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Early warning

Despite the remarkable progress in vaccines and antimicrobial drugs, infectious diseases continue to pose new challenges to public health agencies and scientists. In industrialized nations, polio, smallpox, rubella and measles may have been curbed but new threats like AIDS, Lyme disease, hantavirus pulmonary syndrome and West Nile virus encephalitis have emerged. And old scourges such as malaria, tuberculosis and bacterial pneumonia are reappearing, often with antibiotic resistance added to their armaments. Increased funding is necessary to further understand the biology of these pathogens but also crucial is the implementation and maintenance of an effective surveillance network, both in the United States and globally. Surveillance is critical to an effective defense against new and reemerging infectious diseases and the current monitoring networks are far from adequate.

While in the current global political climate it may seem that potential agents of bioterrorism, like anthrax and smallpox, are the major threats to public health, experts agree that naturally occurring pathogens are a more credible and significant source of any future epidemics. But the threat of bioterrorism has at least helped crystallize thought and brought to prominence the potential risks that infectious diseases still pose. Among the so-called emerging infectious diseases (EIDs), more than 70% are zoonoses, and the animal hosts and/or reservoirs of these infections pose especially difficult monitoring problems. Indeed most scientists' prediction as to the next serious epidemic, possibly even pandemic, is influenza, caused by a virus that is transmitted between humans, pigs and avian species.

In response to the growing challenges of infectious diseases, in 1994 the Centers for Disease Control and Prevention (CDC) formulated a comprehensive plan for combating EIDs; this plan was revised and

expanded in 1998. Today there are at least 29 different surveillance systems agencies in the US. Some systems within the National Center for Infectious Diseases track specific problems like antimicrobial resistance, EIDs and food borne diseases. Other agencies track specific diseases like infectious hepatitis or influenza. Notably, the Emerging Infections Program (EIP) is a network of CDC and state health departments working to assess the public health impact of emerging infections and to evaluate methods for their prevention and control; the EIP network now encompasses nine states.

But there are substantial weaknesses in the present approach to surveillance in the US. There is too little integration between the various agencies and too few state health labs are in operation. Also, given the large potential of zoonoses to serve as sources of EIDs, surveillance on trades in wildlife, domesticated animals and derived products is especially inadequate. Currently these trades are only monitored for notifiable diseases; existing surveillance programs should be extended to all potential pathogens.

Indeed a key component of an effective surveillance and response to EIDs is close coordination and data exchange between agencies including federal, state and local public health sectors, and agriculture and wildlife departments. Currently interagency taskforces are set up only for select diseases such as West Nile virus. In 2000 the CDC developed ArboNet, an electronic based surveillance and reporting system to track West Nile virus activity in humans, horses and other mammals, birds and mosquitoes. Such a system serves as a good model that could be extended to monitor other pathogens.

Measuring the success of a public health network is difficult since success means avoiding uncontrolled outbreaks of disease. The United Kingdom's Public Health Laboratory Service (PHLS), while

not perfect, is widely regarded as something of a public health triumph. Established in the 1940's, the PHLS has built an efficient and comprehensive network on a relatively small budget (\$186 million/year). There is no direct equivalent in the CDC as some of the duties of the PHLS are covered by the state health labs (e.g. microbiological testing), others by the CDC themselves (e.g. some educational outreach programs), while still others are unique to the PHLS (e.g. culture collections, statistical support). But the key to the success of the PHLS is its defined network with well integrated and coordinated nodes; the recent public health disasters in the UK (i.e. BSE and foot and mouth disease) were not in the remit of the PHLS. Ironically, whilst other countries are looking at some of the better attributes of the PHLS with a view to incorporating them into their own public health programs, there are currently political pressures being exerted within the UK to try to disband the PHLS.

Emerging infectious diseases are largely driven by anthropogenic environmental changes such as urbanization, global air travel, deforestation and encroachment into wildlife habitat. As these emergence factors continue to grow a logical progression will be the future increase in newly emerging diseases. This will be further compounded by the continued rise in pathogens acquiring antibiotic resistance, a phenomenon not likely to diminish given that as much as 35% of all antibiotics being produced in the US are used in agriculture as feed supplement, maintaining the chain of exposure and adaptation of virulent pathogens.

Despite our present acute awareness of the potential danger posed by bioweapons, we must not ignore the "back door" threat of emerging infections. In these times, public health surveillance of naturally occurring pathogens is more important than ever.