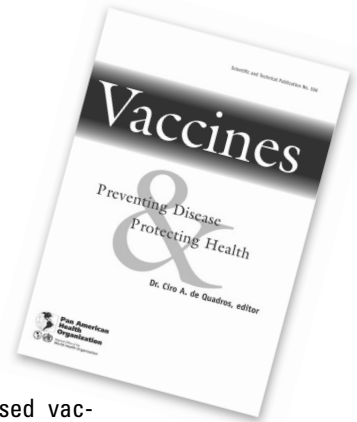


From

VACCINES: Preventing Disease and Protecting Health



1. Vaccine development is an intensely collaborative endeavor. No single organization or group, acting alone, can possibly do all that needs to be done.
2. Immunization programs around the world have made impressive gains in coverage. In the 1970s, coverage stood at a paltry 10%, and included only DPT, BCG, polio, and tetanus toxoid vaccines. Today, coverage averages between 80% and 90%, and new vaccines—including measles, rubella, mumps, *Haemophilus influenzae* type b, and hepatitis B—are constantly being added.
3. The threat of yellow fever persists in tropical areas of Africa and the Americas. In the last two decades of the 20th century, yellow fever emerged again, mainly due to a failure to implement effective vaccination strategies and to population growth in once rural areas. If yellow fever were to be introduced into Asia or other receptive areas with large human populations, there would be significant shortfalls in vaccine supply to deal with a large-scale emergency.
4. Yellow fever is a vaccine-preventable illness, and the continued occurrence of epidemic disease represents a failure of public health. No resident or traveler to an endemic area should suffer this illness.
5. Recent estimates suggest that by the year 2010 there will be 45 million new HIV infections worldwide. By 2020, 70 million people will likely have died of the disease. The virus is set to expand explosively in many countries, including Russia, China and India.
6. The development of HIV vaccines has stumbled against financial and logistic challenges—a low level of public and private investment on HIV vaccine research and inherent complexities in conducting multiple human trials. The major obstacles for the development of an HIV vaccine, however, are mostly of a scientific nature.
7. We now must confront the threat of a deliberate spread of infectious diseases in the form of bioterrorism—a challenge for medicine and public health worldwide.
8. The threat of bioterrorism has reinforced the importance of developing vaccines for all groups of citizens: the young, the old, the infirm, pregnant women, and immuno-suppressed persons.
9. The SARS global outbreak of 2003 was contained, but the disease could re-emerge.
10. Besides an inactivated virus vaccine, akin to those that have worked well against many other viral diseases, other SARS candidate vaccines, including DNA-based vaccines also are in the “pipeline.”
11. Since the polio eradication initiative was launched in 1988, the number of polio cases has been drastically reduced: more than one million childhood deaths and five million cases poliomyelitis have been averted.
12. A new polio vaccine? The possibility that polio could re-emerge in the post-eradication era from OPV-derived strains or from the intentional or unintentional introduction of poliovirus, has raised new concerns. These circumstances point to the need for the development of a new polio vaccine.
13. Vaccines for diseases that are almost exclusively seen in developing countries, such as meningococcal meningitis which occurs mainly in Africa, are largely ignored unless the size of the travel market warrants the product's development.
14. The introduction of a pneumococcal conjugate vaccine has been associated with a dramatic reduction in invasive disease and significant reductions in pneumonia and meningitis. The vaccine has also reduced the burden of antibiotic-resistant pneumococcal disease and has reduced disease in HIV-infected children.

15. Rotavirus infections cause an estimated 450,000 to 550,000 deaths each year; these deaths are concentrated in the poorest countries of Asia, Africa, and the Americas. Rotavirus vaccines are very advanced in their development, with two vaccines currently in clinical trials that could be licensed and available for use within two to three years.
16. There are 160 million cases of shigellosis in the world each year, resulting in about 1.5 million deaths. More alarmingly, *Shigella* could be used as a biological weapon.
17. Approximately a quarter million women die each year of cervical cancer, and human papillomavirus (HPV) infections have been shown to be involved in producing gynecological cancer. Both therapeutic and prophylactic HPV vaccines are currently in clinical trials, bringing hope to women around the world, especially in Asia and Africa, where the disease burden is greatest.
18. *Helicobacter pylori* is believed to be one of the most common bacterial infections in humans, unfortunately, in some persons it can lead to gastrointestinal cancer. Vaccines against *H. pylori* may be able to prevent infection and to eradicate or cure chronically infected individuals.
19. Hepatitis A vaccines are exceptionally efficacious when given to individuals prior to exposure to the hepatitis A virus (HAV) and may even provide some protection if given a week or more after exposure.
20. The hepatitis C virus (HCV) occurs globally, with an estimated 170 million carriers worldwide. Some of the highest prevalence rates exist in Mongolia and northern and central Africa (more than 5%). In the Americas, Brazil has one of the highest prevalence rates, with a seroprevalence of 2.5%–5%.
21. Respiratory syncytial virus (RSV) is a leading cause of respiratory illness in infants, young children, and the elderly. More than two million deaths of children each year are due to acute respiratory infections. RSV has been shown to have a substantial impact in developing countries as well as in the industrial world.
22. About 200 persons die each hour from tuberculosis worldwide, and there are almost 8 million new cases each year. The AIDS epidemic, poor economic conditions, drug-resistant *Micobacterium tuberculosis*, and lack of available treatments are among the factors contributing to these confounding levels.
23. Along with the need to develop vaccines for malaria and AIDS, finding new, effective vaccines for tuberculosis for the developing world remains one of the biggest challenges.
24. The incidence of dengue has increased dramatically since World War II. Dengue vaccine development efforts also have increased, as commercial vaccine developers have joined the effort to bring a tetravalent dengue vaccine to the market to protect both persons living in endemic areas and those traveling to those areas.
25. Malaria wreaks serious health havoc: 40% of the world's population is at risk for the disease, which causes 300 to 500 million cases of disease every year and between 1.4 and 2.7 million deaths. For the first time in history, the vaccine field is poised to overcome malaria vaccines' long history of delays, uncertain funding, lack of collaboration, and poorly powered development efforts. A vaccine candidate designed to prevent replication of the disease in the mosquito vector is in phase 1 trials. If successful, it could be used to vaccinate large populations, such as entire villages or geographic areas.
26. New needle-free vaccine delivery devices currently being tested would help sustain measles elimination and mortality reduction goals in the long-term, by allowing countries to increase measles vaccine coverage.
27. Worldwide, measles vaccine prevents an estimated 80 million measles cases and 5 millions measles deaths each year.
28. Before the introduction of measles vaccine, practically all children contracted measles in the long run. Today, it is not a dream to imagine a world free of measles by the year 2015.
29. The Americas is the first region in the world to achieve the goal of fewer than one case of neonatal tetanus for every 1,000 live births that the World Summit for children set in the 1990s.
30. Maternal immunization, long used to combat neonatal and puerperal tetanus, also can be used to prevent other serious diseases. Lower respiratory tract infections, perinatal conditions, diarrheal diseases, and vaccine-preventable diseases account for more than 10 million deaths each year, almost all of them occurring in children under 5 years of age. Many of these conditions are prime candidates for prevention by passive immunity that might be enhanced by maternal immunization.



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