Testimony
Committee on Energy and Commerce
Subcommittee on Health
United States House of Representatives

Antibiotic Resistance and the Threat to Public Health

Statement of
Thomas Frieden, M.D., M.P.H.
Director
Centers for Disease Control and Prevention
U.S. Department of Health and Human Services

SAFER • HEALTHIER • PEOPLE™

For Release on Delivery
Expected at 2 p.m.
April 28, 2010

Good morning, Chairman Pallone and other distinguished members of the subcommittee. I am Dr. Thomas Frieden, Director of the Centers for Disease Control and Prevention (CDC), an agency of the Department of Health and Human Services, and I appreciate the opportunity to talk to you today about the public health threat of antibiotic resistance and the important role CDC plays in detecting, responding to and preventing this problem.

Introduction

Antimicrobials[1] are used to treat infections by different disease-causing microorganisms, including bacteria, mycobacteria, viruses, parasites and fungi. In the vast majority of cases where antimicrobials are used, the microorganisms have found a way to evade or resist the antimicrobial agent. Resistance occurs wherever antimicrobials are used -- in the community, on the farm, and in healthcare. Antimicrobial resistance is a global problem, and some of our most significant global threats are multi-drug resistant tuberculosis and drug-resistant malaria. Today, however, I will focus on domestic issues and antibiotic-resistant bacteria.

Antibiotic resistance is a public health problem of increasing magnitude, and finding effective solutions to address this problem is a critical focus of CDC activities. Infections with resistant bacteria were first reported over 60 years ago[2], but early on the problem was often overlooked, because if one antibiotic did not treat the infection another was usually available. Since then, infections with resistant bacteria have become more common in healthcare and community settings, and many bacteria have become resistant to more than one type or class of antibiotics. Consequently, doctors and nurses today are faced with treating infections where antibiotic options are very limited, and in some cases, where no effective antibiotics exist. When treatment options

[1] Antimicrobial is a general term for the drugs, chemicals, or other substances that either kill or slow the growth of microbes. Among the antimicrobial agents in use today are antibiotic drugs (which kill bacteria), antiviral agents (which kill viruses), antifungal agents (which kill fungi), and antiparisitic drugs (which kill parasites). An antibiotic is a type of antimicrobial agent made from a mold or a bacterium that kills, or slows the growth of other microbes, specifically bacteria. Examples include penicillin and streptomycin.
[2] Barber M. Staphylococcal infections due to penicillin-resistant strains. British Medical Journal. 1947.

are limited, healthcare providers might need to use antibiotics that are more expensive or more toxic to the patient. When no antibiotic is effective, healthcare providers may be limited to providing supportive care rather than directly treating an infection -- similar to how medicine was practiced before antibiotics were discovered. As resistance increases, the patient's risk of dying from infection also increases. Moreover, resistance is not just a problem for the patient who is infected. When an infection is not effectively treated because of resistance, the microorganisms will persist and potentially spread to others, further extending the resistance problem.

Antibiotics kill or inhibit bacteria that are susceptible to that antibiotic. Bacteria that are intrinsically resistant or that can acquire resistance will survive and replace the drug-susceptible bacteria. Thus, any antibiotic use will provide a selective pressure[3] that perpetuates resistant bacteria. The more that antibiotics are used, the greater the selective pressure. Antibiotics are the most important tool we have to control many life-threatening bacterial diseases once infection has occurred, yet increasing levels of resistance are compromising the effectiveness of these antibiotics. Bacteria have developed multiple ways of becoming resistant to antibiotics; the more often bacteria are exposed to antibiotics, the more likely they are to survive through one of these mechanisms. Antibiotics are used widely to treat persons in the community and in healthcare settings, and are also used to treat animals in agricultural settings. It is imperative that we assess the use of antibiotics carefully – regardless of setting -- and use them only when necessary, to avoid promoting the development of resistance among bacteria.

Antibiotic resistance is also an economic burden on the healthcare system. Resistant infections not only cost more to treat, but also can prolong healthcare use. In a 2008 study of attributable medical costs for antibiotic resistant infections, it was estimated that infections in 188 patients from

[3] Selective pressure means that use of antibiotics will kill susceptible bacteria, but also "enrich" resistant bacteria. Resistant bacteria are "enriched" by the lack of susceptible bacteria to compete with for space, resources, hosts, etc. Thus, those resistant organisms can often thrive and multiple, passing on their resistant genes to the next generation.

a single healthcare institution cost between $13.35 and $18.75 million dollars.[4] Unfortunately, infections caused by antibiotic resistant bacteria are an everyday occurrence in healthcare settings.

Overview of CDC's Antibiotic Resistance Programs

Without continuing to improve on our response to the public health problem of antibiotic resistance, we are potentially headed for a post-antibiotic world in which we will have few or no clinical interventions for some infections. Addressing antibiotic resistance requires a multifaceted approach to reduce inappropriate use, prevent disease transmission, and develop new antibiotic agents. CDC's activities in this area are focused on two goals: preventing the emergence and spread of resistant organisms, and improving antibiotic use to reduce resistance. Many of these activities are conducted in collaboration with partners including other federal agencies, state and local public health departments, academic centers, and international organizations.

Disease Surveillance and Response

Disease surveillance is a core CDC activity. CDC uses surveillance systems to assess and monitor the scope, magnitude and trends of the antibiotic resistance problem. Surveillance data are used not only to monitor resistance rates but are also used to drive and direct prevention efforts, determine treatment recommendations, guide new drug development, and evaluate the effectiveness of prevention programs.

Several different surveillance tools have been developed for bacterial resistance because surveillance strategies and objectives vary for different problems. One of CDC's most important surveillance platforms is the Emerging Infections Programs (EIPs), a network of 10 state health

[4] Roberts, RR, Hota B, Ahmad I, Scott RD II, Foster SD, Abbasi F, Schabowski S, Kampe LM, Ciavarella GG, Supino M, Naples J, Cordell R, Levy SB, Weinstein, RA. Hospital and societal costs of antimicrobial-resistant infections in a Chicago teaching hospital: implications for antibiotic stewardship. Clin. Infect. Dis. 2009; 49:1175-84.

departments working with collaborators in laboratories, healthcare facilities, and academic institutions to conduct population-based surveillance. Through population-based surveillance, CDC is able to provide national estimates of disease burden and to track changes in disease burden over time. Through this network, CDC conducts surveillance for both resistant community-associated and healthcare-associated bacterial infections. Incidentally, the EIP network has been invaluable in our response to H1N1 influenza.

Another component of CDC's antibiotic resistance surveillance system is the National Healthcare Safety Network (NHSN). This web-based surveillance tool for hospitals and state health departments monitors healthcare-associated infections (HAIs), such as those caused by methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile*, and multi-drug resistant gram-negative bacteria. Over 2,500 U.S. hospitals (approximately half) are currently enrolled in NHSN, and the President's budget request for FY 2011 seeks to expand that enrollment by another 2,500 hospitals. Data from this network are used to monitor HAI rates and the prevalence of resistance among the bacteria causing infection.

The CDC, the Food and Drug Administration (FDA), and the Department of Agriculture (USDA) also work in collaboration with participating state and local health departments to operate the National Antimicrobial Resistance Monitoring System (NARMS). NARMS is a lab-based surveillance system in all 50 states that detects resistance in enteric bacteria (microorganisms that inhabit the intestines) that are commonly transmitted from animals to humans through food, such as *Salmonella*, *Campylobacter*, and *E. coli*. NARMS monitors trends in the prevalence of resistance among bacteria isolated from humans, retail meats, and livestock.

Prevention and Control of Antibiotic Resistance in the Community and in Healthcare

Preventing resistant infections provides the greatest opportunity to limit resistance. Strategies to prevent and control resistant bacteria vary by the pathogen and the setting in which the infection is acquired. For some diseases, like *Streptococcus pneumonia*, there are vaccines to prevent infections. For others, CDC works collaboratively to develop infection control and treatment guidelines. Prevention of HAIs, such as MRSA, resistant gram-negative bacteria,[5] and *C. difficile*, can require different interventions than those infections that are community-associated, such as tuberculosis and pneumococcal pneumonia. In all cases, surveillance data are used to monitor the effectiveness of prevention efforts.

CDC works with state and local public health authorities to detect and respond to the emergence of new resistant bacteria. Part of these efforts includes providing reference laboratory services for state and local public health departments to confirm and characterize unusual antibiotic resistance. New resistance patterns often require the development of new laboratory tools for detection. CDC develops these new laboratory tools and then distributes them widely to monitor resistance at the local level.

CDC also provides epidemiologic assistance in outbreak responses. Outbreaks caused by resistant bacteria can occur in community settings where people are concentrated, such as athletic teams, childcare centers, and prisons, or in healthcare settings, including hospitals, long-term care facilities, and ambulatory care facilities. In all of our investigations, CDC works cooperatively with state and local health authorities to learn from each outbreak and use the lessons learned to develop best practice recommendations to prevent similar outbreaks from occurring in the future.

High Priority Antibiotic Resistant Infections

[5] There are several types of gram-negative bacteria that cause healthcare-associated infections. Some of the more common bacteria belong to the *Enterobacteriaceae* family, such as *Klebsiella* spp., and *Escherichia coli*. Other important bacteria are *Acinetobacter* spp. and *Pseudomonas aeruginosa*.

Healthcare Associated Multi-Drug Resistant Gram-Negative Bacterial Infections

The newest resistance challenge in the healthcare setting is multi-drug resistant gram-negative bacteria. Particularly concerning are the carbapenemase-producing bacteria, such as bacteria of the *Klebsiella* species, among others. Bacteria with the carbapenemase-resistance trait are resistant to a class of drugs that were considered the "last resort" for treating serious infections caused by these bacteria. The antibiotic resistant traits are often located on mobile genetic elements, called plasmids. That means that resistance can be readily transferred from one bacterium to another, facilitating the spread of resistance between bacteria.

Most recently, CDC has collaborated with state health departments in New York, Illinois, Florida, California, and Arizona to address outbreaks of carbapenemase-producing *Klebsiella*. In addition to these outbreaks, our reference lab has confirmed carbapenemase-producing *Klebsiella* for 32 other States. Preventing the spread of these resistant bacteria is difficult because patients may harbor the resistant bacteria in their intestinal tracts, but this goes unrecognized because it does not make the patients sick. This is called "asymptomatic colonization." Outbreak investigations, such as the one CDC helped with at an Illinois long-term care facility, found that up to 50 percent of a patient population can harbor the resistant bacteria while only a few patients may have an active infection. Patients with asymptomatic colonization can be infectious without being sick themselves. There is no efficient method to identify all potential types of colonization; furthermore, many of these organisms are part of normal human bacteria, and simply eradicating them could harm a patient.

CDC has responded to this new public health threat by working with laboratory standard-setting institutions to identify and recommend tests for the accurate detection of carbapenemase-mediated resistance. CDC has also worked with our Healthcare Infection Control Practices Advisory

Committee (HICPAC) to recommend methods to identify patients colonized with the resistant bacteria so that infection control precautions can be implemented to prevent further spread.

Acinetobacter is another species of gram-negative bacteria that causes infections in hospitalized patients and often becomes resistant to many antibiotics. Infected patients are usually the individuals with the most comprised health, such as those receiving intensive care. *Acinetobacter* has also caused a large number of infections among U.S. service members injured in the Middle East. CDC investigations of *Acinetobacter* have led to some important discoveries. First, these resistant bacteria can spread rapidly within a healthcare institution and between healthcare institutions within a community. Second, contamination of the hospital environment is often a significant contributor to the spread of the resistant bacteria. In turn, these discoveries have led to the development of aggressive infection control strategies for *Acinetobacter*. Fortunately, consistent application of rigorous infection control precautions and environmental cleaning practices can prevent the transmission of *Acinetobacter*.

MRSA Infections

MRSA infections are transmitted primarily in the healthcare setting. These infections were first encountered in healthcare settings in the 1980s, and the rate of infections has continued to rise. Reducing MRSA infection rates in U.S. hospitals is the focus of several local, regional, and national interventions. For example, the Veterans Affairs Pittsburgh Healthcare System, in collaboration with CDC, achieved a 60 percent reduction in the rate of MRSA infections after it implemented a series of infection control procedures based on evidence-based guidelines designed to decrease the transmission of MRSA in hospitals. The measures included strict attention to hand hygiene, enhanced surveillance for infections, effective use of isolation rooms, and behavior modification techniques for healthcare workers to emphasize the importance of the new procedures. These

interventions were subsequently implemented in Department of Veterans Affairs (VA) medical centers nationwide and in multiple other healthcare systems.

National data from the NHSN show that there has been a significant drop in the incidence of both MRSA and methicillin-susceptible *S. aureus* (MSSA) central line-associated bloodstream infections among intensive care unit patients in U.S. hospitals over the last five years. The incidence of MRSA bloodstream infections per 1,000 central line days (i.e. a measurement of infection burden derived from the number of patients who have a central line, or catheter, whether infected or not) decreased by 50 percent, while the incidence of central line-associated MSSA infections decreased even more substantially, by 70 percent. Serious MRSA infections are also monitored using the Active Bacterial Core Surveillance (ABCs) system; a surveillance system conducted in the EIP network. MRSA ABCs data for 2005-2008 also show a decrease in hospital-onset and healthcare-associated MRSA infections, confirming a downward trend. Thus, it appears that these practical efforts to reduce the transmission of MRSA in hospitals are working, thereby reducing the need for antibiotic usage.

Most serious MRSA infections, an estimated 85%, are associated with a healthcare exposure, but nearly 14% of the infections are community-associated. Although progress in controlling MRSA in hospitals is being made, CDC ABCs data indicate that community-associated MRSA infections are not decreasing. Most of these are skin infections, but severe and sometimes fatal cases of necrotizing pneumonia continue to be reported among otherwise healthy people in the community with no links to the healthcare system. Controlling MRSA in community settings is a new challenge, and CDC is continuing to evaluate evidence-based methods to reduce these infections in community settings. While progress continues to be made, more can be done, and CDC wants every healthcare institution to move toward elimination of MRSA and all other HAIs.

Clostridium difficile

C. difficile infections can be an adverse consequence of antibiotic use. *C. difficile* bacteria can live in the intestinal tract without causing disease because its numbers are kept low by competing with healthy intestinal bacteria for nutrients. However, antibiotics can disrupt this balance by killing off healthy intestinal bacteria, whereas *C. difficile*, which is intrinsically resistant to many commonly used antibiotics, flourish and multiply. *C. difficile* disease can range from mild diarrhea to life-threatening infections. Since 2000, the United States has seen a rapid increase in the number and severity of *C. difficile* infections, primarily in hospitalized patients. Studies done in collaboration with CDC have demonstrated that modifying antibiotic usage in healthcare facilities can decrease *C. difficile* disease rates. Other studies have shown that daily cleaning of hospital rooms will also significantly decrease *C. difficile* infection rates.

Gonorrhea

Over time*, Neisseria gonorrhoeae* (gonorrhea) has become resistant to every antibiotic that has been used to treat it. During the 1970s and 1980s, resistance to penicillin and tetracycline increased significantly, leading CDC to stop recommending those antibiotics for therapy. Over the past decade, fluoroquinolone-resistant gonorrhea spread from the Far East and Western Pacific to the United States, leaving only one class of antibiotics still recommended for effective gonorrhea treament, the cephalosporins.

It is expected that gonorrhea will also acquire resistance to the cephalosporins. Strains with decreased susceptibilities to cephalosporins identified in laboratory testing and some treatment failures following therapy with oral cephalosporins have been reported from several countries in Asia. Cephalosporin resistance has not yet been reported in the United States and has not been detected by CDC. With over 330,000 cases reported each year in the US, even small changes in

the treatment of gonorrhea (e.g., the need for multi-dose or multi-drug therapy) could significantly impact the cost and effectiveness of control efforts for this infection.

CDC is collaborating with the World Health Organization (WHO) to maintain and strengthen its regional gonococcal resistance surveillance programs and to strengthen the laboratory and epidemiological capacity of countries, particularly in the Far East and Western Pacific regions where resistance has emerged in the past.

Foodborne bacterial infections

Non-typhoid *Salmonella* causes approximately 1.4 million cases of disease in humans in the United States each year. Patients with complicated or severe infections are treated with fluoroquinolones or cephalosporins, and of these two drug classes, only cephalosporins are approved for treatment of children with these infections. Since NARMS began surveillance in 1996, cephalosporin resistance among *Salmonella* isolated from humans has increased significantly, and resistance to this class of drugs has also been found among *Salmonella* isolated from the livestock and retail meats for which NARMS conducts surveillance. In many cases, the same types of bacteria and genetic mechanisms of resistance are found in both human and animal sources. Studies have shown that use of cephalosporins in food animals can select for antibiotic resistant bacteria, and, in some cases, specific uses of this class of drugs in food animals are associated with higher rates of resistance among human *Salmonella* infections. In order to successfully manage resistance, it is important to understand antibiotic resistant human infections in the context of specific antibiotic use patterns, including use patterns in food animals.

Campylobacter is one of the leading causes of culture-confirmed foodborne bacterial disease in humans in the United States, and consumption of poultry has been shown to be an important risk factor for *Campylobacter* infection. Fluoroquinolones and macrolides are the drug classes of

choice for treating *Campylobacter* infections. Following the approval of fluoroquinolones for use in poultry, rate of resistance to this class of drugs among human *Campylobacter* isolates rose sharply, to more than 20 percent. FDA has since withdrawn approval of this drug class for use in poultry, and NARMS continues to monitor *Campylobacter* from humans, retail meats and food animals for fluoroquinolone resistance. Studies are also underway to understand domestic and foreign travel-associated sources of fluoroquinolone-resistant *Campylobacter*.

Tuberculosis

Treatment of drug-susceptible tuberculosis (TB) requires 6-9 months of therapy, while drug resistant cases require 18-24 months of therapy with drugs that are less effective, more toxic, and far more costly. TB bacilli become resistant to antibiotics through inappropriate or inconsistently taken therapy; therefore, programs that fail to assure appropriate prescription and direct observation of treatment regimens, drug susceptibility testing, uninterrupted drug supplies, and patient support throughout duration of therapy can contribute to the development of drug resistance. This was the scenario in the United States from 1985 to 1993. Due to a combination of program neglect, the HIV epidemic, and outbreaks in congregate settings, the United States experienced 52,100 more TB cases than otherwise would have been expected during this period. An influx of emergency funds enabled CDC to build capacity in state, local, and territorial health departments to implement Directly Observed Therapy, where healthcare or outreach workers observe the taking of each dose of anti-TB medication and monitor patients' response.

As a result, TB incidence in the United States has declined from 25,107 cases in 1993 to a preliminary count of 11,540 in 2009, with proportional decreases in drug-resistant TB cases. In 2008, 1.1 percent of U.S. TB cases were drug resistant as compared with rates exceeding 20

percent in other parts of the world.[6] However, the epidemiology of drug-resistant TB in the United States has changed, reflecting global patterns. In 1993, 26 percent of multi-drug resistant TB cases occurred in foreign-born persons, whereas in 2008 this was 78 percent.[7] CDC monitors for drug resistance in the United States and, globally, collaborates with the United States Agency for International Development and WHO to provide technical assistance to national TB programs to monitor and prevent drug resistance and implement infection control practices in congregate settings, for example, in waiting rooms in HIV antiretroviral therapy clinics. CDC is also conducting research to develop shorter, more effective regimens for treating TB, drug-resistant strains, and TB in HIV-coinfected persons and children.

Pneumococcal Infections

Vaccination is effective in preventing pneumococcal infections. Penicillin-resistant pneumococcal infections became common during the 1990s. In 2000, a new pneumococcal conjugate vaccine became available for children in the United States, and CDC began tracking the vaccine's impact on resistant pneumococcal infections with the ABCs project. Since the vaccine was introduced into the routine childhood immunization program in the United States, penicillin-resistant pneumococcal infections have declined by 35 percent. Not only has the vaccine been shown to prevent antibiotic-resistant infections, it has been shown to reduce the need for prescribing antibiotics for children with pneumococcal infection in the first place. CDC data also show that adults are getting fewer resistant pneumococcal infections because the vaccine is preventing spread of pneumococci from infected children to adults. It is estimated that since 2001, 170,000 severe pneumococcal infections and 10,000 deaths have been prevented by vaccine use and that the vaccine is highly cost-effective, saving an estimated $310 million in direct medical costs each year.

[6] MMWR, March 19, 2020/59(10), 289-294 and Multidrug and extensively drug-resistant TB (M/XDR-TB): 2010 global report on surveillance and response.WHO/HTM/TB/2010.3

[7] CDC. Reported Tuberculosis in the United States, 2008. (http://www.cdc.gov/tb)

Despite the success of this vaccine, CDC's surveillance has identified the emergence of infections caused by a new multidrug-resistant strain of pneumococcus called serotype 19A. In a sense, the vaccine has provided selective pressure benefiting strains not covered by the vaccine. In February of this year, a new version of the vaccine, which includes protection against strain 19A, was approved for use. CDC will continue to use its surveillance systems to evaluate the impact of this new version of the vaccine.

Improving Antibiotic Use

Antibiotic use often provides lifesaving therapy to those who have a serious bacterial infection. Antibiotic use also provides the selective pressure for new resistance to develop. In order to minimize the selective pressure of antibiotics, it is important to make sure that when antibiotics are used, they are used appropriately. CDC's educational campaign ***Get Smart: Know When Antibiotics Work*** teaches both the provider and the patient when antibiotics should be used.

The ***Get Smart: Know When Antibiotics Work*** program is a comprehensive and multi-faceted public health effort to help reduce the rise of antibiotic resistance. Partnerships with public and private health care providers, pharmacists, a variety of retail outlets, and the media result in broad distribution of the campaign's multi-cultural/multi-lingual health education materials for the public and health care providers. Through ***Get Smart***, CDC develops clinical guidance and principles for appropriate antibiotic use to prevent and control antibiotic-resistant upper respiratory infections. ***Get Smart*** targets five respiratory conditions that account for most of office-based antibiotic prescribing, including: otitis media, sinusitis, pharyngitis, bronchitis, and the common cold. Data from the National Ambulatory Medical Care Survey confirm the campaign's impact on reducing antibiotic use for acute respiratory tract infections among both children and adults. There has been a 20 percent decrease in prescribing for upper respiratory infections (In 1997 the prescription rate for otitis media in children less than 5 years of age was 69 prescriptions per 100 children compared

to 47.5 per 100 children in 2007.) and a 13 percent decrease in prescribing overall for all office visits (Overall antibiotic prescribing dropped from 13.8 prescriptions per 100 office visits to 12.0 prescriptions per 100 office visits, comparing 1997-98 to 2005-06)[8]. The ***Get Smart: Know When Antibiotics Work*** campaign contributed to surpassing the Healthy People 2010 target goal to reduce the number of antibiotics prescribed for ear infections in children under age 5.

Following the success of this campaign, two new ***Get Smart*** campaigns have been launched: ***Get Smart in Healthcare Settings*** and ***Get Smart on the Farm***. ***Get Smart in Healthcare Settings*** will focus on improving antibiotic use for the in-patient population. One of the initial activities will be to launch a website that will provide healthcare providers with materials to design, implement, and evaluate antibiotic stewardship interventions locally. These materials will include best practices from established and successful hospital antibiotic stewardship programs.

Antibiotics are also used in veterinary medicine and animal agriculture. Antibiotic use in animals has lead to the emergence of resistant bacteria, and sometimes these resistant bacteria can be transferred from animals to humans by direct contact or by handling and/or consuming contaminated food. ***Get Smart: Know When Antibiotics Work on the Farm*** is an educational campaign with the purpose of promoting appropriate antibiotic use in veterinary medicine and animal agriculture. CDC funds and provides technical assistance for several state-based efforts to educate veterinarians and food producers, including those in the dairy and beef industries.

There are several CDC initiatives to improve surveillance of antibiotic use to measure how much and where antibiotics are used. One initiative is an enhancement of the NHSN to accept antibiotic use data from healthcare facilities through electronic medical records. This capability is expected

[8] Unpublished data from the National Ambulatory Medical Care Survey, National Center for Health Statistics, 2009; http://www.cdc.gov/nchs/ahcd.htm

to be available in the next year. The second is a point prevalence survey of antibiotic use in selected healthcare facilities from around the U.S. This survey will be conducted through our EIP network, and it is expected to give us a snapshot of antibiotic use in the U.S. Antibiotic use data from both initiatives will provide much-needed information for implementing more targeted strategies to improve antibiotic use nationwide.

Antibiotic Resistance Requires a Coordinated Response

Since the impact of resistance is extensive, the Interagency Task Force on Antimicrobial Resistance was created to plan and coordinate federal government activities. The Task Force is finalizing an update of "A Public Health Action Plan to Combat Antimicrobial Resistance", which was first released in 2001. The Action Plan will focus on:

- reducing inappropriate antimicrobial use;
- reducing the spread of antimicrobial resistant microorganisms in institutions, communities, and agriculture;
- encouraging the development of new anti-infective products, vaccines, and adjunct therapies; and
- supporting basic research on antimicrobial resistance.

The Task Force is co-chaired by CDC, FDA, and the National Institutes of Health and includes seven other federal agencies (Agency for Healthcare Research and Quality, Centers for Medicare and Medicaid Services, USDA, Department of Defense, VA, Environmental Protection Agency, and Healthcare Resources and Services Administration).

Conclusion

With the growing development of antibiotic resistance, it is imperative that we no longer take the availability of effective antibiotics for granted. As a nation, we must respond to this growing problem, and our response needs to be multifactorial and multidisciplinary. CDC will continue to

develop improved diagnostics to detect resistance rapidly and accurately. With the increased investments under the President's budget, we will enhance our surveillance systems, such as NHSN, with electronic laboratory data and electronic medical records data, which will facilitate surveillance at the healthcare level and thereby increase surveillance capacity. It will also result in real-time reporting, which means that there will be greater opportunities for a rapid prevention and control response. Healthcare institutions need robust infection control programs and antibiotic stewardship programs to prevent transmission of resistant bacteria and to decrease the selective pressure for resistance. CDC will continue its support of new and effective vaccines, like the pneumococcal vaccine, to prevent infections caused by some of the most serious infections such as MRSA and *C. difficile*. By building on our current efforts, we can extend the life of current antibiotics and develop future antibiotic therapies to protect us from current and future disease threats.