

MRSA and Hog Confinement Waste Studies

Johns Hopkins MRSA in field applied hog waste:

Researchers from the Johns Hopkins Bloomberg School of Public Health have for the first time found an association between living in proximity to high-density livestock production and community-acquired infections with methicillin-resistant *Staphylococcus aureus*, commonly known as MRSA. Their analysis concluded that approximately 11 percent of community-acquired MRSA and soft tissue infections in the study population could be attributed to crop fields fertilized with swine manure. The study is the first to examine the association between high-density livestock operations and manure-applied crop fields and MRSA infections in the community. The results were published online September 16 in JAMA Internal Medicine.

The rest of the story can be found at:

<http://www.jhsph.edu/news/news-releases/2013/casey-schwartz-mrsa.html>

<http://www.wired.com/wiredscience/2014/01/mrsa-col-cafo/>

Almost 3 times the risk of carrying MRSA from living near a mega-farm

By Marilyn McJenna

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In the long fight over antibiotic use in agriculture, one of the most contentious points is whether the resistant bacteria that inevitably arise can move off the farm to affect humans. Most of the illnesses that have been associated with farm antibiotic use - resistant foodborne illness, for example - occur so far from farms that opponents of antibiotic control find them easy to dismiss. So whenever a research team can link resistant bacteria found in humans with farms that are close to those humans, it is an important contribution to the debate.

A team from the University of Iowa, Iowa City Veterans Affairs, and Kent State University have done just that. In next month's Infection Control and Hospital Epidemiology, they survey 1,036 VA patients who lived in rural Iowa and were admitted to the Iowa City facility in 2010 and 2011. Overall, among those patients, 6.8 percent were carrying MRSA, drug-resistant staph, in their nostrils. But the patients' likelihood of carrying MRSA was 2.76 times higher if they lived within one mile of a farm housing 2,500 or more pigs.

They say: The increasing populations of swine raised in densely populated CAFOs and exposed to antibiotics presents opportunities for drug-resistant pathogens to be transmitted among human populations. Our study indicates that residential proximity to large numbers of swine in CAFOs in Iowa is associated with increased risk of MRSA colonization.

Some important things to unpack here: MRSA (formally, methicillin-resistant *Staphylococcus aureus*) often "colonizes" people - takes up residence on the skin or in the nostrils - before it causes an infection. Studies have shown repeatedly that being colonized with MRSA increases the risk of contracting a difficult-to-treat infection.

Because of that risk, and because MRSA spreads easily in hospitals, the VA since 2006 has required facilities to screen all incoming patients to see whether they are carrying MRSA and thus are posing a risk to other patients. MRSA is frequently found in the vicinity of pigs: not just MRSA ST398, the specific resistant variety that was first identified in pig farmers in the Netherlands in 2004, but the garden-variety community forms as well. And Iowa has a lot of pigs: 19 million, according to the US Department of Agriculture, housed in about 7,000 "CAFOs" (for confined or concentrated animal-feeding operations), which the US Environmental Protection Agency defines as a facility of at least 1,000 pigs, though most are many thousands larger. (If you'd like to know more about MRSA, including the "livestock-associated "pig MRSA" variety, I wrote a book. OK, back to this paper.)

The authors, led by Margaret Carrel, PhD, initially identified 2,996 patient admissions in that 2-year period, and then winnowed out any patients who lived in cities as well as any whose addresses could not be confirmed and plotted using geo-coding. That left them with 1,746 samples taken from 1,036 patients, of which 119 - 6.8 percent - were positive for MRSA. That was a red flag to begin with, because MRSA colonization in the general population is less than 2 percent.

Using data from the Iowa Department of Natural Resources for the locations of very large pig-raising facilities, they then sorted the patients by the distance of their homes from pig CAFOs. Initially, patients who lived 1 mile or less from a CAFO were 1.8 times more likely to be colonized. When the team cleaned up the data - accounting for patients who came into the hospital more than once in that 2-year period, and also adjusting for the known likelihood that elderly patients, who are likely to be in a VA facility, have higher colonization rates - they came up with a relative risk of 2.76.

This is not the first time that MRSA has been found in people who work on farms or live in the vicinity of them. Last year, a study found “pig MRSA” in workers from North Carolina hog farms, and another identified it in workers in Iowa and Illinois. Meanwhile, a third study published just in November found MRSA among people who lived in the vicinity of fields where swine manure was being applied. And last year, a group in Germany identified MRSA in people who lived near hog farms but did not have contact with animals.

None of these studies have been able to trace with precision how workers and neighbors are acquiring MRSA. The authors of the newest study say:

Although the exact mechanism by which residential proximity to large swine CAFOs increased risk of MRSA is unknown, it appears that there is potential for drug-resistant strains of *S. aureus* in animals to transmit to people living at close distances. For example, a 55-pound or greater hog can produce upward of 10 gallons of manure a day.

Typically, in Iowa, manure is spread on surrounding fields, and MRSA can be aerosolized from this manure to human food or water sources.

And they add:

Residential proximity to CAFOs could be risky in ways other than simply direct exposure to preexisting livestock-associated *S. aureus* strains, including via exposure to antibiotic residues via air or water, application of manure containing residues near their homes.

As last year ended, a number of food-policy writers noted that 2013 marked the first time that discussion of agricultural use of antibiotics - and the unintended consequences of that use - really emerged into mainstream discourse. Papers like this can move that process along. Throughout the decades-long discussion of farm antibiotics, the challenge has been linking the externalized costs of those

antibiotics back to their use on the farm. The more those off-farm effects are elucidated, the more complete and transparent the discussion of on-farm use ought to become.

Cite: Carrel M, Schweizer ML, Sarazin MV, Smith TC, Perencevich EN. Residential Proximity to Large Numbers of Swine in Feeding Operations Is Associated with Increased Risk of Methicillin-Resistant *Staphylococcus aureus* Colonization at Time of Hospital Admission in Rural Iowa Veterans. *Infect Control Hosp Epidemiol* 2014;35(2).

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