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The Microbiologist's Response to a Changing world

Editorial

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## Role of The Scientist in the Context of a Rapidly Changing World

The nature of our world is changing, inexorably and sometimes imperceptibly due to technological advances, the growth of under-privileged populations, and the unstable dynamics of competing political systems. The new "information age" provides new ways of perceiving and interpreting the world. For instance, in the biological sciences, large data sets have been used to simulate biological systems in silico. Mankind is learning to use information to predict and control complex events.

Despite the fact that our world is continually being re-constructed, we are all responsible for preserving it for future human beings. Our new interpretive and predictive tools, such as bioinformatics, quantum physics, chaos theory, and new biology, give us the added responsibility of acting like planetary citizens, where there is no room for nationalism. No one owns the knowledge, and nobody owns the planet. As planetary citizens with specialized scientific knowledge we have the responsibility to use all the available tools to promote survival of our species and preservation of all the planetary ecosystems.

As virologists we need to analyze the history of epidemic diseases using our specialized point of view. The 20th century goals of eradicating such infectious diseases as smallpox, polio, yellow fever, and measles were partially reached, but are now challenged by microbial evolution, by rapid commerce, and by economic and health-infrastructure disparities. Each country is in a different state of development and the health care priorities together with research programs are largely motivated by the needs of the affluent countries. For example, some resources have shifted from the study of acute infections to the study of degenerative

diseases that generally affect people beyond their reproductive years. Nevertheless, the three great viral pandemics of the 20th century: influenza, polio and HIV/AIDS, revealed weaknesses in our capacity to respond and defects in our short-term collective memories about the need to prepare for outbreaks of viral diseases. In the current 21st century, hepatitis viruses and outbreaks of new pathogens have increased the challenge. As a consequence, we repeatedly find ourselves unprepared to respond quickly and rationally to new viral threats.

## Scientific challenges

We need to revise our notions of viral ecology in this new world. In the case of global commerce, it has not only accelerated world trade, but also facilitates the rapid dissemination of diseases. Modern advances in world banking and telecommunications, together with new arrangements in intellectual property, in product safety standards, and in global purchasing powers have accelerated exchanges of agricultural products, textiles, clothing, and human workers. These exchanges enable the introduction of new pathogens into virgin ecosystems in a matter of hours. A person infected with influenza in Asia can bring the virus to South America in less than 12 hours (half of the time that it takes for the symptoms to appear). Whereas the Asian population may have been "vaccinated" by repetitive low-dose environmental exposure to the new strain of influenza, the South Americans may be immunologically naive, and suffer higher susceptibility to a new strain.

The acceleration of global commerce and other human activities has additionally contributed to global warming. Even a slight rise in temperature may cause diseases to appear in places that never had them before. For example, the mosquito vectors of dengue and yellow fever are invading new ecosystems.

A rational response to these changes would be to establish excellent global surveillance and to investigate ways to counteract new viral threats. Government and private surveillance efforts have indeed increased over the last few years, (spearheaded by national Center for Disease Control's/CDC and the World Health Organization/WHO), but deficits remain in the numbers of trained medical virologists, in the amount of research support for medical virology, in public education about the value of vaccines and wide and free access to specialized information sources.

The history of influenza, polio and HIV/AIDS epidemics teaches us that we were poorly prepared to confront new viral outbreaks. Only after the diseases were well established did we assemble teams of experts, initiate research programs to understand the characteristics of each pathogen, and develop vaccines. The government health institutions currently responsible for

monitoring and controlling human viral outbreaks do not have the resources or the expertise to deal with all viral diseases. Additionally, we need a way to surmount political issues and profit-motive issues that act against the mitigation of human losses. Scientists should organize information-sharing, collaborative research networks that deliver a better-informed rational and educated response to viral threats. Such networks must be non-profit, non-political organizations that promote the research, training, and global infrastructure needed to address emerging viral threats.

We no longer have the luxury of relying on serendipity to provide expertise needed to overcome significant threats to human health.

Recently created organizations such as the Global Virus Network and the open access journals such as Sci-Doc Publishers and others are a clear example of the new tools that can be used to prevent or minimize the rampant advance of infectious diseases. Our hope is that working together to create global exchanges will fortify mankind against current and future viral diseases