One of the most notorious and hard-to-treat bacteria in humans has been found in wildlife, according to a new study in the Journal of Wildlife Diseases. The researchers isolated methicillin-resistant _Staphylococcus aureus_ (MRSA) in 2 rabbits and a shorebird. Wild animals may act as an environmental reservoir for the disease from which humans could get infected.

_S. aureus_ can cause skin infections or, if it gets into the bloodstream, life-threatening illness. Most infections are easy to manage with penicillin and related antibiotics, but MRSA, the resistant variety, is on the rise; also known as a "superbug," it kills an estimated 18 000 Americans a year. In most cases, people contract the bacterium from a hospital stay. Hospitals are breeding grounds for antibiotic-resistant organisms, because patients are treated with a wide variety of antimicrobial drugs, prompting pathogens to develop defenses.

Now it appears that even animals in the wild can be infected with MRSA. Researchers led by epidemiologist Tara Smith of the University of Iowa's College of Public Health in Iowa City took samples from 114 animals that came into the Wildlife Care Clinic, which rehabilitates injured or orphaned animals, at Iowa State University in Ames. 7 of the animals, or 6.1 percent, carried _S. aureus_ that was sensitive to methicillin; these included owls, pigeons, a beaver, a heron, and a squirrel. 3 animals, or 2.6 percent, carried MRSA: 2 eastern cottontail rabbits and a lesser yellowlegs, a migratory shorebird. (For comparison's sake: an estimated 1.5 percent of Americans carry MRSA in their noses.)

A big question is how these species came to carry MRSA. "This is really, really hard to do -- to understand the source, especially with something like migratory birds," says Jorge Ferreira, a veterinarian and epidemiologist working as a consultant in Switzerland who has studied the presence of MRSA on humans and their pets. Presumably, the infected animals have never received antibiotics, he notes, so they must have picked up the bugs directly from their environment.

Molecular typing of the isolates showed that the shorebird carried a hospital-associated strain of MRSA while the rabbits had community-associated strains. The rabbits' MRSA was also resistant to tetracycline, which Smith says is common in farm animals.

Perhaps most troubling of all was that one of the pigeons carried a _Staphylococcus_ bacterium that, while still sensitive to methicillin, was resistant to the antibiotic vancomycin. "Vancomycin is used as a last resort in MRSA infections," says study co-author Shylo Wardyn, a research assistant in Smith's lab, and vancomycin-resistant staph strains are rare in humans.

Whether wild animals represent a reservoir of MRSA in the environment -- that is, whether they could spread the superbugs to other animals and humans -- is an open question, Smith says. The infections could be "spillover events" from humans, caused by hospital waste, sewage, or farming, that pose no wider threat. It's also not clear if the animals can rid themselves of the infection, if they can be infected multiple times, or if they have ever passed their infection back to humans.
Ferreira’s work suggests that dogs and their owners can pass MRSA back and forth, and wildlife is a well-known source of other human infections, as with deer and Lyme disease, and mice and hantavirus. While such evidence is suggestive, there’s a lot more work to be done to show whether humans can get infected with MRSA from wild animals.

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Abstract
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Livestock and pets have been identified as carriers of _Staphylococcus aureus_; however, the role of wild animals as a reservoir of _S. aureus_ strains has not yet been examined. We conducted a pilot study to determine the prevalence of methicillin-sensitive _S. aureus_ (MSSA) and methicillin-resistant _S. aureus_ (MRSA) in 37 species of wild animals rehabilitated at a university clinic. Nasal, wing, wound, and cloacal swabs were collected. Of 114 animals, 7 (6.1 percent) were MSSA positive and three (2.6 percent) were MRSA-positive. The MRSA isolates were obtained from 2 eastern cottontail rabbits (_Sylvilagus floridanus_) and a lesser yellowlegs (_Tringa flavipes_), a migratory shorebird. Antibiotic resistance testing of the MRSA isolates revealed that 2 were additionally resistant to tetracycline and erythromycin, and the 3rd isolate was also resistant to erythromycin, clindamycin, and levofloxacin. All 3 isolates were positive for the Panton-Valentine leukocidin (PVL) gene. Sequence typing of the staphylococcal protein A (spa) region revealed one MRSA isolate to be t002, whereas the other 2 MRSA isolates were found to be t008. Our results suggest that _S. aureus_, including MRSA, is being carried by wild animals, although at a low prevalence with the limited number of animals tested. Additional studies are needed to determine how this may impact human health.

This study, which found that 2.6 percent (3 animals) carried MRSA, involved 37 species of wild animals that were orphaned or injured and sent to a wildlife rehabilitation clinic at the University of Iowa (USA). Iowa is located in the Midwestern United States, an area that is heavily agricultural: Over 90 percent of Iowa’s land is used for agriculture and Iowa leads the nation in hog and egg production and corn and soybean production (<http://www.agclassroom.org/kids/stats/iowa.pdf>). Major Iowa agricultural product processors include Archer Daniels Midland, Cargill, Inc., Monsanto Company, and Quaker Oats (<http://en.wikipedia.org/wiki/Iowa>). The study does not document how close these rescued wildlife were to an agricultural site, but in Iowa, wildlife were likely never too far from a farm or agricultural facility of some sort.

In fact, a recently published study also found that people living in areas of high farm animal density are at increased risk for carrying livestock-associated methicillin-resistant _Staphylococcus aureus_, even in the absence of direct contact between humans and livestock (Feingold BJ, Silbergeld EK, Curriero FC, et al: Livestock density as risk factor for livestock-associated methicillin-resistant _Staphylococcus aureus_, the Netherlands. Emerg Infect Dis [Internet]. 2012 Nov. Available at <http://wwwnc.cdc.gov/eid/article/18/11/11-1850_article.htm>.

According to an investigative story in the Washington Post, of the 35 million pounds of antibiotic used in the US in 2008, 70 percent went to pigs, chickens, and cows to help prevent disease and make them grow large quickly. Confinement of these farm animals at high stocking density requires use of antibiotics to mitigate the spread of disease exacerbated by these crowded living conditions. Similarly,
intensive fish farming provides conditions that require large quantities of antibiotics to be added to feed (<http://www.bellona.org/aquaculture/artikler/Antibiotics/>).

Antibiotics, as well as bacteria that carry antibiotic resistance genes, from agricultural sources can enter the environment via wastewater treatment plant effluents, processing plant effluents, application of agricultural waste and biosolids to fields, and leakage from waste-storage containers and landfills and can facilitate the development and spread of antibiotic resistance (Tello A, Austin B, Telfer TC: Pressure of Antibiotic Pollution on Bacteria of Importance to Public Health. Environ Health Perspect. 2012 August; 120(8): 1100-6. Published online 2012 Available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3440082/>).

In April 2012, in an attempt to reduce the prevalence of human and animal pathogens resistant to antimicrobial drugs, the FDA recommended phasing out the agricultural production use of medically important drugs in food-producing animals, including farmed fish, and phasing in veterinary oversight of therapeutic uses of these drugs (<http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm299802.htm/>).

Ames, a city located approximately 30 miles (48 km) north of Des Moines, the Iowa state capital in the central part of the US, is the home of Iowa State University and its Veterinary Medicine college (<http://en.wikipedia.org/wiki/Ames,_Iowa>). The state of Iowa can be located on the HealthMap/ProMED-mail interactive map at <http://healthmap.org/r/1Cfz> - Mod.ML.

[It would be important to exclude contamination of wildlife samples with MRSA carried by their rescuers and the researchers themselves.]

Eastern cottontail photo <http://www.nps.gov/blue/naturescience/images/EasternCottontailRabbit0194_1.jpg>
Lesser yellowlegs photo <http://www.1000birds.com/images/Lesser-Yellowlegs53543.jpg>- Mod.JW]


Antibiotic resistant bacteria carried by wildlife have been found in very remote places such as Easter Island, Galapagos, ref: <http://www.ncbi.nlm.nih.gov/pubmed/22017052> and see this for the Antarctic: <http://books.google.com.ar/books?id=nWI5H0UQmxCC&pg=PA287&lpg=PA287&dq=antibiotic+resistant+wildlife+antarctic&source=bl&ots=kmwEMIBKR-&sig=gxzFDhwjJSJlCyYm8Vohkl5CNZEdh=en&sa=X&ei=-luGUP73D46k8QTtxk4HYDQ&ved=0CBwQ6AEwAA#v=onepage&q=antibiotic%20resistant%20wildlife%20antarctic&f=false>.
- Mods ML & PB]

[see also: Antibiotic resistance, Campylobacter: swine, environ. Persistence 20120919.1300101 Antimicrobial use in animals - USA: court ruling 20120327.1081575 2010 ---- Antibiotic resistance & agricultural uses - USA (03) 20100223.0610 Antibiotic resistance & agricultural uses - USA (02); (Europe) 20100220.0585 Antibiotic resistance & agricultural uses - USA 20100216.0552 2009 ---- Antibiotic contamination, food supply - USA 20090106.0053]