The Need for Expanded Global Efforts to Mitigate Viral Threats: Lessons from the HIV/AIDS Epidemic**

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Summary

There is a critical gap between current surveillance efforts and the implementation of clinical responses, caused primarily by the lack of international coordination for research on viral diseases and the shortage of medical virologists who will react once surveillance efforts uncover a problem. This gap jeopardizes the ability to deliver health services and threatens economies, supply chains, medical resources, and national and international security. Today, there is no single, recognized international organization empowered to speak with authority on all human viruses, though the need for such an organization has increased in recent decades. There are also serious deficiencies in training programs for research in medical virology, which threatens our future capacity to control viral epidemics. Finally, there is no mechanism to ensure that new viral threats are met with a sophisticated, international response to identify the virus, develop new diagnostics, initiate the path to discovery of treatments or vaccines, and advise about the best mitigation strategies. To meet this need, the Global Virus Network (GVN) (http://www.ihv.org/programs/gvn.html), which is equipped with globally connected information technology enabling rapid communication between participants, has been formed (Nature, 2011). The GVN exemplifies the type of effort needed to mitigate the global threat of infectious diseases (see Figure 1).

Current realities

Despite the tremendous progress in the early years of HIV/AIDS, including the discovery of the first human retrovirus (HTLV-1) (1980), the discovery of HIV (1983–1984), the identification of HIV as the cause of AIDS (1984), and the development of the first systemic virus-specific therapy (1986), HIV/AIDS remains our number one viral problem today. Scientists agree that vaccination would be the best approach for long-term control and drug therapy remains best for slowing the disease.

There were great deficits in the global response to the HIV/AIDS pandemic, namely, that there were no medical virologists in positions of authority. Due to a lack of proper information technology (IT) infrastructure, the few available medical virologists were not equipped to communicate rapidly. Reflecting on the influenza epidemic of 1918 and the polio epidemic of the 1940s, mankind was unprepared to deal with such outbreaks. Today, we are well-equipped and have a wealth of knowledge from past mistakes. There is no excuse for failing to invest in the research, training, and global infrastructure needed to solve the current viral threats.

With respect to HIV/AIDS, one can argue that the United States Centers for Disease Control and Prevention (CDC) was responsible and prepared, and also performed early, critical, and accurate surveillance. However, the CDC does not have expertise in all human viruses. Indeed, at the onset of the AIDS epidemic, the CDC had no retrovirologists since such viruses were not considered to be human viruses. Moreover, the CDC only represents one country and is a function of the U.S. government. This often creates problems, and surely means that the CDC does not always speak out or freely counsel other governments.

Scientists who made key advances in virology came to the AIDS problem almost by chance during the early years. It was not their responsibility to initiate an effort to understand and combat HIV/AIDS. There was little sense that HIV represented a major threat and no organizations helped to prioritize and drive initial responses to this new disease. The global spread of viral threats has accelerated since that time. We no longer have the luxury of relying on serendipity to provide expertise needed to overcome significant threats to human health.

Scientific opportunities and challenges

In more recent years, the AIDS pandemic and the presence of new, visible funding (e.g., the Gates Foundation) have ensured that a significant number of active groups, organizations, and institutions are entering into the area of global infectious diseases. However, the chief problem remains and is getting worse. There is still no globally responsible organization to promote the engagement of medical virologists to combat new viral epidemics.

Another critical concern is an apparent decline in young people training for careers in virology. This may be due to the decline in young medical doctors going into basic research, reduced government support for infectious disease research, and public complacency about viral threats. An important consequence of our short-term memory about viral diseases is that we fail to support research and training programs needed to ensure the long-term supply of expert medical virologists. The extraordinary development of virus surveillance networks during the past 25 years produces a mountain of information, but without expert medical virologists, we are unprepared to grasp its importance and use it for developing disease mitigation strategies. An analogy can be used: lion hunters may be numerous and good at finding lions, but they need skilled experts who know how to deal with the lions once they have been found. Without a substantial and durable program for research and training, we remain ill-prepared in the face of constantly emerging viral threats.

We must also recognize that the absence of a single, authoritative, internationally recognized body of experts in medical virology opens the door to inappropriate and damaging responses to new viral diseases. This was exemplified by the economic losses and political embarrassment for China due to the severe acute respiratory syndrome (SARS) outbreak, which eventually had little more health impact than seasonal influenza. It is clear that screening efforts require the participation of a (non-governmental) body of experts to formulate a rational response (See Figure 2 for other examples of global disasters).

The challenge is to fill the gaps in training, research, and policy-making that lie between virus surveillance efforts and health care delivery. Whereas agencies such as the CDC and the World Health Organization (WHO) provide surveillance networks, they do not have sufficient resources to address two critical questions: 1) What are the key aspects of viral threats which require new research? and 2) How can we train expert medical virologists to overcome the deficit and provide future scientists who recognize the imperative of international collaboration?

To meet the aforementioned challenges, in 2011, a group of leading virologists from 15 countries met and formed a nonprofit — the Global Virus Network (GVN). The GVN has set 10 goals to address these challenges: 1) an international base (see Figures 3 and 4); 2) freedom from political interests; 3) collaboration to advance our global knowledge; 4) training new virologists; 5) linkage to WHO; 6) advisory capacity to guide policy and share expertise on all classes of human viruses; 7) response to new threats; 8) virus discovery via research; 9) preparedness; and 10) global scientific exchange.

Policy makers should look upon the GVN goals as opportunities for policy actions. For example, in November 2010, Prime Minister Singh of India and U.S. President Obama signed a Memorandum of Understanding (MOU) creating a new Global Disease Detection (GDD) Center in New Delhi, which

will facilitate preparedness against health threats such as pandemic influenza and other dangerous viruses (Padma, 2010). Several such GDD Centers have been established as part of a U.S. CDC program to enhance global capabilities, but they could be viewed as surveillance arms of the U.S. government. A good backup plan would be to link such centers as valuable nodes in the GVN, or another similar nongovernmental organization. New IT would make it possible to establish a global infrastructure to enable the rapid, secure exchange of information. Collecting, analyzing, reporting, and acting on this information would transform and enhance preparedness and would serve as a powerful, vital weapon to combat outbreaks.

Policy issues

- A recognized, sanctioned body of experts (e.g., the GVN) should be empowered to mitigate damage following early reports of viral outbreaks.
- Increase the stature and visibility of the GVN. Provide more opportunities for eminent scientists to become involved in multinational policy decisions.
- Facilitate liaisons between the GVN and other global bodies (Organizations like the Institute on Science for Global Policy [ISGP] could partner with the GVN as an advisory body and both should be chartered within the United Nations).
- Increase funding for global infectious disease organizations like the GVN to maintain collaborations, cross-fertilize, and share their expertise.
- Fund fellowship programs through governments, through corporate partnerships, and through nongovernmental organizations to train doctoral candidates in medical virology at the best virology institutes in the world.
- Global infectious disease organizations should be organized so each center is financed by its host country and a percentage of annual funding is “banked” by the organization for use in outbreak emergencies.
- Commit national and international funds to virus-discovery research.
- Establish IT infrastructure to improve global preparedness.

References

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Padma, T. V. (2010, November 9). Obama's India visit generates science collaborations. *Science and Development Network*. Retrieved September 9, 2011, from http://www.scidev.net/en/news/obama-s-india-visit-generates-science-collaborations.html

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Figure 1: Role of the Global Virus Network

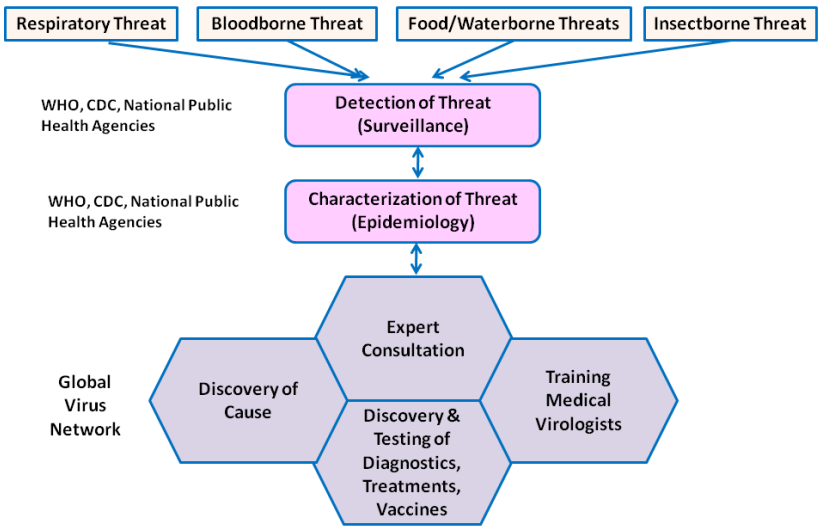

Figure 2: 10 disasters that could have been averted, or at least diminished, if there had been a GVN

1. Polio pandemic.
2. Infection of thousands of people in 1984 due to delays in accepting the HIV blood test. HIV pandemic.
3. Case of the Libyan nurses.
4. SARS debacle for China.
5. The "swine flu" pandemic.
6. The rise in global rabies incidence.
7. Dengue hemorrhagic fever expansion
8. Outbreaks due to anti-vaccine sentiment (e.g., measles, YF)
9. Slaughter of healthy animals containing "potentially dangerous" viruses.
10. Global rise in pox outbreaks.

Figure 3: Centers of Excellence in Virology Cover Expertise in All Known Viral Diseases

Centers	Retro viruses	Pox viruses	Herpes viruses	Respiratory viruses	DNA tumor viruses	Hemorrhagic fever viruses	Hepatis viruses	Enteric viruses	Neurotripic viruses
Africa S. African Natl Lab		■				■	■	■	
Australia Burnet Inst	■			■		■			
Canada Pacific Rim Consortium									■
China Beijing, Shanghai	■	■	■	■	■	■	■		
Germany	■			■	■	■	■		
India				■		■	■		
Ireland	■			■		■	■	■	
Italy	■								
Israel Mideast Consortium	■			■		■	■	■	
Russia Baltic Consortium	■			■		■		■	■
S. America				■		■			
Spain		■	■	■			■	■	■
Sweden	■		■		■		■	■	■
U.K. Glasgow Pirbright	■		■	■	■	■	■	■	■
USA CO St. Univ; IHV Univ MD; Univ Mich.; Mt Sinai, NY; Gladstone; Univ Texas; J. Hopkins	■	■	■	■	■	■	■	■	■

Figure 4: Global Virus Network Centers of Excellence in Virology