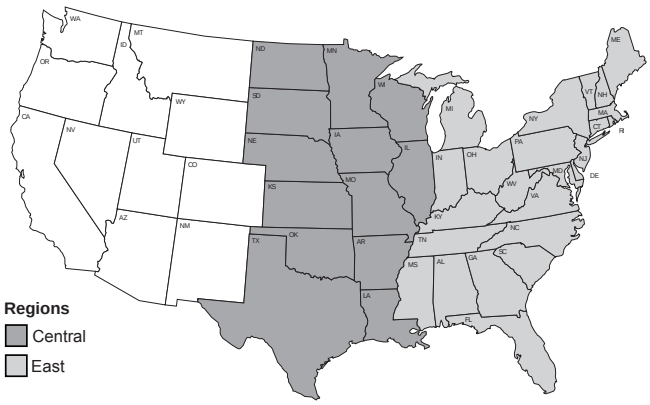
E. coli Peritonitis on Breeder-Chicken Farms in the United States

Breeder-chicken farms consist of primary breeders, whose progeny are breeding birds, and multipliers, whose progeny are broilers and table-egg layers. Breeder farms provide the genetics for the poultry industry, and the birds on these farms are very valuable. Therefore, disease can have a substantial economic impact in these flocks.

Escherichia coli are normal inhabitants of intestinal tracts and can be found in chicken feces, litter, dust, and rodent droppings. It may also contaminate feed and water (Barnes, 2008). *E. coli* is the most common bacteria recovered from birds affected with peritonitis, an infection of the lining of the abdominal cavity (Barnes, 2008; Beckman, 2006). *E. coli* is frequently a secondary infection; tissues damaged by viral infections are susceptible to secondary bacterial infections. Early-production *E. coli* peritonitis in breeder flocks is often related to the onset of egg production and can be secondary to respiratory disease. Late-production infections are often related to vent trauma.

The USDA's National Animal Health Monitoring System (NAHMS) conducted a study of U.S. breeder-chicken farms in 2010. A total of 482 breeder farms located in the Central region (n=107) and East region (n=375) of the United States participated in the study (see map below). The 482 farms consisted of 291 meat-type (broiler) multiplier farms, 117 meat-type (broiler) primary breeder farms, 61 table-egg-type multiplier farms, and 13 table-egg-type primary breeder farms. The study focused primarily on breeder-farm biosecurity.

Poultry 2010 Regions*



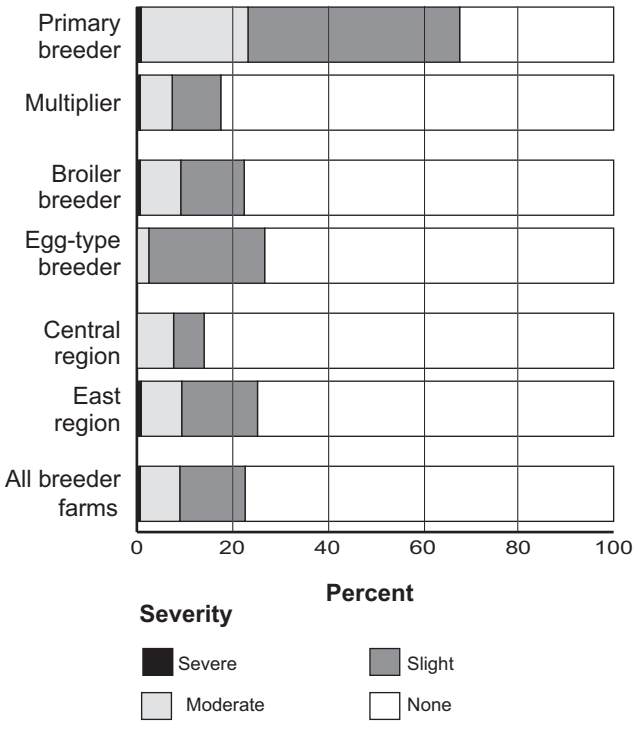
*Companies reported farm location by region, not by individual State.

Occurrence of *E. coli* peritonitis

Breeder farms placed hens in the laying house at 20.9 weeks of age and removed them at 64.1 weeks of age, on average. Breeder farms reported the occurrence and severity of *E. coli* peritonitis in the last completed flock: 22.7 percent of all breeder farms had a slight, moderate, or severe problem in the last completed flock. About two-thirds of primary breeder farms (67.7 percent) had a slight, moderate or severe problem with *E. coli* peritonitis in the last completed flock (see figure below).

Although data regarding specific causes of mortality were not collected, cumulative flock mortality to 60 weeks of age increased with degree of *E. coli* peritonitis problems. Flocks with moderate/severe *E. coli* peritonitis problems had an average mortality of 16.4 percent compared with 13.6 and 9.8 percent for flocks with slight and no problems, respectively.

Percentage of breeder farms by severity of *E. coli* peritonitis problem in the last completed flock, and by demographic



Risk factors associated with *E. coli* peritonitis

Peritonitis in breeder chickens is most often associated with the onset of sexual maturity and egg production. Body weight, flock uniformity, lighting, feed allocation, temperature, and ventilation are important factors in the disease (Merck 2010). These factors, however, were not addressed in the NAHMS study, which focused primarily on biosecurity.

The following analysis identifies biosecurity-related risk factors for *E. coli* peritonitis relating to farm surroundings, farm/house characteristics, human traffic, birds and other animals on the farm, and bird/egg movement and transport. For the risk factor analysis, farms with *E. coli* peritonitis in the last completed flock were compared with farms with no *E. coli* peritonitis problem in the last completed flock. Each factor was evaluated individually and adjusted for farm type (primary breeder vs. multiplier); factors with a p-value ≤0.1 were further evaluated in a multivariable logistic regression model via a backward elimination process (see table below). Results are presented as odds ratios. The odds ratio is the likelihood (odds) of a farm having *E. coli* peritonitis in the last completed flock for farms with the factor compared with farms without the factor.

Model-predicted percentage of breeder farms with *E. coli* peritonitis in the last completed flock and odds ratios, by farm characteristic

Characteristic	Model-predicted pct. with *E. coli* peritonitis	Odds ratio[1]	P-value[1]
History of respiratory disease in same flock[2]			
Yes	56.4	9.4	<.001
No	19.7	referent	
Spiking males introduced in last 12 months			
Yes	22.8	3.9	.006
No	10.7	referent	
Municipal water source for birds' drinking water			
Yes	12.6	.30	.002
No	24.1	referent	
Spray tires of vehicles entering the farm[3]			
Yes	13.2	.22	<.001
No	31.8	referent	
Chicken houses have anteroom separating "outside area" from "inside area"			
Yes	17.9	.30	.002
No	33.4	referent	

[1] Adjusted for farm type (primary breeder vs. multiplier).

[2] Flock had at least a slight problem with one or more of the following diseases: *Mycoplasma synoviae, Mycoplasma gallisepticum*, infectious laryngotracheitis, Newcastle disease, infectious bronchitis, infectious coryza, avian influenza.

[3] Includes feed-delivery vehicles, service tech/veterinarian, catch/vaccination crews.

Farms with a history of respiratory disease in the last completed flock had an increased risk of *E. coli* peritonitis. *E. coli* is a common secondary infection of the respiratory tract and may spread from there to the peritoneal cavity (Barnes, 2008).

Introducing spiking males to a flock—primarily a practice used by broiler breeders—stimulates breeding activity through competition between the young, spiking males and established males. Farms that introduced spiking males in the 12 months prior to the survey were more likely to experience *E. coli* peritonitis in the last completed flock (OR=3.9). This practice may increase the stress level of birds in the flock.

Using a municipal water source for birds' drinking water was associated with a reduced risk of *E. coli* peritonitis. Chlorination of municipal water may reduce *E. coli* contamination.

Biosecurity measures help prevent the introduction of disease pathogens that may secondarily predispose birds to *E. coli* peritonitis. Two biosecurity measures were negatively associated with *E. coli* peritonitis: 1. Providing an anteroom that separates "outside area" from "inside area." 2. Spraying tires of vehicles entering the premises.

Summary

E. coli peritonitis is a common problem on breeder farms. Flock mortality increases with severity of *E. coli* peritonitis. Flocks experiencing respiratory disease and farms that introduce spiking males have an increased risk of disease, while farms that use a municipal water source for birds' drinking water have a reduced risk of disease. Biosecurity measures are important for preventing the introduction of disease pathogens, which may lead to secondary *E. coli* infections. Management of the poultry-house environment (e.g., temperature, lighting, ventilation, etc.) is also important for preventing *E. coli* peritonitis but was not addressed by this study.

References

–Barnes J. 2008. Diseases of Poultry, 12th ed. Blackwell Publ., Ames, IA. 706–707.
–Beckman B. 2006. Current perspectives on peritonitis. Available at: http://www.zootecnicainternational.com/article-archive/veterinary/909-current-perspectives-on-peritonitis.html. Accessed July 16, 2012.
–Kahn C, ed. 2010. Egg peritonitis. In: Merck Veterinary Manual 10th ed. p 2493.

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