HENRY A. WAXMAN, CALIFORNIA
CHAIRMAN

JOE BARTON, TEXAS
RANKING MEMBER

ONE HUNDRED ELEVENTH CONGRESS
Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6115

Majority (202) 225–2927
Minority (202) 225–3641

MEMORANDUM

April 26, 2010

To: Members of the Subcommittee on Health

Fr: Committee on Energy and Commerce Staff

Re: Subcommittee Hearing on Antibiotic Resistance

On Wednesday, April 28, 2010, at 2:00 p.m. in room 2123 of the Rayburn House Office Building, the Subcommittee on Health will hold a hearing entitled "Antibiotic Resistance and the Threat to Public Health". The hearing will explore the phenomenon of antibiotic resistance and the effects it has on human health.

I. INTRODUCTION: BACTERIA, ANTIBIOTICS AND ANTIBIOTIC RESISTANCE

Bacteria are microscopic organisms that are found naturally both inside and outside of our bodies. Sometimes bacteria can be harmless or even beneficial. There are a hundred trillion or so bacteria that live in a person's gut and can help process food and protect people from unfriendly germs[1]. At other times, bacteria can be harmful to humans by infecting the body (e.g., strep infections of the throat). Viruses are different from bacteria but are also microscopic organisms that can infect the body (a viral infection of the upper respiratory tract is usually called a cold).

Antibiotics fight infections by killing or inhibiting the growth of bacteria. These drugs can be lifesaving and have dramatically reduced illness and death since the invention of

[1] NIAID, *Bacterial Infections: Birth of an Intestinal Ecosystem* (online at www.niaid.nih.gov/topics/bacterialInfections/pages/intestinalecosystem.aspx) (accessed Apr. 19, 2010).

penicillin in 1927.[2] Antibiotics are only useful against bacteria and not viruses. Antiviral drugs can be used against viruses.

Antibiotic resistance is "the ability of bacteria or other microbes to resist the effects of an antibiotic. Antibiotic resistance occurs when bacteria change in some way that reduces or eliminates the effectiveness of drugs, chemicals, or other agents designed to cure or prevent infections."[3] Every time antibiotics are used, sensitive bacteria are killed and resistant forms of the bacteria may survive.[4] These resistant bacteria can then flourish and infect others.

The ability for bacteria to be resistant to an antibiotic can be encoded on a single segment of DNA. These DNA segments can be transferred between different strains or even different species of bacteria, and through this gene transfer, bacteria that were never exposed to the antibiotic can acquire the resistance from other bacteria.[5] Some DNA segments can even encode resistance to multiple antibiotics, and so when bacteria acquire that single piece of DNA, they can become resistant to many antibiotics.[6]

The U.S. Centers for Disease Control and Prevention (CDC) observes that "the number of bacteria resistant to antibiotics has increased in the last decade. Many bacterial infections are becoming resistant to the most commonly prescribed antibiotic treatments." According to the National Institute of Allergy and Infectious Diseases (NIAID), "many infectious diseases are increasingly difficult to treat because of antimicrobial-resistant organisms."[7] This hearing will examine the recent trend in infections that have become more difficult to control.

II. PUBLIC HEALTH IMPACT OF ANTIBIOTIC RESISTANCE

---

[2] CDC, *Get Smart: Know When Antibiotics Work—Antibiotic Resistance Questions & Answers* (online at www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html) (accessed Apr. 19, 2010).

[3] CDC, *Get Smart: Know When Antibiotics Work—Antibiotic Resistance Questions & Answers* (online at www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html) (accessed Apr. 19, 2010).

[4] CDC, "Get Smart: Know When Antibiotics Work—Fast Facts" (online at http://www.cdc.gov/getsmart/antibiotic-use/fast-facts.html) (accessed Apr. 19, 2010).

[5] NIAID, "Bacteria Infections" (online at http://www.niaid.nih.gov/topics/bacterialinfections/Pages/default.aspx) (accessed Apr. 19, 2010); NIAID, "Antimicrobial (Drug) Resistance: Causes" (online at http://www.niaid.nih.gov/topics/antimicrobialResistance/Understanding/Pages/causes.aspx) (accessed Apr. 19, 2010).

[6] CDC, *Get Smart: Know When Antibiotics Work—Antibiotic Resistance Questions & Answers* (online at www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html#d) (accessed Apr. 19, 2010).

[7] NIAID, *Antimicrobial (Drug) Resistance* (online at www.niaid.nih.gov/topics/antimicrobialResistance/Understanding/Pages/quickFacts.aspx) (accessed Apr. 19, 2010).

Numerous press reports have highlighted the decreased ability of modern antibiotics to control deadly diseases,[8] and CDC has described antibiotic resistance as "one of the world's most pressing health problems."[9]

HOSPITAL ACQUIRED INFECTIONS

Each year nearly two million patients in the United States get an infection in a hospital, and about 90,000 die as a result of these infections.[10] More than 70% of the bacteria that cause hospital-acquired infections are resistant to at least one of the antibiotics most commonly used to treat them.[11] People infected with drug-resistant organisms are more likely to have longer hospital stays and require treatment with other drugs that may be less effective, more toxic, or more expensive.[12] Between 5 and 10 percent of all hospital patients develop an infection, leading to an increase of about $5 billion in annual U.S. healthcare costs.[13]

IMPACT OF SPECIFIC BACTERIA

Some resistant organisms have garnered specific interest. In 2007, CDC experts estimated that methicillin-resistant *Staphylococcus aureus* (MRSA) was responsible for about 94,000 infections and over 18,000 deaths each year.[14] Even young, healthy patients were killed by this infection.

One outbreak in relatively young patients was documented by CDC in 2004, when an outbreak of antibiotic-resistant *Acinetobacter baumannii* began in veterans returning from Iraq and Kuwait and from Afghanistan.[15]

---

[8] *Rising Threat of Infections Unfazed by Antibiotics*, New York Times (Feb. 26, 2010).

[9] CDC, *Get Smart: Know When Antibiotics Work—Antibiotic Resistance Questions & Answers* (online at www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html) (accessed Apr. 19, 2010).

[10] CDC, *Campaign to Prevent Antimicrobial Resistance in Healthcare Settings* (online at www.cdc.gov/drugresistance/healthcare/problem.htm) (accessed Apr. 19, 2010).

[11] CDC, *Campaign to Prevent Antimicrobial Resistance in Healthcare Settings* (online at www.cdc.gov/drugresistance/healthcare/problem.htm) (accessed Apr. 19, 2010).

[12] CDC, *Campaign to Prevent Antimicrobial Resistance in Healthcare Settings* (online at www.cdc.gov/drugresistance/healthcare/problem.htm) (accessed Apr. 19, 2010).

[13] NIAID, *Antimicrobial (Drug) Resistance: Quick Facts* (online at www.niaid.nih.gov/topics/antimicrobialResistance/Understanding/Pages/quickFacts.aspx) (accessed Apr. 19, 2010).

[14] Klevens RM, *Invasive Methicillin-Resistant Staphylococcus aureus Infections in the United States*, Journal of the American Medical Association (Oct. 17, 2007).

[15] CDC, *Acinetobacter baumannii Infections Among Patients at Military Medical Facilities Treating Injured U.S. Service Members, 2002-2004*, MMWR Weekly (Nov. 19, 2004).

Other infections are becoming so resistant that few antibiotics are effective against them. *Enterococci* bacteria can cause serious infections, especially in people susceptible to infections. There are now strains known as vancomycin-resistant *enterococci* (also known as VRE) which can be resistant to even the drugs of last resort, leaving very little recourse for treating physicians.[16]

III. ORIGINS OF ANTIBIOTIC RESISTANCE AND POTENTIAL ROUTES TO ADDRESS THE PROBLEM

According to NIAID, the broader causes for resistance could include the following:

1. Inappropriate use by physicians.
2. Inadequate diagnostics, leading to use of broad spectrum antibiotics when a specific one might be better, or leading to the use of antibiotics to treat viral infections.
3. Hospital use, because of the heavy use and the close contact among sick patients
4. Agricultural use, particularly in animal feed, although NIAID acknowledges there is debate about the public health impact.

CDC states that "widespread use of antibiotics promotes the spread of antibiotic resistance. Smart use of antibiotics is the key to controlling the spread of resistance." [17] CDC has multiple campaigns to address antibiotic resistance: The "Get Smart: Know When Antibiotics Work" campaign, which focuses on the judicious use of antibiotics by physicians; the "Get Smart: Know When Antibiotics Work on the Farm" campaign, which focuses on use of antibiotics in agricultural settings; and the "Campaign to Prevent Antimicrobial Resistance in Healthcare Settings."

Others, such as the Institute of Medicine, have suggested the need for additional actions, such as incentives to bring more antibiotics to market, more aggressive policies to prevent healthcare-associated infections, strengthened surveillance, and increased efforts in vaccine development and production.[18]

IV. WITNESSES

The following witnesses have been invited to testify:

---

[16] NIAID, *Antimicrobial (drug) resistance: Vancomycin-resistant enterococci (VRE)* (online at www.niaid.nih.gov/topics/antimicrobialResistance/Examples/vre/Pages/default.aspx) (accessed April 19, 2010).

[17] CDC, *Get Smart: Know When Antibiotics Work—Antibiotic Resistance Questions & Answers* (online at www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html) (accessed Apr. 19, 2010).

[18] Institute of Medicine, *Microbial Threats to Health: Emergence, Detection, and Response* (2003).

Thomas Frieden, MD, MPH
Director
Centers for Disease Control and Prevention

Anthony Fauci, MD
Director
National Institute of Allergy and Infectious Diseases