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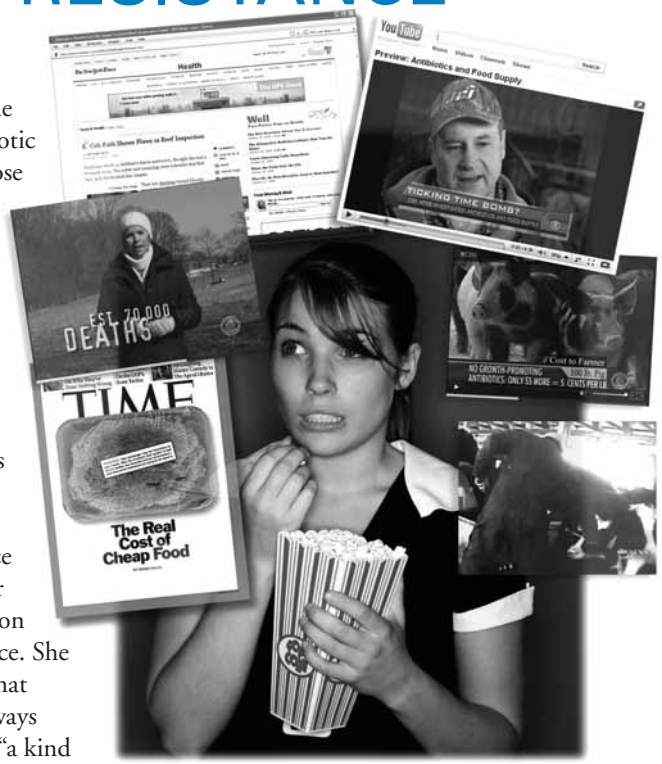
For the Record

Straight talk about antibiotic use in food animal production presented by ALPHARMA Inc., Animal Health

THE NEW URBAN LEGEND: ANTIBIOTIC RESISTANCE

From CBS Evening News with Katie Couric devoting nearly a quarter hour of evening news time in February to the "ticking time bomb" of on-farm antibiotic use, to the movie *Food, Inc.* coming close to winning an Academy Award for best documentary feature, to Chipotle restaurant chain founder Steve Ells witnessing to Senators in early March of his "epiphany" that the road to healthy food for American consumers starts with a congressional ban on your ability to use antibiotics, rumor of danger in farm antibiotics surrounds today's food consumers.



Often missing in those scare stories, says Liz Wagstrom, DVM, assistant vice president of science and technology for the National Pork Board, is a recognition of the complexity of antibiotic resistance. She has labeled the conventional wisdom that low-level use of on-farm antibiotics always encourages resistance to develop to be "a kind of urban legend."

"When you go out looking for hard data, you can find examples where that may be true, and you can find examples where that's not demonstrated."

Considering the strength of the documented science that supports Dr. Wagstrom, it's clear the antibiotic scare stories perpetuated in the media, in legislatures and on the Internet fit the model of the urban legend—those dubious, second-hand stories carrying just enough grains of truth to be believable, yet never quite completely verifiable.

"...(D)ecades of efforts by groups such as the Alliance for Prudent Use of Antibiotics, as well as many regulatory scientists, microbiologists, and physicians," writes risk specialist Tony Cox, PhD, "[have failed] in showing that [low-level antibiotic] use has had any adverse impact on human health via food-borne transmission of resistant bacteria. Rather, it has become common to simply assume, and then to assert, that [such] use harms human health."

LET'S NOT MAKE THE JOB TOUGHER

Putting aside for a moment the damage such folklore does to the consumer's willingness to buy the meat, milk and egg products of American agriculture, there's a potentially more tragic risk behind the distraction of such urban legend-making. It may actually be working against the goal of protecting public health.

"Continuing to pursue the same lame hypothesis," Dr. Cox says, "that animal antibiotic use threatens human health, for decade after decade, despite all empirical evidence that this is not how the world really works, serves no useful purpose, if our goal is to protect human health. The real problems of managing resistance risks are tough enough, without the distractions of chasing imaginary and speculative ones."

Also in this issue

For the record...

Like perennial folk tales, the oversimplified urban legends of on-farm antibiotic use keep recirculating regardless of factual evidence to the contrary.

COULD EVERYTHING CONSUMERS HAVE HEARD

Like the appeals to automatically help fund a sick child's kidney transplant by forwarding emails, or warnings that carpet deodorizer will kill your cat, urban legends that reassure consumers of the "truths" of farm antibiotics and resistance circulate widely. Here are few recent scientific studies challenging what consumers "know" to be true.

'We don't use antibiotics for routine disease prevention in people. Why do it in animals?'

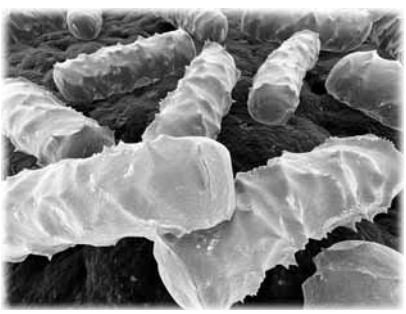
Or, as CBS anchor Katie Couric challenged Dr. Wagstrom: "Some people say giving animals antibiotics to prevent illness or promote growth is like putting antibiotics in a child's cereal." It was an oversimplification echoed in July congressional testimony by biogenetic engineering researcher Lance B. Price, PhD, who claimed no such preventive use in people, "except in extremely rare situations...."

But the mythology is challenged by the real world:

- The National Library of Medicine's database of journal research lists more than 2,300 scientific reviews on the subject of human antibiotic prophylactic prescribing, and more than 11,000 original studies. Although obviously not all encourage the practice, a brief scan of the reviews confirms routine antibiotic prevention is in fact commonly recommended to prevent infection during procedures and conditions ranging from orthodontics to heart surgery to teen acne.
- Two recent studies show such routine preventive antibiotic dosing helps prevent, respectively, MRSA during surgery and post-partum infection in women undergoing Caesarean birth. Both meta-reviews (a recombination and recalculation of data from several studies into one), the first showed injecting antibiotic into the nostrils of patients prior to surgery reduced the rate of MRSA infection after surgery by eradicating bacterial colonization common there, while the second review found pre-Caesarean antibiotics reduced serious infectious complications for the mother by 31 percent.
- According to a review by Scottish infectious disease specialist Ian Gould, MD, the average hospital now uses the equivalent of every patient receiving a full daily dose of antibiotic from their first day of admission until the day they're sent home. Although Dr. Gould rightly notes that on average, less than half of patients will actually receive antibiotics at any one time, the healthcare system has reached the point of antibiotic "ecological saturation" because those who do get antibiotics are often on double doses or combination doses. "Many guidelines advocate prolonged antibiotic prophylaxis," he writes, "...and often these uses are justified by a reasonable evidence base. On many other occasions, however, prescribing is definitely inappropriate—'just in case' or on the basis of a poor quality severity assessment or misdiagnosis."

'Bacteria can transfer the genes that cause antibiotic resistance from one bacterial species to another. That makes any antibiotic use a threat'

A relatively recent resistance theory argues bacteria don't always wait for genes that cause antibiotic resistance to be handed down from generation to generation of a bacterial species. Instead, genetically different bacteria living in a common environment may readily swap pieces of floating genetic material between individuals. If those "plasmids" contain the particular genetic code that causes the organism to become resistant to one or more antibiotics, it can pass that resistance—theoretically from a harmless species to one that could cause disease.



However, the theory is far from proven where it counts: In the human gut. "If there was horizontal gene transfer," McMaster University biologist Gerry Wright, PhD, told *The Scientist* magazine, "you would expect that [antibiotics] would be useless by now."

Meanwhile, other studies continue to suggest some antibiotics are actually capable of "plasmid curing," or reducing the reservoir of genetic material when administered at low levels. A January Harvard study showed the remnants of tetracycline in the environment actually helps sensitive *E. coli* outcompete resistant ones.

ABOUT ANTIBIOTICS BE WRONG?

CBS teased its February "exposé" on antibiotics by labeling the practice a "ticking time bomb" that poses "a threat to your health." But here are a few confounding studies CBS neglected to include:

> *'Farmers are creating a ticking bomb that will explode soon into a public-health disaster'*

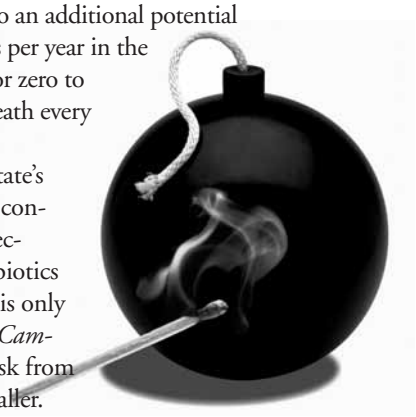
■ Russian scientists tested soil samples sealed from environmental exposure in Siberian permafrost. In layers dated 25,000 to 35,000 years old, they discovered bacteria that proved resistant to several common modern antibiotics, including streptomycin and tetracycline. Several strains were resistant to multiple antibiotics. The work offers additional evidence antibiotic resistance is not a new phenomenon, and resistance genes circulated in the environment long before antibiotics were discovered.

■ A new mathematical model just published in the journal *Risk Analysis* predicts the risk that tetracycline might fail to treat any of the human diseases it's used for because resistance develops on the farm and is then passed to humans is almost nonexistent. Banning all animal uses of tetracyclines—not just in feed—could be expected, at best, to prevent one human treatment failure every two centuries.

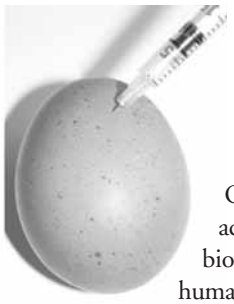
"Current urgent political calls to ban tetracycline and other approved animal antibiotic uses, in an effort to protect human health, are framed in terms of a mental model of cause and effect in which bans would reduce contamination of family meals with 'deadly' antibiotic-resistant pathogens or 'superbugs,' thereby reducing the risk of untreatable foodborne illnesses and deaths," writes lead author Tony Cox, PhD. "Our review of data for specific illnesses suggests that this mental model has little relation to reality."

■ Previous risk analyses have shown risks from other antibiotics to be similarly tiny:

- A previous study by Dr. Cox predicts continuing use of penicillin risks leading to an additional potential zero to 0.135 excess deaths per year in the entire U.S. population—or zero to one potential additional death every seven to 25 years.
- A 2008 study by Iowa State's Scott Hurd, DVM, PhD, concluded risk of reduced effectiveness of macrolide antibiotics because farmers use them is only about 1 in 82 million for *Campylobacter* in swine. The risk from poultry or beef is even smaller.
- Banning the antibiotic virginiamycin could be expected to prevent from zero to less than 0.06 statistical mortalities per year in the entire U.S. population, according to a 2004 study by Dr. Cox.



■ Meanwhile, studies continue to demonstrate that preventing animal illness by using antibiotics can actually help improve public health. A recent study by Minnesota's Randy Singer, DVM, PhD, shows the consumption of subclinically ill poultry could increase the total number of human illness days.



> *'Farmers freely pump animals full of antibiotics while people can obtain them only by careful prescription'*

Even the World Health Organization, a long-time advocate of outlawing farm antibiotics, recognizes liberal access to human antibiotics—both legal and bootleg—contributes heavily to development of antibiotic resistance. A recent study confirms the reality that human antibiotics aren't always doled out carefully:

■ Medical University of South Carolina researchers Googled up more than 130 Internet vendors offering access to antibiotics like penicillin, erythromycin and ciprofloxicin online. Despite U.S. laws that make it illegal to sell antibiotics without a prescription, fully one-third sent antibiotics without one, while others required only a medical history.

The authors of the article, in the *Annals of Family Medicine*, believe these sales represent "a potentially large pool of antibiotics in the United States that may be contributing to antibiotic resistance." Most of the antibiotics didn't arrive until after the time frame in which the disease they were ordered for would have naturally run its course, and the orders were typically bigger than an individual would need to treat a single case.

Principal Points
The New Urban Legend: Antibiotic Resistance
Vol. 9 No. 2 April 2010

- Like perpetual folk tales, the oversimplified urban legends of farm antibiotic use keep recirculating regardless of factual evidence to the contrary.
- Contrary to what has been reported by the media and in testimony before Congress, routine preventive administration of antibiotics is an important tool doctors use to help prevent disease in susceptible human populations.
- Reservoirs of genetic material that can encode bacteria for antibiotic resistance may exist in the environment, but there's little evidence they contribute to human resistance issues in the real world.
- The risk of decreased antibiotic effectiveness in human medicine leading to treatment failures because farmers use antibiotics is virtually nonexistent, according to several painstaking mathematical modeling analyses.

For the Record, sponsored by a grant from ALPHARMA Inc., Animal Health, is designed to help unite the industry and provide a unified, rational message on behalf of producers whose freedom to use safe, effective, economical production methods is at stake. Working together, we can set the record straight on antibiotics.

Questions or comments? E-mail Steve Kopperud at skopperud@poldir.com or editor Mike Smith at CustomMedia@Food360.com. Read past issues or link to more information on this issue at www.AntibioticTruths.com.

CAN'T YOU QUIT DEBATING 'WHAT EVERYBODY KNOWS?'

COMMENTS DELIVERED AT THE INTERNATIONAL CONFERENCE ON THE USE OF ANTIMICROBIALS IN CATTLE PRODUCTION BY MARGARET MELLON, JD, PHD, DIRECTOR OF THE FOOD AND ENVIRONMENT PROGRAM, UNION OF CONCERNED SCIENTISTS, CAMBRIDGE, MASS.

"I've spent a lot of time going to listen to folks in human medicine talk about antibiotic resistance, as well as folks in the animal production sector. But the tone of the meetings are really quite different. Everybody accepts that [antibiotic] use leads to [antibiotic] resistance. We all know enough microbiology to know why that's the case. They get over that hurdle pretty quickly and then start talking about what they can do to reduce unnecessary use, as well as taking lots of other steps in terms of mode of use, for example, that will reduce the overall impact of resistance. Now, sometimes they don't do as well as they should in implementing their own programs, but at least the tone of the meeting is, 'What we all need to do to address the problem.'"

"But here, though, I feel as if even asking the question or making the reasonable assumption that use—massive use—in animals is going to make a difference, to human health as well as to animal health, is somehow 'hanging people out to dry.'"

"I really don't think it is. ...I can't understand the scientific foundation for an argument that massive use of antibiotics in animals, where the bacteria made resistant have paths back to humans, wouldn't have some impact. How big it is, I'm not sure. But it makes sense to me—and I think makes sense to a lot of people—that it would have some impact."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"So I guess my question is why the response isn't more, 'Yes, it probably does make a difference to human health that we're using antibiotics in animal agriculture, let's look to find out how we can reduce that use, and use it in ways that are going to have less of an impact on the problem.'"

I mean I would be interested in...folks' response to the fact that that isn't the kind of frame for [debate]. I am just truly perplexed that that isn't the answer, that 'of course this is something of a problem, let's all get on board to see what we can do about it.'"

HAVE AN ANSWER FOR DR. MELLON?

E-mail CustomMedia@Food360.com or go to www.AntibioticTruths.com and click "Contact Us." We'll forward it for you.

IF THEY GAVE A PRIZE FOR MYTH-MAKING IN SCIENCE JOURNALISM...

The winner should be Nicholas Kristof, *New York Times* columnist. In May 2009, he wildly speculated the "superbug" MRSA— a "flesh-eating bacteria" was probably being caused by "... routine use — make that the insane overuse — of antibiotics in livestock feed." Kristof hit all the talking points of the disinformation campaign over MRSA, finally reaching bottom by implying a northern Indiana doctor had died unexpectedly (of a heart attack, Kristof notes—though he had also suffered MRSA three times, he tells us in the same sentence) just days before he was to be a "whistleblower."

As luck would have it, someone does give such a prize.

"Fear-based science may not pollute our bodies or even the physical environment, but it does something just as toxic," writes the non-profit, nonpartisan Statistical Assessment Service. "It poisons our minds to such a ridiculous degree that we'd prefer to deal with an armed warlord than a tin of beans. Because he has...used this perch to promote fear-based science, STATS regretfully bestows on Nicholas Kristof our 'worst science journalist of the year' award for 2009."