

Speech at the Plenary Session “Emerging Infectious Diseases Requiring Global Solutions”

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When I began my career in science, microbiologists studying infectious diseases were ready to declare victory—the premise was that the world would soon be free of infectious diseases. This has not proven to be the case. The only infectious disease that we have actually conquered, smallpox, is now seen as the greatest threat of catastrophic harm through bioterrorism—something that is poignantly relevant on this 5th anniversary of the terrorist attacks of 9-11-2001. As recognized earlier this year by the G8 leaders, infectious diseases remain as a leading cause of death worldwide and a vigorous response to the threat of infectious diseases is essential to global development and to the well-being of the world's population.

I would suggest that there are several reasons for our failure to conquer infectious diseases. First, our inability to deliver the technical means to many parts of the world need to control the spread of microorganisms through contaminated food and water and the education needed to limit the spread of sexually transmitted pathogens. Waterborne diseases continue to be a major route of transmission and if we cannot provide clean water resources we will continue to see major outbreaks of diseases like cholera and a variety of gastrointestinal illnesses that cause significant morbidity and mortality. To reduce the incidence of infectious diseases we also need to be able to provide vaccines and therapeutic drugs at affordable prices throughout the world. And we must provide the educational programs needed to empower individuals to protect themselves against pathogenic microorganisms.

But even if we do so, I would contend that we will continue to see significant outbreaks of infectious diseases. The reason is that microbes continue to evolve at very high rates and in ways that we cannot yet predict. The result has been the emergence of new diseases, like HIV/AIDS, SARS, and a myriad of others, including the emergence of drug resistant diseases, such as multi-drug resistant tuberculosis that is now a major problem in many parts of the world. As evidenced by the looming threat of a major global pandemic from a newly evolving strain of the H5N1 influenza virus, one that could readily transmit from human to human, there remain major research challenges to develop the understanding needed of microbial evolution and pathogenesis to be able to attack these problems and major challenges to public health—as seen in the outbreak of SARS—that can permit the rapid recognition and control of emerging infectious diseases.

In the United States, the National Institute of Allergy and Infectious Diseases, under the astute leadership of Tony Fauci, is aggressively pursuing the biomedical research endeavors needed to combat these emerging threats to humankind.

We must increase our global surveillance networks, including the capacities of the clinical diagnostic laboratories around the world that are sentinels in detecting outbreaks of infectious diseases. Surveillance needs to be global. We need effective international co-operation, and a

major investment in infrastructure and human capacity. The failure of any nation to detect the emergence of a new and deadly pathogen and to sound the alarm loudly so that the public health system can respond places the entire world at risk. We need new diagnostic technologies and novel diagnostic approaches that can be simply used throughout the world. Our surveillance needs to be able to detect new disease events including in potential animal reservoirs or sentinel wildlife or domesticated animals. In this regard we need effective co-operation between public health and animal health agencies.

This is especially true since over half of the emerging infectious diseases are zoonotic, which, as defined by the World Health Organization, are “diseases or infections which are naturally transmitted between vertebrate animals and humans.” Since 816 or 58% of human pathogen species are known to be zoonotic, many, if not most, emerging and re-emerging pathogens are likely to be zoonotic. The Wellcome Trust, for whom I chair the strategic direction committee in infectious diseases, is carefully examining where it can make strategic investments in the areas of animal health, zoonotic diseases, and the vectors that often transmit these diseases.

These investments in research will need to be leveraged against major investments by other major foundations and governments if we are to develop the necessary knowledge base to combat these emerging infectious agents. As discussed last year at the STS forum, we need new partnerships that will facilitate translating biomedical research into real world solutions that can improve human health.

Jumps of pathogens between host species are frequent and natural. Ecological change is a key driver. Climate change, land use and agriculture, and the broad changes in society and demography all contribute to the likelihood of the emergence of new zoonotic diseases. Given that the pace of change is high and will stay high we should expect more pathogens to emerge. Globalization and international travel contribute to the likelihood of the spread of these diseases. The result is the high risk of future pandemics.

Currently our fear is that the H5N1 influenza virus will evolve the capacity to transmit readily from human to human. We have watched with alarm the movement of infected wild bird populations and the transmission to domesticated fowl. We have seen the sporadic transmission to humans, especially in several Asian countries. The pattern of viral evolution is alarmingly similar to the 1918 strain of influenza virus that evolved from an avian strain and caused a global pandemic, infecting nearly a third of the world's population and causing more than 40 million deaths worldwide. We simply are unable to predict whether the H5N1 virus will evolve the capacity to cause a new global pandemic. But we must be vigilant. We must be prepared for the unexpected—which means making major investments in research and public health preparedness.

In closing I would point to the extraordinary capacity of microbial pathogens to persist, emerge, and re-emerge. They will continue to challenge our public health systems. Only through international cooperation and by supporting research and development of new ways of detecting and controlling pathogenic microorganisms can we hope to control infectious diseases. We must extend our focus on human infectious diseases to the burden of animal diseases and the natural reservoirs of evolving pathogens. This must include wildlife as well as domesticated animals. Our efforts must be broad and global in reach if we are to combat successfully the ever changing microbial pathogens that are responsible for emerging and re-emerging infectious diseases.

The G8 leaders have made a commitment to achieve tangible progress firstly in improved international cooperation on the surveillance and monitoring of infectious diseases, including better coordination between the animal and human health communities, building laboratory capacities, and full transparency by all nations in sharing, on a timely basis, virus samples in accordance with national and international regulations and conventions, and other relevant information about the outbreaks of diseases; and secondly by intensification of scientific research and exchanges in the area of infectious diseases, with a special attention given to involving scientists from developing countries in international scientific research programs. These are very important areas for us to support.