New Study Adds to Antibiotic Debate

A major study recently completed for the Food and Drug Administration (FDA) has found that diarrheal illness can often be caused by the consumption of chicken contaminated with bacteria. It is likely to figure into the debate whether to ban the use of antibiotics in animal feed because it appears to provide scientific evidence that Congress has long sought. The study, which was conducted by researchers in Seattle, addresses a narrow but important part of the antibiotic debate and will likely be used by advocates of a ban to challenge congressional opposition that has kept the issue in regulatory limbo for 6 years. FDA recently made the report available, although it is still undergoing peer review by government scientists.

FDA proposed a ban in 1977 based on considerable data and with the support of many scientists. Congress, however, objected on two grounds. First, that there was no direct evidence that human illness is related to the use of antibiotics in animal feed. And second, that there were no good epidemiological data showing that bacteria in meat—whether they are resistant to antibiotics or not—are a widespread public health problem.

The study published in the 6 September issue of the *New England Journal of Medicine* is widely regarded as establishing a link between the use of antibiotics in cattle feed and human illness. That study, conducted by Scott A. Holmberg at the Centers for Disease Control and colleagues, tied 18 cases of diarrheal illness to antibiotic-resistant bacteria in beef. The cattle had been fed tetracycline (*Science*, 5 October, p. 30; 12 October, p. 144).

Holmberg's study did not address the broader question of how much human illness is caused by consumption of meat contaminated by bacteria, however. That was the focus of the new study sponsored by FDA. The study, carried out by Seattle researchers, found that half the cases of diarrheal illness among local residents were caused by the consumption of chicken contaminated by bacteria. Although other investigations have tied enteric disease to the consumption of bacterially tainted food, the Seattle study was significantly different in design and scope. In previous studies, investigators established the cause of illness by beginning with the victim and tracing backward in time to discover the cause. The Seattle study, however, simultaneously surveyed contaminated chicken sold at grocery stores and monitored the incidence of enteric illness among 300,000 members of a local health maintenance organization for a period of 20 months. This experimental design is believed to provide more reliable data to determine cause-effect relationships.

Poultry was the the most frequent source of bacterial contamination, the report says. Investigators found almost one out of every four chickens sold was contaminated by bacteria. Although *Salmonella* is usually considered the most common contaminant in chickens, the investigators found that poultry products were four times more frequently contaminated by *Campylobacter jejeuni*.

Campylobacter jejeuni "does appear to flow from chickens to man via consumption of poultry products," according to the study, which was headed by Charles Nolan, a physician and infectious disease specialist at the Seattle–King County health department. The bacteria caused illness at a rate of 100 per 100,000 persons, 2.5 times as often as the rate of illness caused by *Salmonella*. Individuals who ate chicken had a 20 percent greater risk of contracting enteritis caused by *C. jejeuni* than those who did not. The infections by *C. jejeuni* and *Salmonella* have identical symptoms but clinically are treated differently.

Investigators identified *C. jejeuni* as the culprit based on several criteria: about half of the 225 *C. jejeuni* victims had eaten chicken before the onset of illness, and bacteria isolated from victims and chickens were similar according to serological, genetic (plasmid), and other tests. Two other research groups have reported that enteritis was caused frequently by chicken contaminated by *C. jejeuni*.

The Seattle study also found that the *C. jejeuni* isolated from chickens and patients showed the same pattern of resistance to antibiotics. Tests revealed that 30 percent of the isolates from animal and human sources were resistant to tetracycline. Tetracycline is now fed to about 30 percent of the nation's poultry. However, the study did not investigate whether the chickens from the Seattle area had been fed antibiotics to promote growth because this was beyond its scope, Nolan says.

The study fills in a gap of information that Congress has cited for the past 6 years in opposition to a ban on antibiotics in animal feed.

Although a second study by Holmberg of CDC reported that drug-resistant *Salmonella* can be more virulent than a drug-sensitive strain, the Seattle researchers did not speculate on the clinical significance of drug-resistant *C. jejeuni*. The researchers noted that people were just as likely to contract a drug-resistant *C. jejeuni* strain as one that does respond to antibiotic therapy. Tetracycline is not the drug of choice to treat most patients with *C. jejeuni*.

Researchers were surprised to learn that two other food sources carried a slightly higher risk of causing *C. jejeuni* infections. According to the study, persons eating turkey products, such as pressed turkey, or fresh mushrooms were about 1.5 times as likely to become infected with *C. jejeuni* as individuals not eating them. Fresh mushrooms are grown commercially in high concentrations of manure from animals, including chickens. (Sources of the other half of the *C. jejeuni* cases were traced to travel to a foreign country, consumption of raw milk, contact with other people sick with enteritis, and contact with pets with diarrhea, particularly dogs.)

The study's findings suggest ways to reduce *C. jejeuni* bacteria in poultry. The researchers found, for example, that bacterial counts were lowest on Mondays, when grocery store display cases were cleanest and meat was freshest. But in terms of the antibiotic debate, the findings are likely to be used by FDA to answer past congressional demands for more data linking health problems to bacteria in meat.—**MARJORIE SUN**