Stochastic Modeling of Vaccine-Derived Poliomyelitis

Youjin Lee

28 July 2008

Abstract

Since the introduction of vaccines against polio in the mid 1950s (Inactivated polio vaccine (IPV)) and the earl 1960s (Oral polio vaccine (OPV)), the control of polio has been successful. However, vaccine associated paralytic disease, which is caused by reversion of OPV, remains an unsolved issue in the present. Even though OPV has ability to induce a high level of intestinal immunity, it may replicate in the human gut, mutate back to virulence and transmissibility re- sulting in circulating vaccine derived polio viruses (cVDPVs). The developing countries still use OPV because of low cost, simple oral administration, and high eectiveness for a small number of doses. The risk of vaccine associated paralytic polio(VAPP) exists among contacts of oral vaccine recipients, so cVDPVs circulated for many years before they could be detected. Most of developed countries use IPV, but the virus can come from outside of countries easily. Therefore, as long as the virus exist in environment, the countries are not in safe against reintroduction and infection of the virus. We formulate a stochastical model to assess the impact of cVDPVs and contact infection on prospects for polio eradication.