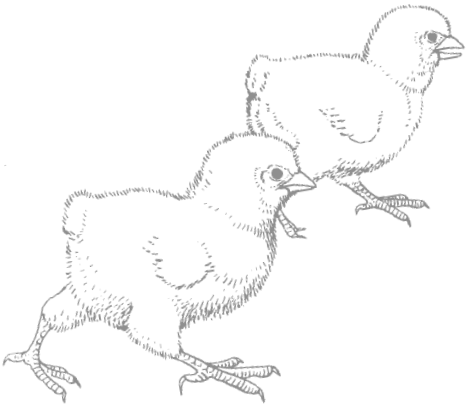
CURRENT CONCEPTS IN Broiler Production FALL 2003

Campylobacter and *Arcobacter* in Poultry

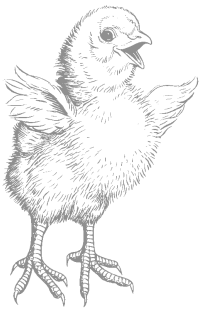


Several bacteria living in the intestinal tract of chickens have adapted to survive and multiply in the gut without producing any disease in the birds. However, some of these bacteria can produce human gastroenteritis in susceptible people. Contamination of chicken meat with these pathogenic bacteria may occur when chickens are processed to produce human food. Most of us are familiar with names such as *Salmonella* and *Listeria,* but the names become less familiar when we hear *Campylobacter* or *Arcobacter,* two closely related bacterial groups frequently associated with chickens.

Campylobacters have been studied extensively due to their association with human diarrhea. Some strains of *Campylobacter jejuni* have also been incriminated in the production of Guillian-Barré syndrome, an acute neuromuscular paralysis, and Reiter syndrome, a reactive arthropathy. The Centers for Disease Control and Prevention, in collaboration with other organizations such as state health departments, has been reporting the level of *Campylobacter* infections in humans through sentinel sites located across the United States. These efforts by the CDC started in the mid-1990s and currently highlight *Campylobacter* as the second most common bacterial pathogen—after *Salmonella*—in humans, with an incidence of 13.8 cases per 100,000 people.

The CDC has also set national health objectives for bacterial diseases. These NHOs represent the highest number of cases health authorities would like to see for particular bacterial diseases. For instance, the current incidence for *Salmonella* is 15.1 cases per 100,000 people, but the NHO for *Salmonella* for the year 2010 is 6.8 cases per 100,000 people. If we achieve the NHO for *Salmonella,* the number of cases for the year 2010 will be less than half the current number. In the case of *Campylobacter,* the NHO for the year 2010 is quite modest, with a reduction of just 1.5 cases from the current number.

Several variables account for the difference. *Campylobacter* produces isolated cases with very few outbreaks. An outbreak is defined as two or more similar cases. *Salmonella,* for example, produces more outbreaks. If we control a few outbreaks that involve several cases, our impact in reducing the overall incidence of cases is larger for *Salmonella* than for *Campylobacter.* We also seem to understand the epidemiology of *Campylobacter* less than that of *Salmonella.* Part of our poor understanding stems for the lack of reliable methodologies for isolation and identification of *Campylobacter.* All these limitations make the control of *Campylobacter* a complicated issue for human health authorities. Fortunately, research is currently underway to elucidate how this disease is transmitted and what intervention strategies can help reduce the overall incidence.



The other bacterial group, *Arcobacter,* is seldom discussed in the United States. Although *Arcobacter* has been linked to human disease, its appearance does not seem to be as important as *Campylobacter.* We seem to

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AUNotes From Joe Hess, *Extension Poultry Scientist*

Two new faculty members have joined the Poultry Science Department courtesy of the Poultry Product Quality and Safety Peaks of Excellence Program. Omar Oyarzabal and Nahed Kotrola, both food safety microbiologists, arrived in Auburn in mid-August. As these individuals get their programs into full swing and interact with existing faculty and staff, Auburn's efforts in the poultry product quality and food safety areas will increase significantly.

Dr. Mike Eckman will retire at the end of the year. Eckman has been an important contact for Alabama's poultry industry for many decades, and his efforts in the poultry health area will be missed.

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understand the epidemiology of *Arcobacter* even less than the already poorly understood epidemiology of *Campylobacter*. In addition, the methodology for isolation is time consuming, and we do not actively search for it.

Baseline studies of bacterial pathogens on poultry carcasses have shown a high incidence of *Campylobacter* since the first studies conducted in 1994-1995. Incidences of 75 to 88 percent with no apparent seasonal variation are the average figures released by these studies. The lack of standard, reliable methodologies for *Campylobacter* isolation has always been discussed when attempting to understand the meaning of these figures. The Food Safety and Inspection Service has requested the National Advisory Committee on Microbiological Criteria for Foods to evaluate methodologies used in the 1994-1995 and 1999-2000 studies. Meanwhile, work continues on the established baseline data and methodologies for application in risk assessment. To date, no performance standards for *Campylobacter* have been set by the U. S. Department of Agriculture.

Studies on the genetic makeup of different *Campylobacter* isolates suggest that up to 20 percent of *Campylobacter* isolated from humans are genetically related to poultry isolates. These findings have been used to link chicken meat as an important reservoir of campylobacters for humans. Yet, larger *Campylobacter* outbreaks are not usually associated with raw poultry—they are typically related to drinking unpasteurized milk or contaminated water.

In chicken flocks, the isolation of *Campylobacter* from colonized live birds does not present major difficulties, making it easy to link the appearance of *Campylobacter* at processing with carriage by live birds. However, the isolation of *Arcobacter* from chicken intestinal contents has been inconsistent and, in most cases, elusive. *Arcobacter* has never been reported from skin and feathers of live chickens. We have a poor understanding of the role of live birds as carriers and potential reservoirs of *Arcobacter*. Yet, by studying *Arcobacter* we may be able to better understand the epidemiology of *Campylobacter*, and we can develop better control strategies to impact both groups of bacteria.

A high degree of genetic diversity is found among *Campylobacter* strains isolated from poultry. For some time, we have believed that a flock is usually colonized by a single genotype. However, flocks raised at different times in the same farm or house may be colonized by different genotypes. Recent studies strongly suggest that more than one *Campylobacter* genotype may in fact colonize the same flock. Few studies have examined the possibility of *Arcobacter* and *Campylobacter* colonizing the same flock. If more than one genotype and more than one related species of *Campylobacter* coexist in the same flock, the colonization of the chicken intestine by *Campylobacter* should be studied further. Some of the food safety research efforts at Auburn University are geared toward a better understanding of the key epidemiological factors affecting the transmission of *Arcobacter* and *Campylobacter* in poultry.

The methodology for isolation of *Campylobacter* from food samples is still evolving. Unlike *Salmonella* or *E. coli, Campylobacter* and *Arcobacter* do not metabolize sugars. Therefore, the use of rapid biochemical testing does not help in identification. Very few physiological tests are used for identification of *Campylobacter* in microbiology laboratories, and most of these tests are time consuming and subjective. Research conducted at Auburn University has shown that *Arcobacter* isolates can be obtained using some of the media formulated for *Campylobacter* incubated at lower temperatures. We have also corroborated previous findings showing that the application of DNA techniques for identification of isolates is a fast, reliable method that can replace some of the laborious physiological tests for identification of *Arcobacter* and *Campylobacter* isolates.

This information was provided by Dr. Omar Oyarzabal of the Poultry Science Department at Auburn University.

Maintaining Paw Quality

The export market for broiler feet (paws) has become a lucrative business for most broiler companies. With eight billion broilers processed yearly in the United States, the number of paws available for export is staggering provided markets are strong. Sales of this product, which were formerly rendered, have added profit to a sales mix looking for any possible good news. One impediment to gaining all possible profits from sales of paws has been inconsistent quality of the finished product. A number of field- and plant-related inputs can affect paw quality negatively.

The monetary worth of paws is affected by both paw size and grade. Size (count/lb. or kg) creates a price differential from small to large, with the largest paws (jumbo) bringing the highest price. While paw size will be driven by bird size in a given complex and can't be changed for the paw market, grade considerations may be controlled to increase profits. Although grade and inspection factors are clouded somewhat by China's request for USDA inspections of paws, general grade factors include shank pigmentation, ulcers, calluses, bruises, and bone fractures.

Ulcers and calluses can be influenced by live production conditions and practices. Since some of these lesions are trimmable or may be associated with the outer layers of the skin only (removed during

scalding), quality improvements are economically possible. The most obvious contributor to footpad ulcers is substandard litter quality. Litter management is an ongoing struggle for growers and service personnel, involving ventilation, evaporative cooling, and drinker management. Remember, prevention of wet litter is easier than drying litter once it has become wet. As the birds grow, they cycle increasing amounts of moisture through the litter. If litter is wet, it becomes harder and harder to dry as the birds age. Litter treatments that trap ammonia will help reduce footpad burns, although most treatments do not last for the life of the flock. Broiler house equipment with sharp edges or protruding wires that may cut birds' feet and litter materials with sharp edges may contribute to paw problems by opening a wound, leading to a longer-term sore.

Nutrition can influence this aspect of paw quality as well. Footpad burns have been reported from houses with relatively dry litter. There are some indications that sticky, caustic, indigestible carbohydrates from plant protein sources (primarily soybean meal) contribute to footpad problems even if litter moisture is within acceptable levels. A number of feed enzymes are on the market that may help reduce this effect if footpad burns are a problem with dry litter. These enzymes generally improve bird performance as well as footpad quality, improving payback for including them in the feed. Auburn research has shown that high protein feeds lead to more footpad burns. High levels of potassium (generally from high soybean meal feeds), magnesium, or sodium can contribute to wet litter by increasing water consumption. Several mycotoxins increase water consumption, wet litter production, and could be a factor in footpad burns.

Deficiencies of biotin, although not common, are associated with lesions of the skin of the foot. Biotin has been used for decades to treat broiler foot problems with mixed success. Recently, the cost of biotin has moderated such that additions of biotin as a treatment are cost effective. Added biotin in the water or feed may be warranted if paw downgrading is a real problem. Add-on treatments such as this will not cover up larger problems such as poor litter management.

Bruising of the foot and bone fractures occur most commonly during catching and transport. Constant attention must be paid by catching crews to ensure optimum bird handling practices are followed. If foot bruising is a recurring problem, transport cages and live-hang procedures should be reviewed. Greenish gray pigmentation on the top of the foot and the shank is a common downgrading issue. This problem is associated with genetics and will be strain associated. Research at Auburn has demonstrated that pigmentation is more pronounced in broiler females than in males. There is nothing known at this date in the field or plant that can reduce the appearance of this pigmentation.

This information was provided by Joe Hess and Sarge Bilgili of Auburn's Poultry Science Department.

New Standards for Organic Chicken

The USDA's National Organic Program guidelines went into effect October 21, 2002. Previously, many states and certifying groups maintained varying standards of what constituted organic food. This new federal standard levels the playing field and provides consistency. The standards apply to all food except that grown by small farmers who produce less than $5,000 of organic products a year.

Any poultry intended for sale as an organic product must be raised under strict organic guidelines. The following are excerpts from USDA's organic standards.

- Organic livestock must be maintained under continuous organic management.
- Organic producers must maintain records sufficient to preserve the identity of stock.
- Feed, including forage, must be organically produced; however, using manure as fertilizers could be a negative attribute.
- Organic poultry must be grown without hormones, antibiotics, pesticides, chemical fertilizers, irradiation, or bioengineering.
- Organic animals must be treated humanely.
- No drugs, growth promoter, or antioxidants can be given unless they are truly organic and must be justified. Range rearing may reduce the challenges if a rotation program is used.
- Birds must have outside access.

Organic foods receive different labeling according to their percentage of organic ingredients.

- 100% Organic
- Organic—95% organic ingredients
- Made with organic ingredients—70% to 95% organic; no USDA seal
- Less than 70% organic—no USDA seal

Organic chicken has a definite place in poultry marketing, but it will only take a small percentage of the market with current consumer preferences.

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This information was provided by R.A. Voitle of Auburn's Poultry Science Department.

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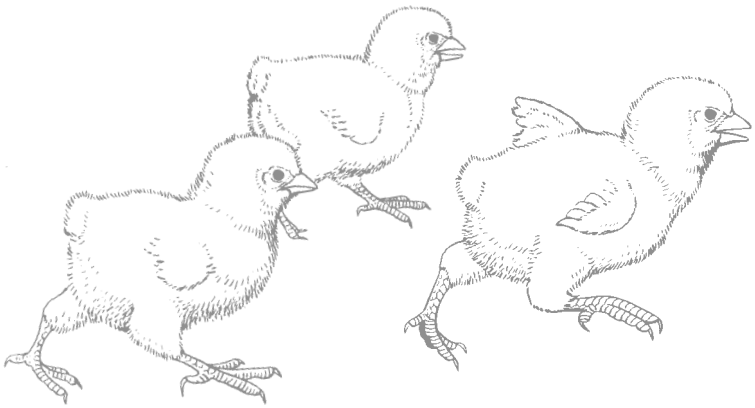
Setting the Standards. Jan. 2003, Food Systems Insider.



Research Shorts

Recent Research of Interest to Poultry Managers

C.Z. Alvarado and A.R. Sams, 2003. Injection marination strategies for remediation of pale, exudative broiler breast meat. *Poultry Science* 82:1332-1336.

Pale, soft, and exudative (PSE) meat has poor water holding capacity and cooking losses. High phosphate salt solutions injected into breast fillets helped increase pH and reduce cooking losses in affected fillets.

E. Gonzales, N. Kondo, E.S.P.B. Saldanha, M.M. Loddy, C. Careghi, and E. Decuypere, 2003. Performance and physiological parameters of broiler chickens subjected to fasting on the neonatal period. *Poultry Science* 82:1250-1256.

Body weight at 42 days decreased linearly by holding broilers off feed for up to 36 hours. Birds held off the longest showed body weight reductions of 5 percent at market. Birds fasted for the longest periods showed shortened intestinal tracts and reduced villi length, indicating that early restriction affected gut function.

J. Ash, C. Novak, and S.E. Scheidler, 2003. The fate of genetically modified protein from roundup ready soybeans in laying hens. *Journal of Applied Poultry Research* 12:242-245.

An immunoassay test was used to determine whether genetically modified proteins from roundup ready soybeans were incorporated into meat and eggs of laying hens. Assays from soybeans, soybean meal, and finished feeds were positive for the GM protein, while meat, eggs, liver, and feces were negative. It appears that the hen's digestive system broke down protein structure to the point that GM proteins were no longer an issue.

M. Shapiro, 2003. Ruling the Roost. *Smithsonian* 34(4):19-20.

This article discusses the lives of the butter and egg men who shipped eggs from the Midwest to New York City in the 1930s-40s. It is an interesting look at early poultry marketing efforts and the profits that were available to the middleman at that time. Although this means little in today's poultry marketing schemes, it can be instructional to occasionally revisit your roots.

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