

Control, elimination, eradication and re-emergence of infectious diseases: getting the message right

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During the 25 years since the certification of smallpox eradication there has been considerable debate among public health practitioners about how existing health technologies can best be used to decrease infectious disease incidence and prevalence. Interruption of transmission has often been envisaged as the ultimate goal, and standard public health concepts of disease reduction have been defined or re-defined. In 1998, Dowdle proposed a definition of control as a reduction in the incidence, prevalence, morbidity or mortality of an infectious disease to a locally acceptable level; elimination as reduction to zero of the incidence of disease or infection in a defined geographical area; and eradication as permanent reduction to zero of the worldwide incidence of infection.¹

Whereas the proposed definition of eradication emphasizes that routine intervention measures are no longer needed once interruption of transmission has been certified worldwide, inherent in the definitions of control and elimination is the need for continued intervention measures to prevent re-emergence and re-establishment of transmission. It is this need for continued intervention after reaching control or elimination targets that has been the source of confusion among public health workers, health policy-makers and the politicians who provide resources for infectious disease control. At times, misunderstanding has led to neglect or complete cessation of intervention activities, with concurrent decrease in financial resources, and thus to re-emergence of the target disease.

In this issue of the *Bulletin*, Song Liang et al. (pp. 139–144) describe schistosomiasis in eight counties in the Sichuan Province of China that re-emerged an average of 8.1 years after attainment of control targets in seven counties and interruption of transmission in the eighth. Control and interruption of transmission had been attained through a mixture of interventions

including mollusc control, chemotherapy, health education and provision of clean water. Surveillance to determine where disease was present in humans, snails and cattle underpinned control activities and continued in some form in most counties after attainment of control targets. Most other interventions to control infection in the snail vector and human host were, however, discontinued.²

The authors underscore the role of mobility of humans and cattle in the re-introduction of schistosomiasis from adjacent counties where control targets had not yet been met, and the role that cessation of control activities played in the subsequent re-emergence of indigenous transmission. They cite decreased funding, lack of awareness, and apathy as causes for the cessation of control activities, and describe the weakness in surveillance that resulted in late detection of human infection.

In today's world of rapid travel and transport, re-introduction of infectious diseases occurs not only locally: humans, insects, livestock and food products carry infectious agents from country to country and from continent to continent. Infectious agents carried by humans are often asymptomatic or in the incubation period, while those carried by vectors, livestock and food often remain silent.^{3, 4}

The spread of poliomyelitis from Nigeria between August 2003 and July 2005 provides another example of the re-introduction of an infectious disease agent to areas where control interventions were neglected, but on an international rather than a local scale. Wild poliovirus genetically linked to endemic poliovirus in northern Nigeria was re-introduced into polio-free countries in Africa, the Middle East and Asia. In many, routine polio vaccination programmes had been neglected by governments after attainment of polio-free status, and campaigns to deliver vaccine to children door to door had been stopped because of lack of national

and international resources. When wild poliovirus was re-introduced there was therefore no protective barrier to transmission, and polio re-emerged in 18 polio-free countries. As in the Sichuan Province, surveillance that had been maintained after attainment of polio-free status detected re-emergence and has guided the vaccination response.⁵

In 1980, after the certification of smallpox eradication, routine smallpox vaccination was discontinued in all countries. Noting that the smallpox virus was (and still is) maintained in two laboratories, the Smallpox Eradication Advisory Group concluded that the risk of accidental release from these laboratories could not be reduced to zero. It therefore recommended that smallpox surveillance be continued and that an international stockpile of smallpox vaccine be maintained.⁶ Reports of possible smallpox cases are still received by WHO 25 years later, and each report is epidemiologically investigated in the field and followed by confirmatory diagnosis in a WHO reference laboratory.⁷

Lessons learned from smallpox eradication and experiences such as those of the Sichuan Province of China and the global polio eradication initiative are clear. Microbes are dynamic and resilient: they spread locally, nationally and internationally with ease in our globalized world, and when they find susceptible populations they re-emerge as public health problems. Surveillance and continuation of control interventions are necessary to maintain achievements in infectious disease control unless transmission has been interrupted and the microbe destroyed worldwide. Our job as public health professionals is to ensure that the message is clear, that commitment and political will continue, and that financial resources remain available. ■

References

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