

techniques for more rapidly sequencing or synthesizing peptides, proteins, and genetic material (RNA and DNA); and refinements in x-ray crystallography for showing protein structure, and thus the portions of pathogen surfaces that present to the human immune system. In addition, new methods have been developed for manipulating cellular systems, for example, to synthesize selected molecules in quantity; for presenting antigens to the immune system in novel ways, for example, by using carriers such as iscoms (immunostimulatory complexes) or by using timed-release capsules; and for enhancing the immunogenicity of antigens, with new adjuvants. Finally, the scientific understanding of the human immune system has been deepened, in part as a result of the research stimulus provided by the HIV/AIDS epidemic. Consequently, the opportunity exists, if all these techniques are applied energetically on a broad front, for there to be an unprecedented wave of vaccine development.

THE NEED FOR IMPROVED AND COMBINATION VACCINES

To attain optimal immunity and protection from an infectious disease, full vaccination needs to be achieved before the recipient is exposed to the disease-causing agent. For many diseases, this requirement means that vaccination must occur in infancy. However, some currently available vaccines cannot be usefully administered early enough in life to provide complete protection. Furthermore, most require multiple doses for full effect and some are not as free from side effects as is desirable. Hence, there is a need to develop improved vaccines for certain diseases.

It is highly desirable that each child be fully immunized in as few contacts as possible with the health care delivery system and that the child receive the minimum number of injections on a single visit (multiple injections are safe but may distress vaccine recipients or their parents). Some existing vaccines are already administered in combination -- for example, diphtheria-tetanus-pertussis vaccine (DTP) and measles-mumps-rubella vaccine (MMR). However, further combinations of existing and new vaccines are necessary. The need to improve immunization delivery through the development of such desirable vaccines is a major feature of the recently launched, internationally supported Children's Vaccine Initiative.

THE CHILDREN'S VACCINE INITIATIVE

The potential to eradicate certain diseases such as poliomyelitis and to build sustainable immunization programs that reach every child may not be realized with existing vaccines. Vaccines are required that will improve access to services by simplifying the immunization schedule. Therefore the United States is a cosponsor of the worldwide Children's Vaccine Initiative (CVI), which is intended to facilitate the transition from existing to new vaccines by promoting directed vaccine research, catalyzing improvement in the quality of vaccines produced in developing countries, and strengthening supply and delivery systems. The CVI is sponsored by the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the Rockefeller Foundation, the World Bank, and the World Health Organization (WHO).

The CVI has outlined the ultimate objective of its quest: a vaccine (or combination of vaccines) that is safe, heat stable (that is, does not require refrigeration), can be administered orally early in life, and produces life-long protection against a number of diseases with only one or a few doses, and that is affordable. Such "tools" would facilitate US. immunization efforts as well as those in developing countries. Although developing a single vaccine that meets these ambitious specifications may take several decades, the United States, as one part of its contribution to the CVI, has already made rapid progress in the development of new combinations of current vaccines -- for example, DTP and Hib-conjugate -- to help make immunization more efficient within the next few years. Work is currently in progress in the United States on other combinations, such as DTP-polio, DTP-hepatitis B, MMR-varicella (chicken pox). The CVI has recently launched a major fundraising effort to support implementation of its recently developed strategic plan.