



Vaccines and Vaccination Programs Revisited

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Despite the significant progress in microbiologic research, infectious diseases are the second leading cause of death throughout the world, particularly among people under the age of 50. As microbes adapt to changes in demographic human behavior, selective pressures of public health programs and the environment, new infections emerge and old diseases re-emerge. A significant landmark in the combat of man against infectious diseases was the understanding that protection from infectious diseases can be achieved by immunization. Vaccination, or the practice of actively inducing immunity has been and continues to be one of the most powerful public health interventions in medicine. The development of vaccines constitutes the greatest achievement of modern medicine, having accomplished near miracles in the fight against infectious diseases. The success of vaccines in controlling disease has been profound. Many diseases that formerly devastated and destroyed whole communities are now under control and some are believed to be completely eliminated in many parts of the world. Despite this success however, many vaccine-preventable infectious diseases continue to strike, particularly in developing nations.

The first vaccine that was developed for human use was against smallpox. Since the introduction of this first vaccine by Edward Jenner in 1798, more than 200 years ago, the development of vaccines and the implementation of vaccination programs have led to the decline of major diseases, including smallpox, diphtheria, pertussis, tetanus, yellow fever, poliomyelitis, measles, mumps and rubella. But have we become victims of our own success? Since the introduction of the successful vaccination programs almost half a century ago, and the almost total eradication of many diseases, we are witnessing a decline in vaccine efficacy and the re-emergence of new strains of the formerly vaccine-preventable pathogens. In addition, concern regarding the safety of vaccines has increased enormously over the past two decades. Anecdotal links between vaccines and a number of disorders have been discredited, but the controversy over these alleged ties remains.

If complacency existed in the public health and decision-making authorities, the re-emerging pathogens and the anti-vaccination public reactions have led to a reevaluation of vaccination programs, implementation of changes therein, and a search for novel approaches in vaccine development. The papers published

in this edition of IMAJ exemplify the current dynamic state in the field of vaccinology.

Starting with the polio vaccine: in 1998 the World Health Organization embarked on a campaign to eradicate polio, but despite the intensified global immunization efforts, the polio virus has not yet been eliminated. To find the answers to this dilemma, Shulman et al., from the Central Virology Laboratory of the Israel Ministry of Health, analyze the genetic changes in the oral poliovirus (Sabin) and inactivated poliovirus (Salk) strains, and their occurrence in the environment. This study was undertaken to evaluate the threat of vaccine-derived poliovirus to a poliomyelitis-free population in Israel, a country with a long-term vaccination program. The findings of this paper emphasize the importance of adequate immunization programs, combined with environmental surveillance to prevent transmission of VDPV in the community. The paper by Rishpon, the Ministry of Health's Officer for the Haifa District, discusses the changes that were introduced in the national polio vaccination program and the reasons for eliminating the combined OPV-IPV vaccination program, which were partly based on Dr. Shulman's findings.

Pertussis, an endemic worldwide disease, was contained in Israel for 40 years due to the routine immunization program that was introduced in 1957. The stable incidence of the disease was 1-2/100,000, with small outbreaks every 3-4 years. Since 1999 the incidence of pertussis increased and reached 24/100,000 in 2004. Moerman and colleagues, from the Ministry of Health's Department of Epidemiology, analyze the reasons for the re-emergence of pertussis in Israel. The results of this analysis, which led to the addition in Israel of a fifth dose to the routine vaccination schedule of children in their second year of elementary school, are also discussed in Rishpon's paper. The review by Hochwald et al. clearly and concisely summarizes the reasons that led to the global re-emergence of pertussis disease in vaccinated populations.

The adverse effects of vaccination are represented here by a case report by Tishler and team from Bnei Zion Medical Center in Haifa, who discuss a case of immune thrombocytopenic purpura following influenza vaccination. Since it is a unique case it is

VDPV = vaccine-derived poliovirus

OPV = oral poliovirus

IPV = inactivated poliovirus

difficult to assess the significance of this paper and include this entity among the possible risks of the influenza vaccine.

The subject of improved vaccines is also discussed. The re-emergence of vaccine-related pathogens and concern regarding the safety of the current vaccines have encouraged scientists and industry to develop better and safer vaccines. One novel approach in vaccine development is the utilization of synthetic peptides that constitute relevant protective epitopes. Studies on such vaccines are described by Ben-Yedidia et al. from the Weizmann Institute of Science, who developed peptide-based vaccines against the parasite *Schistosoma mansoni* and against influenza virus, in which the flagella of Salmonella serve as a platform for the selected epitopes. This approach is very promis-

ing and the influenza vaccine is currently under development by a commercial company.

In conclusion, vaccines still present a major challenge to scientists, industry and public health officials. The present increase in the incidence of vaccine-preventable diseases and the global increase in infectious diseases indicate that there is an urgent need for a revisit.

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