In this role he was responsible for new product development and fully cooked products. He was then named Manager for the Grannis/Broken Bow Complex in Grannis, Arkansas and Broken Bow, Oklahoma, where he was responsible for two processing plants and live production. Within 18 months, he was promoted to Division Production Manager for the New Commodity Division. In this position he oversaw the management of live production and processing for five processing plants. Approximately a year ago he was named Vice President of Operations – Foodservice Poultry. In this capacity he manages live production and processing for six Tyson complexes and five contract-debone facilities.

In a relatively short career, Charlie Solomon has risen to a position of prominence and importance in Tyson Foods. Today, Tyson Foods is the largest provider of protein products on the planet, the world leader in producing and marketing beef, pork, and chicken.

It is our pleasure to honor Charles "Charlie" Solomon with our NCSU Poultry Science Distinguished Young Alumnus Award for 2004.

ODOR CONTROL

Kathy Bunton

Area Specialized Agent, Poultry

The biggest complaint associated with animal farms is odor. As more, and more people move into North Carolina, the number of complaints about odors from farms is going to grow. Even though odor is generally more irritating than dangerous, it often evokes outrage from neighbors. Many growers, who may previously have ranked odor among the least pressing of their problems, are now encouraged to make it a priority. Odor, like flies, is unlikely to be totally eliminated, but it can be controlled.

Good management is the key to controlling odor, so keeping up with new developments is important to all managers. New developments are part technological breakthroughs and part trial and error; and many of them have been discovered by farmers solving real life problems.

The causes and cures of odors on the farm must be known before a plan can be implemented for their control. Growers must know how odors are generated and the factors that produce them, or they cannot know what practices can be used to counter their effects. There are four very important strategies for odor control.

- Of most importance, prevent odor problems from developing in the first place. Locate your facility away from residences. Handle litter in a dry state as much as possible. Cover litter piles, or build a dry stack. Remove all mortalities and spilled feed immediately and dispose of them properly. Incinerators smell worse when burned in the early evening or morning hours because cool air hugs the ground; this is also when your neighbor wants to sit on his back porch after a long day at his off-farm job.
- Alter the unpleasant smells by chemical or microbiological treatment. That is, use collection and storage treatment that can include drying the litter, composting, anaerobic digestion, or disinfection.
- Contain the odors; prevent their escape into the atmosphere by using well maintained caterers, good ventilation equipment and bedding materials that repel moisture.
- Disperse and dilute odors once they do escape into the atmosphere. For example, consider the wind direction, and other weather conditions before applying litter, and plant or take advantage of natural windbreaks, riparian forests or buffers, and injection or other soil incorporation methods to reduce the odor associated with land application. In addition, exhaust fans can be pointed away from other buildings or down to the ground so that stale, odor filled air is deflected into the ground near the housing facility.

FLY CONTROL- IS IT REALLY IMPORTANT???

Jody C. Smith

Area Specialized Agent, Poultry

We all realize the importance of fly control in the poultry industry. Proper manure management is the key for minimizing flies and other pests within poultry houses. As the urban sector collides with the rural population, proper management within poultry houses will aid in reducing neighbor complaints associated with growing poultry. For example, fly control, odor abatement, and air emissions (ammonia, dust, and feathers) are all major contributors to nuisance complaints that farmers and the general public deal with on a daily basis. We may ask ourselves, "Do I really need to know how flies thrive in order to provide proper management?" Well the answer is YES. Basically all flies go through four stages of development: egg, larva, pupa, and adult. Adult females lay 250-1500 eggs during their average three week life span. Eggs are deposited in manure, typically with moisture content of 50% or more because this environment is better suited for larval development. Typically, for house flies the larval and pupil stages may last from 10-12 days under normal environmental conditions.

Fly problems generally intensify in the spring as the environmental temperature begins to rise. Fly development can vary anywhere from 10 to 45 days depending on the temperature. As the flies mature and the outside temperature rises, they begin to disperse from the poultry houses. The effective house fly dispersal range is from 0.5 to 2 miles, yet they have been known to range as far as 10 to 20 miles. Flies generally disperse either across or into the wind with greater nuisance problems detected near the breeding areas.

There are three control practices associated with pest management; cultural, biological, and chemical. Combining these practices is commonly referred to as an Integrated Pest Management program. Cultural practices involve physical activities to decrease the likelihood of a pest problem. Some examples include minimizing the pending of water around poultry facilities, conveying rain water away from the poultry houses, maintaining proper litter moisture within the house, and keeping grass and tall weeds mowed down from around the exterior of each poultry house. The next phase involves the use of biological control agents. These agents include parasitic wasps, mites, and beetles that feed on fly eggs and larvae. These parasites are typically found in a deep-litter style house (layer or breeder houses). The third and probably most popular technique is chemical control. Chemical control involves the use of pesticides that aid in controlling pests that pose health and nuisance problems within the poultry house. This practice is often misused by either applying too much or too little pesticide or applying pesticides that do not target the pest of interest. Pesticide misuse can often lead to pest control failures, increased costs, pesticide residues in meat or eggs, and to the development of insect resistance to the chemical being applied. Proper pest monitoring is also imperative in order to determine the best possible time to apply the pesticide.

In summary, proper pest management is one aspect of your poultry production operation that can be successfully monitored and practices introduced to provide effective control of pests that can be a nuisance to both the grower and his or her neighbors. Not only is the poultry industry undergoing significant changes but the neighborhood you live in is also rapidly changing. Taking a proactive approach to managing your poultry operation is where all producers should be directing their attention.

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Funding Sources:

North Carolina Agriculture Foundation
United States Department of Agriculture

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NOTICE

Poultry Regulations Update

James Cochran, Area Specialized Agent, Poultry

Tuesday, June 7, 2005 at 10:00 at NCDA&CS
Southeastern Agricultural Center & Farmers
Market, 1 mile east of I-95 Exit 14 on US 74 in
Lumberton.

Topics:

1. Discussion of EPA's Air Emissions Agreement.
2. Review of NC third party litter handling "broker" rules and regulations (record-keeping requirements).
3. Update of NC's dry litter NPDES permit process (public hearings) for large poultry farms (125,000 plus broilers, etc.)

Call 910-671-3276 for more information and to register to attend.