



Microbial Threat

World Must Devote More Funding Toward Expanded Scientific Base

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GLOBAL INITIATIVES in international health have proven to be remarkably effective, probably more effective than any other development sector in mobilizing efforts which garner a near universal consensus and participation. Witness the eradication program for smallpox which required active participation by every country, first in eliminating the disease and, secondly, in providing sufficient documentation and access to international commissions to permit the accomplishment to be validated.

This scenario is being replicated now in the polio eradication effort. Even civil conflict was able to be circumvented by the programs. Several countries so embroiled were able to negotiate "days of tranquillity" during which fighting ceased and children were vaccinated.

Of even greater importance is the special and vital role played by medical research in mobilizing efforts globally. Scientists across the globe are linked as never before in the pursuit of knowledge and the discovery of better mechanisms for the prevention or treatment of disease.

Medicine, by its very nature, bears a unique potential for building effective bridges of understanding and cooperation. In contrast, other sectors such as education and agriculture must inevitably cope with a host of often contrary national economic and political interests. Fortunately, these are largely absent from the medical sector.

Where Are Resources?

However much has been accomplished thus far through collaborative international efforts, much, much more is promised what with the expanding potential of biomedical research and the rapid spread of electronic communication. But where are resources to be found to continue support of international programs, let alone to expand them? The industrialized countries today seem all but totally preoccupied in dealing with present problems of budget deficits and privatization of government functions.

There are few who seem willing to, or even interested in, shaping future global agendas. In part, this reflects the more provincial attitudes of the post cold-war era and, in part, the absence as yet of any overriding global ethos.

For most countries, the primary agenda in health is the architecture and financing of domestic sickness care services. A debate as to how health care should be provided and paid for is welcome. It is long overdue—but, regrettably, in the United States, and no less in other countries, the debate has little to do with how to achieve an ever healthier population at a cost deemed to be affordable. Rather, it is primarily a debate as to how curative care services are to be provided and paid for.

How better to illustrate this than to note that the primary question in the United States about Medicare and Medicaid budgets is

how rapidly they should increase. Meanwhile, budgets for the two subject areas which would contribute most to improved health in the population—biomedical research and public health—are expected, at best, to stagnate but more likely decrease.

Over the coming decades, neither we in the United States nor policy makers in other countries can afford to deal so myopically with fundamental questions of how best to assure the healthiest possible population. Providing some level of care to those who are sick or disabled is essential but, as has been repeatedly documented, public health and prevention have been the factors primarily responsible for the enormous changes which have taken place both with respect to longevity and quality of life.

As the Institute of Medicine reports, even now in the United States, most successful initiatives to avert premature mortality require improved preventive measures. Curative medicine, it is believed, can offer mar-

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ginal contributions.

There is, however, a more compelling reason to give a renewed priority to public health and to medical research. The reason is grounded both in national security and global security terms and is illustrated by the epidemic of human immunodeficiency virus infections. This epidemic has proved to be a sobering experience for politicians and scientists alike. A previously unknown highly fatal infection emerges, perhaps from rain forests in Africa, and relentlessly spreads across the world to infect millions of persons. Heroic efforts over 10 years involving the world's best scientists and all but unlimited research budgets have as yet failed to produce either a vaccine or a drug which is more than marginally effective.

Deterrence of spread must rely on behavioral modification, always difficult to implement, and with respect to HIV infection, only modestly effective.

But what might have been the scenario had HIV been able to spread as an aerosol infection such as measles and influenza does?

A Complex World

The occurrence of the HIV epidemic and the discovery more recently of a number of other hitherto unrecognized infections has sensitized the scientific world and the public to the fact that we live in a complex world of microorganisms which themselves are continuously and rapidly mutating. We

now appreciate that new diseases and old diseases with new attributes are to be expected.

We know we can expect new strains of influenza which wholly elude the immunity provided by older vaccines; microbes like tuberculosis and malaria that will become insensitive to previously effective drugs; and viruses such as Ebola which can be expected to arise periodically and to cause a type of disease never before seen.

It is now all too apparent that we cannot afford to be complacent, that an infrastructure of expertise and institutions is needed which can provide early detection of disease outbreaks and which is able to move expeditiously to characterize the organism and to develop new drugs or vaccines. However, that infrastructure today is woefully inadequate.

The reason is that beginning in the 1960s, there was a naive belief that the infectious diseases were effectively "conquered" and that it was time to turn our attention to the chronic and degenerative diseases. Less and less attention was given to microbiology in our medical schools; departments of microbiology vanished; and infectious disease residencies diminished in number. Those with expertise in tropical medicine could qualify as an endangered species.

Meanwhile, in sympathy with the times, the Centers for Disease Control steadily reduced its core of infectious disease expertise and experience in favor of an eclectic array of other prevention activities. Finally, with the advent of the HIV epidemic, more and more money both at NIH and CDC came to be earmarked specifically for HIV research, substantial amounts of which represented funds transferred from other infectious disease areas. The net effect has been that expertise and resources in the infectious disease field became seriously deficient.

As the number of new and re-emerging infectious diseases has grown, the question has been raised as to whether there really are more such entities or whether we are more alert in identifying them. Given the fact that the infrastructure for detecting and identifying new agents has been steadily deteriorating over time in the United States and even more so in the developing world, it would seem that discoveries of new or emerging agents would, if anything, be less likely than before.

There are good reasons, however, to believe that there are in fact more new or emergent microbial agents of concern. There are more opportunities now for agents to emerge from parts of our ecosystem with which man has previously been in only limited contact. Partly this reflects rapid global population growth and the settlement of new lands and partly it reflects



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man's propensity and ability to penetrate remote areas ever more deeply.

Moreover, urban areas throughout the world are now expanding at a phenomenal pace as population growth continues and rural residents congregate in cities resulting in urban growth rates which are many times those of the countries as a whole. An organism which initially may not be highly transmissible from man to man will have its best hopes for survival in such densely crowded, poorly sanitized areas.

Finally, air transport passengers, in particular, are increasing rapidly in number each year and, with lower-priced fares, entire families are traveling, adding the dimension of greater disease transmission for those diseases commonly carried largely by children.

Microbe Threat

How should our degree of concern be calibrated? One point of departure is to recognize that we now support a Department of Defense whose responsibility it is to deal with the threat which man poses against man. Recently, it was pointed out—in a statement meant to awe—that 100 million persons, both civilian and military, had died in this century as a result of wars. However, a quick calculation would suggest that *at least* two to ten times this number have died this century from smallpox alone before it was eradicated in 1977.

Clearly, the threat posed by microbes, even today, dwarfs the threat posed by man's aggressiveness against man. It offers meaning to Dr. Josh Lederberg's observation that man's only competition for domination of the planet are the microbes—and the outcome is by no means a foregone conclusion.

It would seem logical, both nationally and internationally, to begin today, as an urgent matter, to greatly strengthen our capability to deal with the microbial world. It implies an expanded research base; it implies special and augmented training programs for physicians, microbiologists, veterinarians and other relevant scientists; it implies a strengthened public health infrastructure with a greatly expanded capacity for surveillance of disease and for epidemiological investigations; it implies cooperative research, development and training programs with third world scientists and countries; and it implies the development of a public-private network of scientists and laboratories, which would be capable of rapidly developing and evaluating new vaccines or drugs to counter a new threat.

With today's constrained budgets, can we afford the expenditures necessary to undertake such an effort? The better question is can we afford not to? Could we today afford a Department of Defense which is perhaps one-tenth its present size? The latter question has been answered