# Multiple Factors Linked to Antibiotic Resistance

BY MICHELE G. SULLIVAN

Although dermatologists are undoubtedly contributing to the rise of antibiotic-resistant bacteria, there's plenty of blame to go around, said Dr. Theodore Rosen.

Patients play their part by demanding unnecessary antibiotics and failing to comply with the proper dosing regimen. And even commercial livestock—pigs and chickens, for example—are adding to the problem.

"Swine are routinely fed low-dose antibiotics on farms, which has led to the rise of methicillin-resistant [*Staphylococcus*] *aureus* in both the pigs and the farmers who care for them," Dr. Rosen said at the at the annual Hawaii dermatology seminar sponsored by Skin Disease Education Foundation, in Maui.

Studies have confirmed that up to 25% of antibiotic-dosed hogs are colonized with MRSA (Vet. Microbiol. 2008; 126:383-9), and a 2007 report linked drug-resistant *Escherichia coli* to urinary tract infections in women who routinely consume potentially contaminated food (Foodborne Pathog. Dis. 2007;4:419-31).

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DR. ROSEN

"Women with resistant *E. coli* were about four times more likely to eat chicken or pork three or more times per week than women without the resistant strains," he said in an interview.

Patients who don't take their antibiotics properly, even appropriately prescribed antibiotics, encourage resistant bacterial strains in much the same way as the farmer who underdoses his hogs—by exposing the microbes to doses that aren't strong enough to kill, but are strong enough to lead to survival of mutated, adapted bacteria, said Dr. Rosen of Baylor College of Medicine, Houston.

As long ago as 1945, Scottish biologist and pharmacologist Alexander Fleming—who pioneered the use of penicillin—warned of this remarkable adaptive ability: "It is not difficult to make microbes resistant to penicillin in the laboratory by exposing them to a concentration not sufficient to kill them."

"Microbes have had 3.5 billion years to learn how to adapt," Dr. Rosen said. "Given sufficient time and drug use, resistance will develop; there are no antibiotics to which resistance has never developed."

Study after study has confirmed the problem and impact of patient noncompliance worldwide. Dr. Rosen cited an 11-country survey of patients who received antibiotics for an acute infection. The average noncompliance rate was 22%, ranging from 10% in the Netherlands to 44% in China (Int. J. Antimicrob. Agents 2007;29:245-53).

But physicians also play an enormous part in fostering resistance by handing out unnecessary antibiotics, dosing improperly, and failing to match the right bug with the right drug, Dr. Rosen noted. Although there are no data indicating the impact dermatologists might be having on the issue, he pointed out that, in the United States alone, dermatologists prescribe up to 9 million systemic and 4 million topical antibiotic treatments each year (Cutis 2007;79 [suppl. 6]:6-8).

"Before you prescribe, it's important to ask yourself, 'Does this patient really need antibiotics?' " he said. "Could you be looking at a viral infection or a foreign body reaction instead of a real bacterial infection?" Some infections are trivial or self-limiting, and really don't require antibiotic treatment, while others respond well to alternative therapies like incision and drainage.

"Rather than relying on broad-spectrum drugs, it's a better idea to use narrow-spectrum antibiotics whenever possible," he said. "And when in doubt, culture a specimen, identify the organism, and determine its actual antibiotic sensitivity."

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