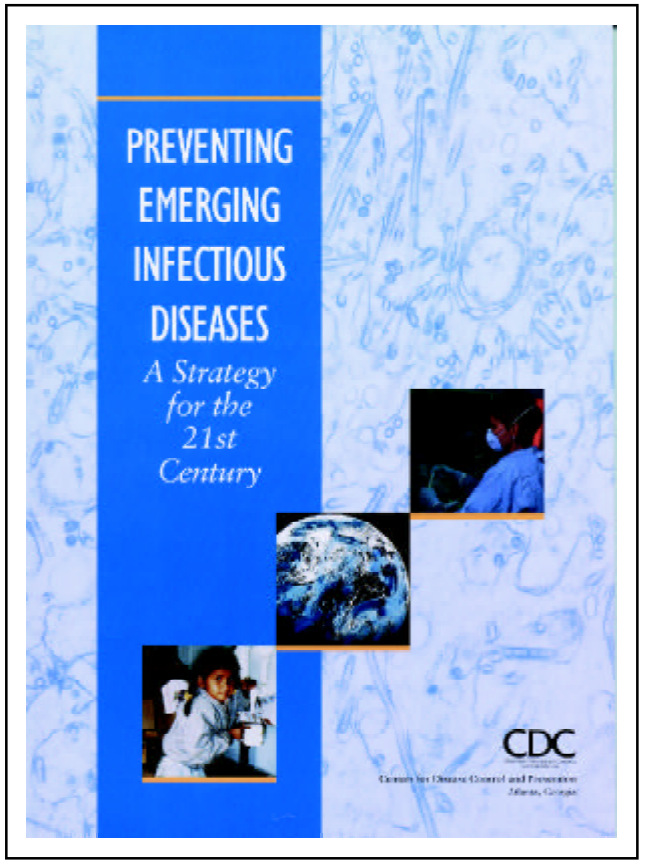
Eradicating Diseases Through Vaccination

Perhaps the greatest success story in public health is the reduction of infectious diseases through the use of vaccines. Immunizations have eradicated smallpox from the globe and led to the near elimination of wild poliovirus. Vaccines have reduced preventable infectious diseases to an all-time low, and now few Americans experience the devastating effects of measles, pertussis, and other illnesses. Vaccines are among the very best protections we have against infectious diseases.



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
Atlanta, GA 30333
www.cdc.gov/ncidod

Where To Find Additional Information

- Website for the complete plan, *Preventing Emerging Infectious Diseases: A Strategy for the 21st Century:* **www.cdc.gov/ncidod/emergplan**
- Website for information on infectious diseases: **www.cdc.gov/ncidod/diseases**
- National Immunization Program (NIP) home page: **www.cdc.gov/nip**
- National Vaccine Program Office (NVPO) home page: **www.cdc.gov/od/nvpo**
- Website for influenza vaccine information: **www.cdc.gov/ncidod/diseases/flu/fluvac.htm**
- Website for information on hepatitis: **www.cdc.gov/ncidod/diseases/hepatitis**
- Voice Fax for CDC (receive information on various diseases by voice message or printed fact sheets): **1-888-CDC-FAXX (1-888-232-3299)**

Infectious diseases can cause suffering and death to anyone regardless of age, gender, lifestyle, ethnic background, and socioeconomic status; moreover, they impose an enormous financial burden on society. Because we do not know what new diseases will emerge, 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 encompasses nine specific categories of emerging infectious disease problems and groups of people who are most at risk: antimicrobial resistance; foodborne and waterborne diseases; vectorborne and zoonotic 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 the public health activities of the National Center for Infectious Diseases (NCID) that address vaccine development and use.

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.

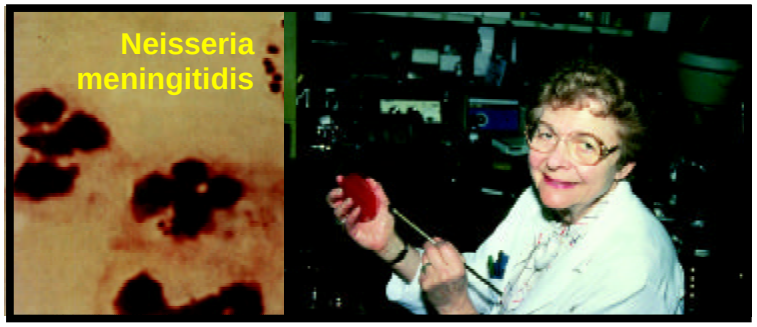
The goal of surveillance and response is to detect, investigate, and monitor emerging pathogens, the diseases they cause, and the factors influencing their emergence, and to address these problems as they are identified. For applied research, the goal is to integrate laboratory science and epidemiology 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 infectious diseases.

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 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.

Goal IV: Prevention and Control

- In partnership with international organizations, governments, and public and private partners, eradicate polio.
- Expand existing mechanisms for ensuring vaccine safety and efficacy. This may involve ensuring an adequate cold chain, developing heat-stable vaccines, and testing new adjuvants.
- Work with public and private partners to optimize vaccination strategies by developing guidelines and implementing pilot studies.



- Employ state-of-the-art technologies to identify microbial antigens that elicit immune responses in humans. Use this information to create new vaccines and diagnostic tests.
- Conduct field evaluations of new vaccines to evaluate their safety, immunogenicity, and efficacy.
- Evaluate the potential role of vaccines in responding to deliberate releases of microorganisms by bioterrorists.

Goal III: Infrastructure and Training

- Establish laboratory networks for the diagnosis and molecular epidemiologic study of vaccine-preventable diseases.
- Establish contingency plans for epidemics of vaccine-preventable diseases, including an influenza pandemic.
- Establish field sites for clinical trials of vaccines and other interventions.

Vaccination is one of the most cost-effective public health tools for disease prevention. Because of vaccination, childhood diseases such as diphtheria, tetanus, measles, mumps, rubella, and *Haemophilus influenzae* type b (Hib) meningitis have been virtually eliminated in the United States. Instead of treating an illness, vaccines prevent an individual from contracting the disease and becoming ill. In addition, the induction of herd immunity—the prevention or reduction of the circulation of an infectious pathogen due to the lack of susceptible individuals in a community with a high vaccination rate—reduces the risk of infection for those who are not vaccinated. Vaccines allow us to control, prevent, and in some cases, eliminate diseases once seen as intractable scourges. A global vaccination program has eradicated smallpox, and polio has been eliminated from the Americas and targeted for worldwide eradication. CDC played a prominent role in both these campaigns.

Polio survivor

The childhood vaccine most recently licensed in the United States, pneumococcal conjugate vaccine, was added to the immunization series in 2000. This vaccine will prevent pneumococcal disease and may also reduce the number of ear infections caused by *Streptococcus pneumoniae*. A vaccine against Lyme disease was licensed in 1999 for use in adults and is currently being evaluated for use in children. Other vaccines currently being evaluated include meningococcal conjugate vaccine and a live, attenuated influenza vaccine.

The importance of maintaining high rates of vaccination was illustrated by an epidemic of diphtheria in the former Soviet Union in the early 1990s, after immunization rates declined, and an increase in measles cases in the United States in the 1980s, before booster shots were incorporated into childhood immunization protocols.

In 1999, the Global Alliance for Vaccines and Immunization (GAVI) was formed to introduce specific vaccines to countries where they are not currently in use. However, no effective vaccine exists for many new or reemerging diseases, such as tuberculosis, AIDS, dengue, hepatitis C, and malaria. CDC is working with many other partners to develop new vaccines; to identify populations most in need of vaccination; to improve vaccination strategies; and to evaluate the immunogenicity, efficacy, and safety of new vaccines. To help develop new vaccines, scientists at NCID are studying people's immune responses and the microbial antigens that elicit them.

NCID Activities for Addressing Vaccine Development and Use

In collaboration with many private and public partners, NCID plans to take the following public health actions to address the issues of vaccine development and use.

Goal I: Surveillance and Response

- Enhance surveillance for vaccine-preventable diseases and use these data to monitor vaccination strategies and target interventions.
- Develop molecular and immunologic tools for the surveillance of microbes that cause vaccine-preventable diseases. These tools will be used to track microbial variants and distinguish them from vaccine strains.
- Expand existing mechanisms used to monitor vaccine safety. These efforts will include collecting data on vaccine failures and the adverse effects of vaccination.

Goal II: Applied Research

- Investigate naturally acquired protective human immune responses to diseases like malaria and hepatitis C and use the research results to create vaccines.
- Identify improved methods for the evaluation of vaccines under development.

PREVENTING EMERGING INFECTIOUS DISEASES

Addressing the Issues of Vaccine Development and Use

A Strategy for the 21st Century

CDC

Department of Health & Human Services
Centers for Disease Control and Prevention (CDC)
Atlanta, GA 30333

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