



# CDC highlights threats posed by antibiotic resistance, calls for action

by Theoklis Zaoutis, M.D., M.S.C.E., FAAP

The Centers for Disease Control and Prevention (CDC) recently released the landmark report *Antibiotic Resistance Threats in the United States, 2013*, which describes the burden and threats posed by antibiotic resistance, and outlines immediate actions that must be taken to address the problem.

## Burden of antibiotic resistance

The CDC, World Health Organization and other international agencies have described antibiotic resistance as one of the world's most pressing public health threats. It is estimated that more than 2 million people in the United States are infected with antibiotic-resistant bacteria, and at least 23,000 people die each year because of these infections.

*Clostridium difficile* infection, the most common cause of diarrhea acquired in a health care facility and an infection that usually results from antibiotic use, causes approximately 250,000 hospitalizations and at least 14,000 deaths annually. Although *C. difficile* infection often is considered to affect predominately adults, recent evidence suggests an increase in infection rates and mortality in children.

In addition to increasing patient morbidity and mortality, infections with antibiotic-resistant bacteria also drive up medical costs. Studies have estimated that antibiotic resistance in the United States adds up to \$20 billion in excess costs to the health care system

each year, and costs to society due to lost productivity are as high as \$35 billion.

## Factors contributing to resistance

The use of antibiotics is the single most important factor leading to the development of antibiotic resistance. Antibiotics are among the most commonly prescribed drugs used in human medicine. However, up to 50% of all prescribed antibiotics are unnecessary or prescribed inappropriately.

The number of antibiotic-resistant bacteria and the diversity of molecular mechanisms of resistance have increased sharply in recent years, but the development of newer, effective antibiotics has not kept pace. The loss of effective antibiotics will hamper clinicians' efforts to treat infections.

At the same time, many advances in medical treatment involve immunosuppression, and patients' ability to fight infections depends on the availability of effective antibiotics. When first-line and second-line treatment options are limited by resistance or are unavailable, health care providers are forced to use antibiotics that may be more toxic to the patient and frequently more expensive and less effective.

In addition to use in humans, the overuse of antibiotics in animal agriculture is a major contributor to the problem of antibiotic resistance. The vast majority of antibiotics in animals are not used to treat infectious diseases, but are fed regularly to animals to speed

## Antibiotic-resistant bacteria posing health threats

### Urgent threats

carbapenem-resistant *Enterobacteriaceae*  
antibiotic-resistant gonorrhea  
*C. difficile*

### Serious threats

methicillin-resistant *S. aureus*  
drug-resistant tuberculosis  
drug-resistant *Streptococcus pneumoniae*  
extended spectrum beta-lactamase producing  
*Enterobacteriaceae*  
multidrug-resistant *Acinetobacter*  
drug-resistant *Campylobacter*  
fluconazole-resistant *Candida* (a fungus)  
vancomycin-resistant *Enterococcus*  
multidrug-resistant *Pseudomonas aeruginosa*  
drug-resistant nontyphoidal *Salmonella*  
drug-resistant *Salmonella* Typhi  
drug-resistant *Shigella*

### Concerning threats

vancomycin-resistant *S. aureus*  
erythromycin-resistant Group A *Strep*  
clindamycin-resistant Group B *Strep*

growth and compensate for unsanitary and crowded conditions. The CDC has determined that antibiotic use in animals is linked to antibiotic resistance in humans.

The Food and Drug Administration recently described a pathway toward reducing inappropriate antibiotic use in animals, and many major medical and public health organizations, including the Academy, have called for stronger action.

### Ranking threats

The CDC report ranked the antibiotic-resistant bacteria (and fungi) that have the most impact on human health in categories of urgent, serious and concerning (see chart).

The threats were assessed according to seven factors associated with resistant infections: 1) health impact, 2) economic impact, 3) prevalence of the infection, 4) 10-year projection of prevalence, 5) ease of transmission, 6) availability of effective antibiotics and 7) barriers to prevention.

### Actions to prevent, slow antibiotic resistance

To combat the threat posed by antibiotic resistance, the CDC has identified four core actions that must be taken:

**1. Preventing infections, preventing the spread of resistance.** Antibiotic-resistant infections can be prevented by immunization,

## RESOURCE

The CDC report *Antibiotic Resistance Threats in the United States, 2013* is available at [www.cdc.gov/drug-resistance/threat-report-2013/](http://www.cdc.gov/drug-resistance/threat-report-2013/).

infection prevention in health care settings, safe food preparation and handling, and handwashing.

**2. Tracking.** The CDC gathers data on antibiotic-resistant infections to help inform strategies and interventions to prevent antibiotic-resistant infections.

**3. Improving antibiotic use/stewardship.** The most important action needed to slow the development and spread of antibiotic resistance is to modify the way antibiotics are used in humans and animals.

**4. Development of drugs and diagnostic tests.** Antibiotic resistance develops as a part of a natural process in which bacteria evolve. Therefore, new antibiotics will be needed to keep pace with the emergence of resistance. Furthermore, new diagnostic tests are needed to track the development of resistance.

Only through concerted and collaborative efforts can the threat of antibiotic resistance be addressed.



*Dr. Zaoutis is a member of the AAP Committee on Infectious Diseases. He also is a member of the Board of Scientific Counselors' Antimicrobial Resistance Working Group, Centers for Disease Control and Prevention, Office of Infectious Diseases.*