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Voyages for the 21st Century

PittsburghConVoyages04

Convocation, U. of Pittsburgh School of Public Health
25 April 2003

I am exceptionally pleased and honored to join with you today in celebrating what is always joyous event – for you, the graduates, the privilege of adding several important letters to your name – PhD, MPH, or whatever – for many, the happy thought that you may have written your last examination (but don't count on it) –for others the thought that they may have written their last tuition check (but don't be too sure). This, indeed, is a watershed event.

You should take special pride in graduating from one of the world's most prestigious schools of public health, a school founded by the legendary Thomas Parran, and a School that has graduated so many of the leaders in our field over the past 50 years.

I take special pleasure in being asked to speak with you today, especially so as this is my first commencement as a University of Pittsburgh faculty member. From Dean Goldstein's generous introduction, you might surmise that I have had difficulty in holding any job for very long. (**Smallpox Dean Story**) My wife has regularly reminded me over the past three years that I am in the process of failing retirement for either the sixth or seventh time, – happily, she has announced that she has stopped counting. In large measure, this is simply because there are today so many challenges and opportunities in our field that a quiet life on the golf course or cruising on a boat neither seems very exciting or even very interesting.

The last 2 ½ years have brought dramatic changes to all our lives and more are promised. One surprise for me that was totally unexpected has been the tidal wave of interest in smallpox. As you know, we haven't had a case anywhere in the world for some 27 years. And just 16 years ago we completed our archival history entitled "Smallpox and its Eradication" (with a bit more imagination, we could have come up with a livelier title – e.g. Smallpox, sex and the single virus – it almost certainly would have sold better). In 1700 pages, it tells you more than you really want to know about the disease. The World Health Organization printed some 5000 copies but after several years and still with a thousand or so copies remaining, the Office was beginning to

wonder what to do with them. Since they weighed fully 2 pounds each we proposed selling them as door stops. Then came September 11. Anthrax was clearly a serious threat but smallpox, were it to occur, could result in an international catastrophe. To make a long story short: the book is now out of print; the National Library of Medicine has put it on a web-site; a CD Rom is available, and, so I am told, it is selling on ebay for about \$800 a copy. Would that I had stashed a few copies away.

I want to reflect with you today on a new world that the events of 2001 have brought into focus. It is a world that is beginning to recognize once again, as it did 100 years ago, that public health has to play a more central role in our lives. Now, it is not that the world itself has been suddenly transformed. It hasn't. But change is occurring around the world and the change is logarithmic. This is too little appreciated. The most dramatic change is our perception of the microbial world. It is certain that our increasing understanding and mastery of biology in the 21st century will govern, in a major way, the future of mankind. Biotechnology offers an increasing cornucopia of products that can make life better, more productive and more secure -- vaccine and antibiotics, enriched food products and new diagnostic methods. There is, of course, the dark side which we once innocently ignored. History tells us that each major technological advance brings with it a new class of weapons -- as physics brought both enormous benefits and nuclear weapons. Likewise, our advances in biology bear the intrinsic seed for a new class of weapons -- more powerful than any hitherto used and accessible even to small groups and to those with limited resources. We are also beginning to appreciate that the ecological relationships between man and microbe are changing more rapidly than ever in history, bringing with them, a range of new organisms -- HIV,, SARS, , and now the H5N1 influenza.

Nine years ago, new counter-terrorism programs were launched by President Clinton who, in 1995, issued a secret Presidential Decision Directive. It asked that all Departments take special measures in planning and development to deal with terrorism. One impetus for these efforts was the devastating sarin gas attack in the Tokyo subway by an apocalyptic terrorist group who also endeavored to spread anthrax and botulinum toxin as aerosols throughout Tokyo. What concerned us was the question that if a hitherto unknown religious sect could undertake such actions, who was to say there were not other groups similarly motivated? Our concerns were heightened as it became apparent in the early 1990s that the Soviet Union, unbeknownst to the West, had developed a biological weapons program that rivaled their nuclear program in size and

sophistication. Meanwhile, as the Cold War wound down, many Russian scientists began to migrate to other countries. How many other countries might have bioweapons programs is unknown. Detection of such programs is close to impossible, --so little space, money and manpower being needed to produce quantities of the most potent weapons.

Beginning in 1995, efforts and resources were devoted to strengthening the capacity of police, fire and emergency rescue personnel to deal with an attack involving a bomb or chemical weapon. The naïve assumption was that biological events could be treated in the same manner. What was not understood was that the release of a biological agent would be surreptitious, undetected, silent and that casualties would only begin to show up in emergency rooms days to weeks later. It would be an epidemic and, to deal with an epidemic, one need public health and medical staff.

We argued that what was needed was a greatly strengthened public health infrastructure working with the medical community, civil authorities and volunteer organizations. Gradually, that is coming to be understood. The budget for the Department of Health and Human Services rose from just \$8 million in 1998 to \$4.5 billion this year. It all falls under the rubric of Public Health Emergency Preparedness.

The threat, regrettably, will not go away. Recall that only some 10 grams of a high grade anthrax powder was used in the anthrax attack. Some one, some group made that preparation and there is no question but that they had to have made more than this as it takes practice and a number of attempts to produce such a product. The Soviet bioweapons program kept 30 metric tons of dried spores in storage at all times.

For the 21st Century, our concerns extend beyond the release of new organisms by man. The potential threat of new and emerging infections has likewise changed. There is a constantly mutating diverse microbiota throughout the world. It regularly throws off new variants into a much more populous world – a world now with more than 30 cities with populations of 7.5 million or more. In 1950, there were only 2. The cities are densely crowded, many in tropical areas with poor nutrition and sanitation. A fertile ground for breeding new agents. We have wondered for a long time whether there could possibly be a new influenza variant behaving as did the 1918 Swine Flu. We have had several alarms but this year, the most serious of all, the chicken influenza in Asia claimed 35 victims of whom 23 died. And last year, we dealt with a new respiratory infection – SARS – with a potential for explosive spread and a case-fatality rate of some 10 to 15%.

Can we expect more? The answer is "definitely". Population pressures; greatly expanded tourism and to remote areas; internationalization and industrialization of our food supply have together conspired to create a biological threat potential that is unique in history and is growing. These factors serve to greatly increase the probability of emergence of many more new or latent diseases. However, whether our problems derive inadvertently through Nature or are the product of a terrorist, the challenge for public health and medicine are the same. Bioterrorism has provided us a wake-up call.

But, for all the problems that are posed, there are equally cogent reasons to believe that we are now poised to take on the challenge of confronting effectively some of the most significant problems of the developing world -- of AIDS, of tuberculosis, of malaria, of the hemorrhagic fevers -- and, of population.

New and practical approaches to disease control have been developed that have given us confidence that much more is possible if we have leadership and the right tools.

For example, when we began the smallpox eradication program in 1967, we worked with African countries to map out mass vaccination campaigns. Based on earlier efforts by colonial health services, we estimated that it would take not less than 3 years to vaccinate throughout each of the countries. With difficult road and communication systems and understaffed and inexperienced health workers, even 36 months looked optimistic. However, as new vaccination tools were developed, as systems became established and as experience accumulated, prospects changed. I would be confident that, if, today, we had a new vaccine, say for AIDS, at least 80% of those in Africa or Asia could be vaccinated in 9 months.

During the early years of the smallpox program, we came to the realization that little vaccine of any sort, other than smallpox, was being provided to children in the developing world. It seemed logical to try to give more than just smallpox vaccine and so, four years into the program, we proposed what inelegantly we called "the Expanded Program on Immunization" to make available, as well, diphtheria, pertussis, tetanus, measles and polio vaccines. We really should have come up with a sexier name --like "Operation Protective Shield" or some such (perhaps I have been spending too much time with the Office of Homeland Security). Whatever, that effort gradually gained momentum and by 1990, 80% of all children were receiving those vaccines.

Smallpox deaths dropped from 2 million a year to "0". In Latin America, childhood mortality rates dropped at a faster rate than ever in history. Some expressed

concern that population growth would explode causing more problems than ever. But, as was discovered, fertility rates began dropping as precipitously as the childhood death rates, albeit with a lag in time. In brief, it translated into fewer, healthier children.

Meanwhile, those in the Brazilian program tried a new approach to vaccination. They were having difficulty obtaining coverage rates of more than 60% despite all efforts to vaccinate in clinics, hospitals and by private care-givers. They decided to try a National Immunization Day. The idea was, on a single day, to vaccinate all children under 5 years throughout the country. On each of the first two days, 90% were vaccinated. Polio rates fell precipitously. Health policy gurus in Geneva solemnly assured everyone that such a program could not be sustained. The Brazilians persisted and Immunization Days continued every year. As one Brazilian said to me: "We have Carnival every year and no one seems to get tired of it. Why not Immunization Days every year?" Other countries began to do the same and, in 1985, the Latin American countries decided to eradicate polio from the hemisphere. The last case occurred just over five years later. National Immunization Days have now extended throughout the world -- indeed to China and then to India where, in each country, more than 100 million vaccinations were performed on a single day.

Now, large scale efforts have been launched to develop new vaccines for many of the major killers -- malaria, AIDS, tuberculosis and dengue. The Gates Foundation has invested more than a billion dollars in support of these efforts and those in family planning and there are increasingly generous contributions from national governments and non-governmental organizations throughout the world. A sea change has taken place over just a 30 year period. There is now both the potential and the need to effect a change of an even greater magnitude over the next 30 years.

These are tasks that will require the best and the brightest from all parts of the world. Public health has a very special role to play for it is the public health community that knows best what and where the health problems are and what are the priorities for research and development. It is only beginning to fulfill that role. International cooperation of an order of magnitude not imagined today is absolutely critical. For public health and medicine, the world is far more receptive to cooperative international efforts than in other sectors such as arms control or agriculture or trade. In brief, the world needs a public health model for international development to rebuild the bridges that have been damaged and to construct more extensive and more sturdy structures.

Working in public health offers one quite different dimensions and opportunities than does clinical medicine. We have few, if any, satisfied patients as such. I, for one, have yet to have someone thank me for their not having had smallpox or polio. However, one takes satisfaction in other ways. I recall only too well the faces of agony as we rounded on smallpox wards or dealt with rooms full of polio patients breathing with the assistance of respirators -- and to know today that through our efforts, those wards are no more.

For some 14 years, while Dean at Johns Hopkins, I worked closely with the Dean of Medicine, Dr. Richard Ross. At the 100th anniversary celebration of our Hospital, he looked at me quizzically and said: "You know, as I was thinking about this event, it occurred to me that you and your colleagues at the School probably are responsible for saving more lives in a year than we have saved at the Hospital in the last 100 years. I hated to suggest to him that the more appropriate time frame for us was actually in terms of a few months not a year.

My best wishes to all of you as you embark on a career in one of the most exciting, challenging and potentially gratifying of all fields of endeavor.