Antibiotics, Animal Agriculture and MRSA: A New Threat

Health Care Without Harm

Widespread use of antibiotics leads to the development and spread of more antibiotic-resistant bacteria, like MRSA.[1] When used, antibiotics kill off susceptible bacteria leaving resistant ones to multiply and spread; greater use of antibiotics—wherever that occurs—translates into greater numbers and different varieties of drug-resistant bacteria. Infections in hospitals are often resistant to many antibiotics due to widespread antibiotic use there. Bacteria from farms also are often resistant to the multiple antibiotics routinely used on many farms.[2,3,4]

Methicillin-resistant *Staphylococcus aureus* (MRSA)—a potentially deadly strain of staph bacteria, resistant to treatment with multiple antibiotics—can be found in some farm operations and retail meats, as well as in the human population. Rising numbers of MRSA infections occur among previously well people, living in the community, rather than among sick hospital patients. If, as science suggests, industrialized meat production methods have helped to spread a new farm-associated strain of MRSA in rural communities, it is important that immediate action be taken to limit the scope, pain and suffering, and expense of the problem.

Background

Staphylococcus aureus are bacteria often living in the nose and on skin. People can carry the bacteria unknowingly and without getting sick, but it also can cause serious human infections of the bloodstream, skin, lungs (pneumonia) and other organs. In such cases, oxacillin and other penicillin-like antibiotics are treatments of choice.

Rising numbers of people are falling ill with a kind of staph untreatable with these drugs, called methicillin-resistant *Staphylococcus aureus* (MRSA).[5] MRSA resists treatment not only with methicillin, but with its close relative oxacillin as well. While other antibiotics can usually be found to treat the MRSA, the bacteria's resistance to the antibiotic first chosen only becomes apparent with "treatment failure", as a patient's condition further deteriorates. The use of newer, second-choice drugs drives up medical costs, and runs the risk of inducing more bacterial resistance to the latter medicines of "last resort."

Rising disease and its costs.

MRSA infections accounted for an estimated 19,000 deaths in the U.S. in 2005, more than AIDS; hospital-treated MRSA infections have more than doubled in the last decade from approximately 127,000 in 1999 to 278,000 in 2005.[6] MRSA also is being diagnosed more often in people with no hospital connection—many of them young, healthy students or professional athletes.[7] Scientists remain unsure of the origin of the MRSA in these cases. Did MRSA strains normally acquired in hospitals simply spread to the community? That's unlikely. New, communityacquired MRSA strains differ genetically from their hospitalacquired cousins.

MRSA is costly. Patients with staph infections, generally, stay three times longer in hospital than do patients without these infections (14.3 vs. 4.5 days), costing more than three times as much ($48,824 vs. $14,141).[8] Drug resistant staph infections, like MRSA, cost even more; MRSA patients typically receive more expensive antibiotics, and stay in hospital between two and four 4 days longer, with costs $7,200 to $13,901 higher, than do patients with non-resistant staph infections.[9]

MRSA spreads from farm animals to humans

Livestock (pigs, poultry and cattle) can carry a specific type of MRSA, called ST398. In Europe, ST398 is shown to transfer from pigs to pig farmers and their families, and also to veterinarians.[10,11,12] In Europe and Asia, MRSA has been detected in retail meats, including the farmassociated ST398 strain of MRSA.[13,14]

Dutch MRSA

From farm to fork MRSA links to pig farming were first made in 2004 when a six month-old Dutch infant being screened for surgery was found to carry MRSA, a rarity in that country; the hospital investigated and identified her family's pigs as the source.[15] Soon after, a young Dutch mother's MRSA breast infection also was traced back to family pigs.[16] Today, 39 percent of Dutch slaughter pigs and 20 percent of pig farmers carry ST398.[17] ST398 has also been found in Danish and German pigs,[18] in poultry in Belgium,[19] in Dutch veal calves[20] and in all types of Dutch meat including pork, beef, and poultry.[21]

As recently as 2002, Dutch laboratories looking at MRSA bacteria cultured from humans did not see the ST398 strain; by late 2006, it accounted for more than 20 percent of such bacteria. The Netherlands' ST398 cases have been clustered in areas where livestock are raised, and pig (and cattle) farmers are much more likely to be carriers.[22]

Antibiotics used on livestock farms almost certainly contribute to the emergence and spread of MRSA there. For example, Dutch pig farms that routinely use antibiotics are more likely to have MRSA than are farms with limited antibiotic use.[23] The USDA also acknowledges MRSA "moves freely between animals and humans," and is likely spread due to close contact between animals and handlers on farms, and that prudent use of antibiotics therefore is needed.[24]

In the first MRSA research involving U.S. swine and swine workers, a 2009 study found MRSA highly prevalent in swine (49 percent) and swine workers (45 percent) on a large-scale commercial confinement operation with farms scattered throughout Iowa and Illinois.[25] All MRSA detected belonged to the ST398 strain (that shown in Europe to come from farm animals and associated with skin, wound, lung, and heart infections in humans).[26,27] MRSA of any type is present in about 1.5 percent of the general population,[28] so these hog workers were 30 times more likely than the average American to have MRSA. The swine-related MRSA in Iowa were resistant not only to methicillin and other penicillins, but also to tetracycline, clindamycin, and Synercid. If these MRSA strains are now causing, or come to cause future human infections in American communities, it could spell problems because doctors use identical or closely related antibiotics for treating MRSA.

A previous (2007) study also had found pigs carrying MRSA on almost half of Canadian pig farms tested, with 1-in-4 pigs and 1-in-5 pig farmers testing positive.[29] Most MRSA+ pigs (80 percent) carried the ST398 strain. A smaller, though significant number carried a MRSA strain (called USA 100) that is among those most commonly acquired in hospitals in North America. Canada is the largest exporter of pigs and pork to the U.S.

Summary

Veterinarians, farm workers and others in contact with livestock often pick up ST398, a strain of MRSA. They can become ill, or they can act as asymptomatic carriers, simply passing the strain onto others who may become ill. What can hospitals do?

Support producers that prohibit or place meaningful limits on the use of antibiotics in animal agriculture.

Hospitals nationwide are working in a stepwise fashion to replace purchase of conventionally produced poultry and meat with products approved to carry one or more of the following eco-labels or product label claims: USDA Organic,[i] American Grassfed,[ii] Animal Welfare Approved,[iii] Certified Humane Raised & Handled,[iv] Food Alliance Certifiedv, Raised Without Antibiotics or No Antibiotics Added.

Support policy reform in the U.S. Congress.

Hospitals and health systems are encouraged to support federal legislation that would eliminate the routine use of antibiotics in animal feeds, especially the use of antibiotics that belong to classes of drugs used in human medicine.

Encourage additional research on livestock-associated MRSA.

Identifying and controlling community sources of MRSA is imperative for the public health of Americans. Though MRSA ST398 has been found in the Midwest, the federal government thus far has failedto date to survey or test for this strain of MRSA in livestock elsewhere in the U.S. In addition, the CDC should survey rural hospitals and U.S. farmworkers to determine how livestock-associated MRSA currently impacts human health. These steps are needed to determine the extent of this threat to public health and our food supply and to allow scientists to pinpoint the origins of farm-related MRSA.

i. www.ams.usda.gov/NOP/NOP/standards/FullText.pdf
ii. www.americangrassfed.org/
iii. www.animalwelfareapproved.org
iv. www.certifiedhumane.org/whatis.html
v. www.foodalliance.org/certification/index.html

MRSA in a larger food safety context "Conventional" food animal production in the U.S. today includes large quantities of antibiotics being added to livestock feeds, both to reduce the amount of feed that animals consume, and to prevent diseases that occur because of the confinement of animals in crowded, stressful conditions that make them vulnerable to illness. Based on the best available data, these feed antibiotics may be eight times greater by volume than are antibiotics used in human medicine.[30] Many such feed antibiotics are identical or very nearly so to human medicines, including penicillin, tetracycline, erythromycin and sulfa drugs. Routine exposure to these antibiotics in the farm setting can create "reservoirs" or large populations of bacteria resistant to them. These bacteria in turn can cause human or animal infections impervious to lifesaving treatment. MRSA is just one bacterial threat among many from livestock farms. Infections due to resistant "food-borne" bacteria (i.e., food poisoning) also have been connected to livestock production. Roughly one-fifth of Americans' annual 1.4 million Salmonella infections and half of their 2.4 million Campylobacter infections are drug-resistant, according to CDC studies. Each year, some 326,000 Salmonella infections in people are resistant to two or more antibiotics, while 96,000 Campylobacter infections are multidrug resistant to at least five drugs.[31] While these are the most commonly acknowledged causes of foodborne illness, FDA data show that meat is even more likely contaminated with drug-resistant Escherichia coli or Enterococcus.[32] Strains of both bacteria can cause serious human illness. Other disease-causing bacteria found both on farms and on meat include Clostridium difficile and Klebsiella pneumoniae.[33]

For more information on antibiotics use in animal agriculture, health care specific food purchasing tools, and ways to influence policy reform on this topic see www.ProtectAntibiotics.org.

Adapted by David Wallinga, MD and Marie Kulick from a fact sheet compiled by Keep Antibiotics Working: the Campaign to End Antibiotic Overuse, available at www.KeepAntibioticsWorking.com.

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ENDNOTES

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Heath Care without Harm (HCWH) is an international coalition of organizations working to transform the health care sector, without compromising patient safety or care, so that it is ecologically sustainable and no longer a source of harm to public health and the environment. HCWH's Healthy Food in Health Care (HFHC) Program works with hospitals across the country to build a healthier, more sustainable food system, providing education and resources to make the connection between the food they serve and the health of their patients, staff and community.