Effective Global Response to Emerging Infectious Diseases

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To discuss the global efforts needed to detect and control emerging infections, I will begin with a personal experience. In 1987, a large epidemic of meningococcal meningitis occurred during the haj, the annual pilgrimage of Moslems to Mecca. The Centers for Disease Control and Prevention (CDC) sent a team of epidemiologists and laboratorians to Kennedy Airport to meet the thousands of pilgrims returning to the United States. Returning pilgrims were given chemoprophylaxis; nasopharyngeal cultures showed that 11% of the pilgrims carried the epidemic strain of group A *Neisseria meningitidis*, the causative agent. Only 25% of the returning pilgrims were intercepted and treated; thousands of others dispersed throughout the country (presumably with the same 11% carriage rate of this highly virulent strain). Were U.S. surveillance systems adequate to rapidly detect any subsequent outbreaks? We were completely dependent on local physicians to diagnose cases, on laboratories to isolate and serotype the organism, on the notification systems to inform the state and federal agencies. In this instance, the United States was fortunate and did not see any secondary outbreaks. Other countries were not so fortunate; large epidemics occurred in Chad, Kenya, and Tanzania as a result of the same virulent clone of *N. meningitidis*. The importation of this epidemic clone illustrates the central importance of local capacity to diagnose, report, and control emerging infectious diseases.

A more recent example is the 1997 influenza H5N1 outbreak in Hong Kong: the outbreak illustrates what systems are needed to detect a new organism and to respond appropriately. First, the Hong Kong public health system had to have the capacity to isolate the organism and to recognize that it was not an ordinary influenza strain. Because infections emerge at the local level, the capacity to detect new threats when they arise should be available throughout the world. Secondly, the specialized diagnostic reagents had to be available and the reference laboratories had to be able to make a definitive identification, not just of that initial strain, but of the hundreds of other strains evaluated. In this case, H5 reagents (the result of National Institutes of Health [NIH] research) had been distributed (by CDC) to reference laboratories internationally. The capacity to respond to potential outbreaks with expert epidemiologic investigation also had to be in place. The team that went to Hong Kong consisted of epidemiologists, laboratorians, a public affairs specialist, and an expert in animal influenza. The team worked closely with Hong Kong colleagues to detect new cases by implementing an enhanced surveillance system. They targeted not only hospitals but also outpatient settings. Most importantly, they designed studies to rapidly determine whether the strain could be transmitted from human to human. Would the H5N1 isolates share the pathogenic potential of human influenza, which is so readily transmissible from human to human, or was this strain relatively limited in its ability to spread? The kind of rapid but rigorous epidemiologic studies undertaken by the outbreak response team were invaluable in answering this question; fortunately, the strain had limited potential for human-to-human transmission. Still, we cannot become complacent; given the genetic recombination potential of influenza viruses, we need to maintain and enhance our surveillance systems worldwide.

Through the U.S. emerging infections initiative, the number of laboratory surveillance sites supported to look for new influenza strains has been increased. In China, sites had been expanded from 6 to 12, which improved the ability of the World Health Organization (WHO) system to monitor evidence of dissemination of this strain on the Chinese mainland. Through the CDC WHO Collaborating Center on Influenza, we made diagnostic kits based on the NIH H5 reagents available to reference laboratories around the world so that many different areas can detect H5N1 should it emerge. At the same time, the WHO Collaborating Center was actively engaged in training activities.

The H5N1 example shows that we are somewhat better able to deal with emerging infections in 1997 and 1998 than we were in 1987. The example also underscores what is needed: dramatically strengthened local surveillance, including both laboratory and epidemiologic capacity; commitment on the part of local governments; and a strong collaborative international research and response system.

Two other areas of international capacity development contribute to effective response to emerging infections. The first is Field Epidemiology Training Programs. These programs operate on the assumption that the best way to develop epidemiologic capacity in a country is to train local professionals who are committed to continuing to work with the government in surveillance, outbreak response, epidemiology, and other aspects of public health management. Field Epidemiology Training Programs have been developed in 17 countries. These programs are now planning to create an executive secretariat to facilitate collaboration and provide regional expertise. WHO and CDC are working with these countries to ensure necessary support and coordination with international surveillance. The second area is communication systems. The Internet globally facilitates our ability to share technical and surveillance information.

We are better able in 1998 to address the threats of emerging infections, but we are by no means fully prepared. We must have the capacity to identify new or reemerging threats and to respond successfully. We need to be creative and efficient in identifying necessary resources; for example, the polio eradication program has developed a global network of laboratories and is strengthening the surveillance systems needed to identify poliomyelitis cases. Eradication activities also contribute to health capacity development, and the laboratory and surveillance capacities created for polio eradication should also be useful in detection of and response to emerging infectious diseases. Many other creative approaches and collaborations are needed for an effective global response to whatever our microbial adversaries may produce.

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