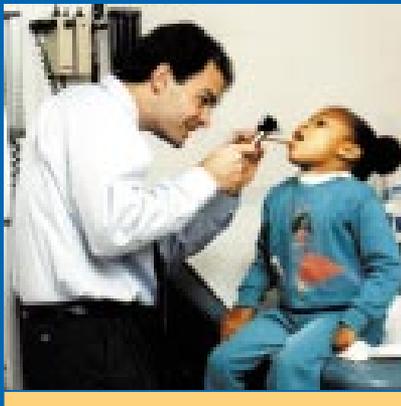


PREVENTING EMERGING INFECTIOUS DISEASES

*Addressing
the Problem of
Antimicrobial Resistance*



*A Strategy for the
21st Century*

CDC
CENTERS FOR DISEASE CONTROL
AND PREVENTION

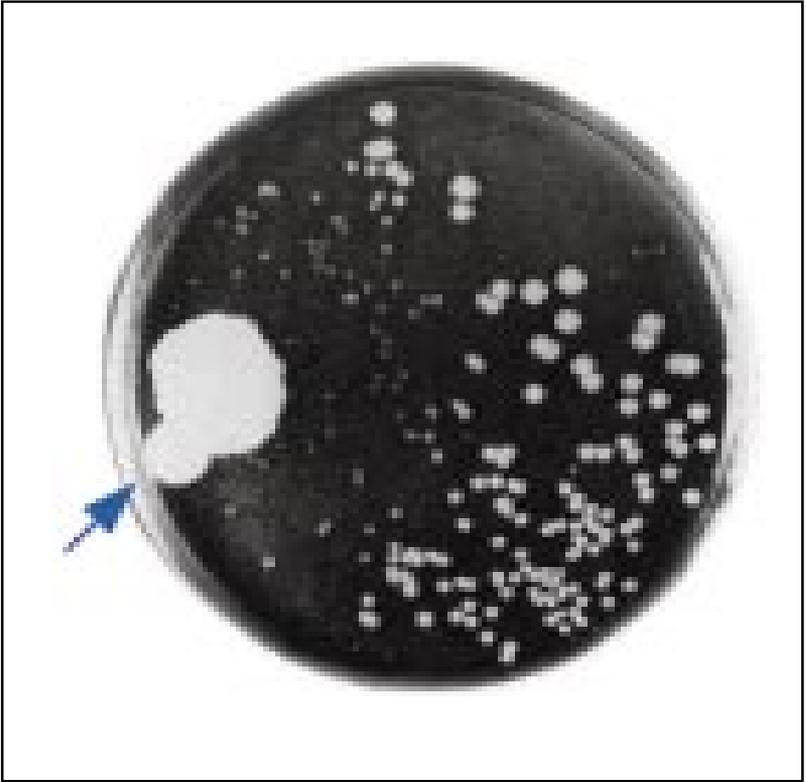


Figure 1: The antibiotic era dawned in 1928, when British physician Sir Alexander Fleming noticed the growth pattern in this photograph: bacteria (small dots on the right) did not grow in the portion of the plate contaminated with *Penicillium* mold (arrow on the left). Although penicillin did not become widely available until the end of world War II, it was followed by many other antibiotics. Today, bacteria have adapted to the widespread use of antibiotics by becoming resistant to these precious drugs.

Infectious diseases are a continuing menace to all segments of society, regardless of age, gender, lifestyle, ethnic background, and socioeconomic status. They cause suffering and death and impose an enormous financial burden on society. Because we do not know what new diseases will arise, we must always be prepared for the unexpected. The Centers for Disease Control and Prevention (CDC) has recently released a plan, *Preventing Emerging Infectious Diseases: A Strategy for the 21st Century*, which describes steps that we can take to move toward the realization of CDC's vision of a world in which all people join in a common effort to address today's emerging infectious diseases and prevent those of tomorrow.

The national emerging infectious disease plan targets specific categories of emerging infectious disease problems and particular groups of people who are at special risk. The nine target areas are antimicrobial resistance; foodborne and waterborne diseases; diseases transmitted through blood transfusions or blood products; chronic diseases caused by infectious agents; vaccine development and use; diseases of people with impaired host defenses; diseases of pregnant women and newborns; and diseases of travelers, immigrants, and refugees. This booklet focuses on emerging antimicrobial resistance.

Public health activities for the nine target areas are organized under four broad, intersecting goals: surveillance and response, applied research, infrastructure and training, and prevention and control.

CDC RESPONDS

The goal of surveillance and response is to detect, investigate, and monitor emerging pathogens, the diseases they cause, the factors influencing their emergence, and to respond to problems as they are identified. For applied research, the goal is to integrate laboratory science and epidemiology to better understand and optimize public health practices for the prevention and control of emerging infectious diseases. The goal of infrastructure and training is to strengthen the underlying foundation of public health surveillance, research, and programs by supporting the planning, delivery, and evaluation of public health activities and practices. Finally, the goal of prevention and control is to ensure prompt implementation of prevention and control strategies and enhance communication of public health information about emerging infections.

The Centers for Disease Control and Prevention Responds

The CDC's National Center for Infectious Diseases (NCID) has developed specific public health activities that address the nine target areas. Many of the activities build on existing efforts or are in the planning stages. Others represent new efforts. These activities are described in individual booklets for each target area.

In the 1940s, the widespread availability of penicillin and the subsequent discovery of streptomycin led to a dramatic reduction in illness and death from infectious diseases.

ANTIMICROBIAL RESISTANCE

Unfortunately, the emergence of drug resistance in bacteria, parasites, viruses, and fungi is swiftly reversing the progress prompted by the many miracle drugs developed over the last 50 years. For example, in some areas of the United States, up to 30% of infections with *Streptococcus pneumoniae*, the most common cause of bacterial pneumonia, meningitis, and ear infections, are no longer susceptible to penicillin (Figure 2).

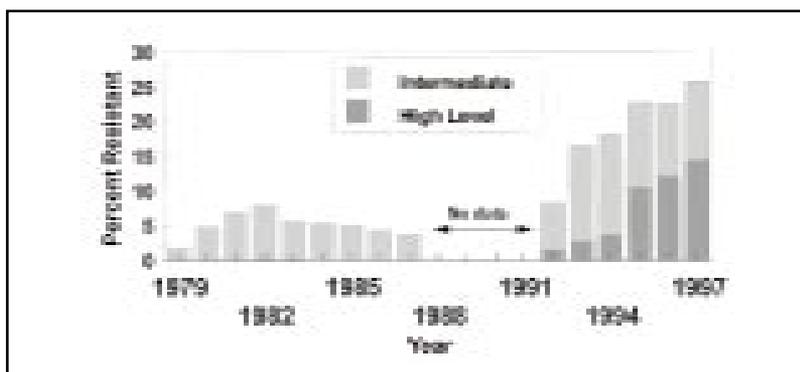


Figure 2: Percentage of invasive *Streptococcus pneumoniae* infections with high-level or intermediate resistance to penicillin in CDC surveillance projects in the United States, 1979-1994 (Sentinel Network) and 1995-1997 (Active Bacterial Core Surveillance System).

Moreover, data from intensive care unit patients in the United States show that 28% of the bacteria that most frequently cause hospital-acquired infections are resistant to the preferred antibiotic for treatment. Many other pathogens, including the agents that cause malaria, tuberculosis, gonorrhea, HIV/AIDS, and salmonellosis, are becoming resistant to standard therapy. As we enter the 21st century, many important drug options for the treatment of common infections are becoming increasingly limited, expensive, and, in some cases, nonexistent.

CDC ACTIVITIES

For example, we are losing our ability to treat infections caused by *Staphylococcus aureus*. Strains of this bacterium cause sores and abscesses on the skin and can spread to the bloodstream, lungs, brain, bones, or heart, causing severe organ damage or death. Today, nearly all *S. aureus* strains are resistant to penicillin, and many have become resistant to methicillin and other similar drugs, the treatment of choice for *S. aureus* infections.

Vancomycin has been considered the only uniformly effective drug for methicillin-resistant *S. aureus*. However, in 1997, strains of *S. aureus* with decreased susceptibility to vancomycin were reported for the first time in Japan and the United States. If we are unable to limit the emergence and spread of resistance—and to replace drugs like vancomycin as they lose their effectiveness—*S. aureus* and other similar common bacterial infections may become untreatable, as they were 60 years ago.

Activities for Addressing Antimicrobial Resistance

As long as antimicrobial drugs are used, drug resistance will remain a challenge. The CDC's vision is a world in which antimicrobial resistance is a routine and manageable problem that does not compromise the availability of safe and effective drugs to treat infectious diseases. In collaboration with many private and public partners, NCID plans the following public health activities to address the problem of antimicrobial resistance:

ANTIMICROBIAL RESISTANCE

Surveillance and Response

- “ Enhance and coordinate surveillance systems for drug-resistant infections. Data collected through these systems can provide early warnings of outbreaks, identify changing patterns of resistance, guide drug and vaccine development, target prevention and control measures, and assist in targeting and evaluating interventions.
- “ Enhance and coordinate surveillance systems for identifying risk factors that lead to drug resistance, including antimicrobial drug use in humans, agriculture, and the environment. These data can be used to assess trends in drug use, the relationship between drug use and the emergence of resistant infections, the appropriateness of drug use, and the extent to which resistance can be reduced through the prudent use of drugs.

Applied Research

- “ Investigate the molecular basis of antimicrobial resistance and the epidemiologic factors associated with its emergence and spread.
- “ Develop and evaluate new laboratory tests to improve the accuracy and timeliness of antimicrobial resistance detection in clinical settings.



CDC ACTIVITIES

- “ Develop, implement, and evaluate appropriate infection control strategies in diverse settings (e.g., hospitals, child care centers, long-term care facilities, and outpatient settings) to prevent transmission of resistant infections.
- “ Develop, implement, and evaluate educational and behavioral approaches for improving health provider adherence to practical recommendations and guidelines for the prudent use of antimicrobial drugs.
- “ Develop, implement, and evaluate educational and behavioral interventions that limit the emergence and spread of drug resistance by modifying the drug-prescribing practices of health care providers and educating patients on the appropriate use of drugs.
- “ Evaluate vaccine use in preventing drug-resistant infections.
- “ Evaluate the effectiveness of formulary controls, reimbursement policies, and regulatory activities in reducing the development and spread of drug resistance.
- “ Evaluate the impact of drug resistance, including clinical outcomes and economic costs of treating resistant infections.

Infrastructure and Training

- “ Strengthen the capacity of public and private health agencies, health care delivery organizations, and clinical laboratories to

ANTIMICROBIAL RESISTANCE

detect and report drug-resistant infections, isolate and identify resistant microorganisms, and implement prevention and control strategies.

- “ Promote professional education and training in the epidemiology, detection, and prevention and control of diseases that are resistant to antimicrobial drugs, both in the United States and abroad.

Prevention and Control

- “ Implement public health programs that prevent the emergence and spread of drug-resistant microorganisms. Such public health programs would include 1) infection control strategies in diverse settings; 2) behavioral and educational interventions for modifying drug-prescribing practices of health care providers; 3) behavioral and educational interventions for patients on the appropriate use of drugs and adherence to prescription instructions; 4) health education programs to promote the use of new vaccines for infectious diseases; and 5) feedback of antimicrobial resistance data to health care providers to reinforce and evaluate intervention programs.
- “ Develop and disseminate practical recommendations and guidelines for the prudent use of antimicrobial drugs.
- “ Develop and disseminate recommendations and guidelines for laboratory tests to improve the accuracy and timeliness of drug-resistance detection in clinical settings.

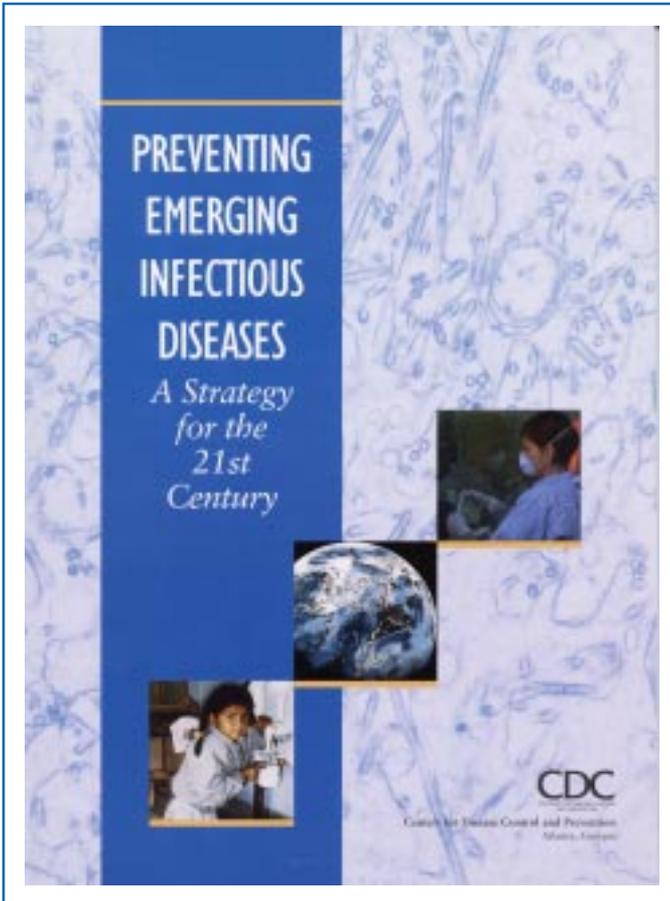
MORE INFORMATION

Where To Find Additional Information

- Web site for the complete plan, *Preventing Emerging Infectious Diseases, A Strategy for the 21st Century*:
www.cdc.gov/ncidod/emergplan
- Web site for CDC Antimicrobial Resistance:
www.cdc.gov/ncidod/diseases/antmic-d.htm
- Voice Fax for CDC:
1-888-CDC-FAXX (1-888-232-3299)
- Address for obtaining additional copies of this booklet:
Office of Health Communication
National Center for Infectious Diseases
Centers for Disease Control and Prevention
Mailstop C-14
1600 Clifton Road, NE
Atlanta, GA 30333



THE CDC PLAN



Copies of the above plan are available from
National Center for Infectious Diseases
Centers for Disease Control and Prevention
Mailstop C-14
1600 Clifton Road, NE
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www.cdc.gov/ncidod

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