

Drug resistance link from animal to man

In the three decades that low levels of antibiotics have been added to the feed of American livestock to spur growth, many scientists have voiced concern that the practice poses a health threat to humans. They fear such small, chronic doses of the drugs also foster the growth of bacteria immune to these important medical weapons (SN: 6/30/79, p. 422). But the link from grain bin to human disease has been extremely difficult to confirm and is still much debated.

This week, scientists from the Centers for Disease Control (CDC) in Atlanta published a 12-year survey of disease outbreaks that they say offers new evidence that animal-to-man transmission of *Salmonella* resistant to antibiotics is responsible for "an important fraction" of the human infections reported. Raw milk and undercooked beef, pork and poultry are thought to serve as the chief dietary sources of *Salmonella*.

Scott Holmberg and CDC colleagues investigated 52 outbreaks of infection with the intestinal bacteria *Salmonella* between 1971 and 1983, in search of the source of infection. It was a quest fraught with complications. Tracing a given hamburger to the steer it came from is like trying to trace the travels of a penny from your pocket — "nearly impossible," Holmberg says. But from the 38 outbreaks of infection whose source they could pin down, food animals were responsible for 18, and more than half of those infections involved strains of bacteria resistant to antibiotics.

The findings indicate that intestinal bacteria immune to antibiotics "frequently arise from food animals and can cause serious infection in humans," the scientists say. One of the 1983 outbreaks was specifically traced to a herd of cattle fed low levels of antibiotics, and offers strong support, Holmberg says, of a phenomenon investigators have long suspected. Details of the case will be published within the next few weeks, he says.

Salmonella infections can range from innocuous to deadly, depending on the particular strain and the immune status of the infected patient. From among the 2 million to 4 million U.S. infections of the bacteria reported each year, between 1,000 and 2,000 patients die, Holmberg estimates. Between 20 and 30 percent of all cases of *Salmonella* infections involve bacteria resistant to antibiotics. In the cases reported to the CDC, the fatality rate was 4.2 percent among patients infected with antibiotic-resistant strains of *Salmonella*, compared to 0.2 percent among those whose disease was linked to antibiotic-sensitive strains.

Resistant strains may be particularly dangerous, Holmberg says, for patients

who are already undergoing needed treatment with antibiotics such as penicillin or tetracycline for unrelated infections. Such broad spectrum antibiotics tend to temporarily wipe out harmless colonies of bacteria in the intestine that would normally help keep a *Salmonella* infection in check. In addition, the overuse of antibiotics to treat a myriad of other human infections is widely thought to contribute to the increasing prevalence of drug resistance among all types of bacteria.

Since 1970, the Food and Drug Administration (FDA) has attempted several times to severely restrict most uses of penicillin and tetracycline as additives to animal feed, but has been forced by Congress to forgo such regulation, at least until more scientific data on the topic have been

compiled. Several large studies are expected to be completed within the next year, according to the FDA.

The FDA estimates that nearly half of all the antibiotics used in the United States each year go into feed for farm animals. All turkeys, at least 30 percent of chickens, 80 percent of swine and veal calves and 60 percent of feedlot beef cattle consume the drugs for some portion of their lives. The National Cattlemen's Association asserts that "the efficient production of beef requires the use of antibiotics," not only to speed the animals' growth, but also to prevent disease. FDA and industry estimates of the costs consumers would face if the drugs were withdrawn from feed range from \$15 million to \$3.5 billion.

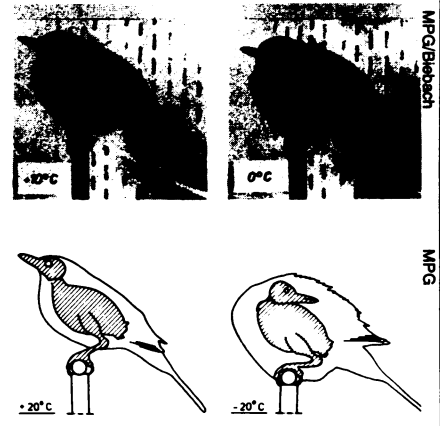
— D. Franklin

Stay-at-home blackbirds cope with cold

European Blackbirds, like the American Robin, are among the "partial migrants" of the bird world. When the days get shorter in the autumn, some blackbirds in southern Germany go to southern France, Spain or North Africa, while others brave the cold and remain in their regular breeding grounds. Herbert Biebach of West Germany's Max Planck Gesellschaft (MPG) investigated how the stay-at-homes survive, and the costs and benefits of their choice.

ness of the insulation; it decreases the ratio between heat-shedding surface area and volume as their shape approaches that of a sphere; and this downy ball provides a refuge for poorly insulated body parts such as the beak, head and legs.

Thanks to these conservation measures, the birds are able to survive at -30°C and even colder temperatures, and maintain their normal daytime working temperature as long as they can eat



Biebach, a zoologist at the MPG's Institute for Behavioral Physiology in Seewiesen, near Munich, found that the birds faced two problems: cold and a reduced food supply. Studies in a climate-controlled chamber revealed that the birds cope with cold in two ways. First, they reduce their energy demand by lowering their nighttime body temperature. As the birds' fat reserves get lower, they reduce their night body temperature from a normal 41°C to 39°C . Second, they improve their insulation. The colder it gets, the more they "fluff up" their feathers, until, at -30°C , they are transformed into feathery balls.

This conserves heat in three ways: It increases the thickness and thus effective-

ness of the insulation; it decreases the ratio between heat-shedding surface area and volume as their shape approaches that of a sphere; and this downy ball provides a refuge for poorly insulated body parts such as the beak, head and legs.

enough to maintain adequate fat reserves. "The critical factor for the birds," says Biebach, "is less the conservation of heat than the production of heat, which has to be about five times as high at -30° than at $+20^{\circ}$. Or, to put it another way: The real threat [to the birds] is not freezing, but starving."

Despite the risk, the stay-at-home strategy has its rewards, at least in mild winters. Survivors stake out territories before the migrants return, and thus get a head start in mating and nesting. The migrants, of course, profit in harsh winters. This "two-track" strategy, with its division of risk, improves the species' odds of survival.