Campylobacter on U.S. Swine Sites—Antimicrobial Susceptibility

Background

In 2006, there were 17,252 cases of laboratory-diagnosed foodborne illnesses in humans attributed to 10 organisms under surveillance by the Centers for Disease Control and Prevention (CDC) in 10 States.[1] *Campylobacter* was the second most common bacterial pathogen identified, accounting for 33.1 percent of cases. However, *Campylobacter* from pork was not frequently a cause of foodborne illnesses.[2] [3]

Most human illness from *Campylobacter* is attributable to *C. jejuni. Campylobacter* causes fever, abdominal cramping, and diarrhea in humans and can lead to Guillain-Barré syndrome and reactive arthritis.[4]

Foodborne transmission of *Campylobacter* can occur through fecal contamination of food, water, and carcasses at slaughter. Although *Campylobacter* can be considered normal flora in livestock, it may cause diarrhea in young pigs. Both *C. jejuni* and *C. coli* can be shed by asymptomatic carriers through the feces; however, *C. coli* is the predominant species present in pig intestines.[5]

Campylobacter on U.S. swine sites

In 2006, the USDA's National Animal Health Monitoring System (NAHMS) conducted a study on swine health and management practices from a random sample of swine production sites with 100 or more pigs in 17 States.* These States represented approximately 94 percent of U.S. pig inventory and 94 percent of U.S. pork producers with 100 or more pigs.

As part of Swine 2006, fecal samples were collected from pen floors on 135 sites. On each site, up to 15 fecal samples were collected from pens containing grower/finisher pigs and cultured for *Campylobacter*. From September 5, 2006, through March 15, 2007, 1,951 samples were cultured for *Campylobacter*.

Overall, at least one sample was found culture-positive for *Campylobacter* on 98.5 percent of sites, 88.5 percent of barns, and 64.8 percent of pens. Additionally, 51.6 percent of samples were culture-positive. Of these isolates, 92.2 percent (928) were identified as *C. coli*, 0.4 percent (4) as *C. jejuni*, and 7.4 percent (75) died before speciation.

Antimicrobial susceptibility

The 932 *C. coli* and *C. jejuni* isolates were tested for resistance to a panel of 9 antimicrobial drugs: azithromycin, ciprofloxacin, clindamycin, erythromycin, florfenicol, gentamicin, nalidixic acid, telithromycin, and tetracycline. Resistance break points used by the National Antimicrobial Resistance Monitoring System were used to classify isolates as susceptible, intermediate, or resistant.[6]

Of the four *C. jejuni* isolates, one was resistant to azithromycin, clindamycin, erythromycin, and telithromycin, and all four were resistant to tetracycline. Due to the small number of *C. jejuni* isolated, the remainder of this information sheet focuses on *C. coli*.

Resistance to tetracycline was most common (82.9 percent of isolates). Nearly 60 percent of isolates were resistant to erythromycin and azithromycin (59.4 and 59.1 percent, respectively). All *C. coli* isolates were susceptible to florfenicol. Table 1 depicts the resistance of all isolates to the nine antimicrobial drugs.

Table 1. Number and Percentage of *C. coli* Isolates Resistant* to the Following Antimicrobials

Antimicrobial	Number	Percent
Tetracycline	769	82.9
Erythromycin	551	59.4
Azithromycin	548	59.1
Clindamycin	328	35.3
Telithromycin	327	35.2
Nalidixic acid	34	3.7
Ciprofloxacin	31	3.3
Gentamicin	1	0.1
Florfenicol	0	0.0

*Intermediate isolates were classified as not resistant.

Table 2 depicts the resistance patterns from *C. coli* isolates. Resistance to tetracycline alone was most common (29.6 percent of isolates). Resistance to azithromycin, clindamycin, erythromycin, telithromycin,

* **States**
Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Carolina, Ohio Oklahoma, Pennsylvania, South Dakota, Texas, and Wisconsin.

and tetracycline was seen in 20.7 percent of isolates. Overall, 8.8 percent of *C. Coli* isolates were susceptible to all antimicrobial drugs tested.

Table 2. Number and Percentage of *C. Coli* Isolates by Antimicrobial Resistance Pattern

	***C. Coli* Isolates**	
Resistance Pattern*	**Number**	**Percent**
Susceptible to all antimicrobials	82	8.8
Tetracycline	275	29.6
Azithromycin, clindamycin, erythromycin, telithromycin, tetracycline	192	20.7
Azithromycin, erythromycin, tetracycline	120	12.9
Azithromycin, erythromycin, telithromycin, tetracycline	79	8.5
Azithromycin, clindamycin, erythromycin, tetracycline	67	7.2
Azithromycin, clindamycin, erythromycin, telithromycin	39	4.2
Other	74	8.1
Total	928	100.0

*Intermediate isolates were classified as not resistant.

Table 3 shows the multidrug resistance of the 928 *C. coli* isolates tested. Overall, 91.2 percent of *C. coli* isolates were resistant to at least one antimicrobial drug, and 61.6 percent were resistant to more than one antimicrobial drug. The highest percentage of isolates (29.6 percent) were resistant to only one drug. Eleven *C. coli* isolates (1.2 percent) were resistant to 7 drugs.

Table 3. Number of Antimicrobials by Number and Percentage of *C. coli* Isolates Showing Resistance*

Number of Antimicrobials	**Number *C. coli* Isolates**	**Percent *C. coli* Isolates**
0	82	8.8
1	275	29.6
2	23	2.5
3	154	16.6
4	188	20.3
5	193	20.8
6	2	0.2
7	11	1.2

*Intermediate isolates were classified as not resistant.

Conclusions

The prevalence of *C. jejuni* on swine sites remains very low, while the prevalence of *C. coli* is expectedly high. Resistance of *C. coli* to antimicrobial drugs on swine sites, particularly tetracycline and erythromycin, is an issue of concern.

References

1 Centers for Disease Control and Prevention. 2007. Preliminary FoodNet data on the incidence of infection with pathogens transmitted commonly through food-10 States, 2006. *MMWR Morb Mortal Wkly Rep*; 56:336-339.

2 Centers for Disease Control and Prevention. 2006. Surveillance for foodborne-disease outbreaks-United States, 1998-2002. *MMWR*; 55(SS-10):28-29.

3 Duffy, E.A., K.E. Belk, J.N. Sofos, G.R. Bellinger, A. Pape, and G.C. Smith. 2001. Extent of microbial contamination in United States pork retail products. *J Food Prot*; 64(2):172-178.

4 Beers, M.H., and R.B. Berkow (eds.). 1999. In: The Merck Manual 17th ed. Merck Research Laboratories, Division of Merck & Co., Inc., Whitehouse Station, N.J. p. 1174-1175.

5 Cliver, D.O., and H.P. Riemann. 2002. Foodborne Diseases 2nd ed. Academic Press, San Diego, CA. p. 106-108.

6 http://ars.usda.gov/SP2UserFiles/Place/66120508/NARMS/animal_campy/CampyMICdistribution-2006.pdf

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