

# Waterways Carry Antibiotic Resistance

Bacteria that have developed immunity to antibiotic drugs pose a large and growing threat to the success of modern medicine. Three studies now find that U.S. rivers have become a major reservoir of such microbes.

Reported at the American Society for Microbiology (ASM) meeting this week in Chicago, the studies demonstrate that antibiotic resistance is literally streaming across the nation.

Ronald J. Ash of Washburn University in Topeka, Kan., sampled waterborne bacteria from 15 U.S. rivers, including the Mississippi, the Ohio, and the Colorado. He tested the microbes' resistance to ampicillin, a synthetic penicillin.

At each of the 21 sites examined, ampicillin failed to kill between 5 and 50 percent of the bacteria. Though most of these bacteria are not types usually linked to disease, Ash notes that any bacterium can transfer its drug-resistance genes to pathogenic organisms in either the environment or a host.

Finding antibiotic-resistant bacteria in rivers is hardly novel. "What has not been appreciated is the extent of contamination," Ash says.

Because he found resistant bacteria both near major cities and in remote areas, Ash says, "I can't say that I see any patterns." In fact, he expected the water near New Orleans, at the end of the Mississippi, to be loaded with resistant bac-

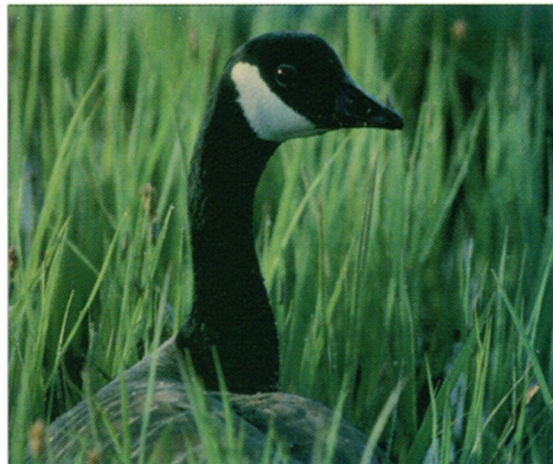
teria, but they weren't particularly plentiful there.

Antibiotic resistance is widespread but also unpredictable in the Rio Grande, finds Keith L. Sternes of Sul Ross State University in Alpine, Texas. He focused on enterococcus bacteria resistant to vancomycin. This drug is often a last line of defense against potentially lethal infections, such as those caused by *Staphylococcus aureus* bacteria that have become immune to the penicillin family of drugs (SN: 4/24/99, p. 268).

Sternes tested water from the Rio Grande River's headwaters in Colorado down to Presidio, Texas, at intervals of 50 miles or less. Though resistance was most prevalent downstream of El Paso—detected in up to 30 percent of the bacteria there—it was not always highest adjacent to big cities or ranches.

John Bennett of Clarke College in Dubuque, Iowa, found plenty of antibiotic-resistant bacteria—including pathogenic *Escherichia coli* and *Salmonella*—while testing 95 percent of the permanent streams in rural Dubuque County. He zeroed in on resistance to tetracycline, a drug widely used for livestock and people.

In some waters, just 1 percent of the



Wild birds harbor and may transmit drug resistance.

bacteria proved immune to tetracycline. In others, 30 to 40 percent resisted the drug. Moreover, Bennett found that greater than 80 percent of the tetracycline-resistant bacteria examined were also immune to one to six additional antibiotics.

Tainted water probably explains the resistant bacteria in wild Canada geese living year-round in Chicago's suburbs, says Monica L. Tischler of Benedictine University in Lisle, Ill. From goose feces, she isolated 179 types of bacteria, many of which showed strong resistance to streptomycin, erythromycin, vancomycin, tetracycline, and penicillin-family drugs. Resistance rates ranged from 2 to 100 percent, depending on the microbe and antibiotic tested.

"The surprise was that we found any resistance," says Tischler. With little human contact or direct access to farms, these birds "should have had absolutely no exposure to antibiotics, unless it's through their environment," she says.

"The most important source of environmental, antibiotic-resistant bacteria is domestic animals," says Richard Novick of New York University Medical Center. Farmers often feed livestock low doses of antibiotics to boost growth (SN: 7/18/98, p. 39). Inevitably, some bacteria in the animals, in manure-tainted fields, and in local waters evolve to coexist with the drug. Such resistant bacteria also develop in people taking antibiotics, he notes.

This resistance, which undermines the effectiveness of drugs, "is a reflection of our heavy antibiotics use," indeed overuse, says ASM President Stuart B. Levy of the Center for Adaptation Genetics and Drug Resistance at Tufts University in Boston. That the resistance has spilled over into wild animals, such as geese, should "provoke a cry" to use antibiotics more judiciously, says Levy.

—J. Raloff

## Cocaine use boosts heart-attack risk

Bearing out researchers' longstanding suspicion of a link between cocaine use and heart attacks, a new study confirms that cocaine users' risk skyrockets within minutes of taking the drug.

Cocaine is "one of the strongest triggers of heart attacks," concludes Murray A. Mittleman of Beth Israel Deaconess Medical Center in Boston. "The only thing that comes close is the case of the completely sedentary person who suddenly goes out and does vigorous exercise."

Mittleman and his coworkers analyzed records of 3,946 patients who had had heart attacks. Of those, 38 said they had used cocaine in the year before being stricken, and 9 reported taking cocaine an hour or less before heart-attack symptoms appeared. The researchers estimate that during that hour, these otherwise low-risk individuals had an abrupt increase in heart-attack risk to 24 times the normal risk.

"It's what everybody suspected for a long time, and they did a nice job of

actually proving it," says Judd E. Hollander of the University of Pennsylvania in Philadelphia. "Putting a number on it . . . shows just how dangerous the drug is. It's a lifelong Russian roulette."

The likelihood of heart attack returned to normal just 2 to 3 hours after cocaine use, Mittleman's team reports in the June CIRCULATION.

Cocaine users were, on average, 17 years younger than nonusers when their heart attacks occurred and were more likely than nonusers to be male, nonwhite, and current smokers. The researchers accounted for these other risk factors when they calculated cocaine's threat.

"There are about 5 million regular users of cocaine in the U.S. and about 30 million people who have experimented with the drug," Mittleman says. "If this information could be disseminated, it could help put the effects of cocaine, particularly on younger people, into context." —S. Carpenter