

## SCHOOL OF ADVANCED INTERNATIONAL STUDIES

### GLOBALIZATION & DISEASE:

#### KEYNOTE ADDRESS

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**MODERATOR:** Thank you for being here at SAIS - the Nitze School and I'm delighted to welcome you all to what proves to be, I think, an interesting and informative day.

This conference, I think, Scott has been planning this conference for over a year, so it's not exactly a rapid response to what's been going on. I think it indicates a long term interest that our Energy, Environment and Science Technology Program has had in this area.

And we're also delighted to be able to work with our sister institution in Baltimore, the School of Public Health and this is part of a broader strategy that the University's had to try to work together more closely to bring Baltimore and Washington together and we're very happy that this conference is evidence of that cooperation.

This is also being webcast by the Kaiser Network and I—my understanding also that our Center in Bologna is listening to this live as we speak.

I'm very delighted to again, to have this as a hostess conference and we're very happy also to be working with the Novartis Corporation. Novartis has sponsored the SAIS/Novartis prize in international journalism now for the last five years and has been a good partner for us at SAIS and I'm happen to welcome to the stage Terry Barnett, who is the CEO of Novartis to make some opening comments. Terry.

**MR. TERRY BARNETT:** Good morning. I'm Terry Barnett. I'm CEO of Novartis Corporation and I'd like to welcome you all here this morning to this conference: Globalization and Infectious Diseases: Institutions, Policies and the Threat of Bioterrorism. Novartis is pleased to sponsor this event with Johns Hopkins University.

We ended the new Millennium with six billion people in an increasingly globalized world. Globalization can mix and create interdependencies among people and communities around the world. While it can be a force for good, yielding higher standards of living and new economic opportunities for all people, it also brings very new risks. With globalized travel and trade, no part of the world is far from us. Nor are its diseases and its conflicts. During this century, we will continue to face the challenges of poverty, hunger, disease, environmental deterioration and illiteracy. And, we now find ourselves confronting the

reality of bioterrorism. All of us must cooperate to address these pressing problems and to prepare the world for the challenges for the next generation.

We all have something to contribute, but Novartis, we strive to improve the health and well-being of people throughout through innovative products and services. In our health and nutrition businesses, we develop model disease treatments and offer products to improve quality of life and life expectancy. We recognize, however, the millions of people, billions of people probably do not have access to the medicines and care they need. In response, we have developed new models for sustainable access to our malaria and leprosy treatment for the developing world and we have established a patient assistance program for our new breakthrough cancer drug, Levic [sp], that assures that costs will not be a barrier to treatment.

As a company dedicated to improving health and saving lives, Novartis must respond to social concerns over issues such as access to medicines, drug safety and innovation. The long term business success of our company depends on our being a responsible member of the global community. It is also the right thing to do.

To this end, we have committed to upholding the United Nations' Global Compact and its human rights, labor and environmental principles. We have also developed a corporate citizenship policy by which we define what the compact principles mean for Novartis and how we will implement them. I invite you to learn more about the Compact and if you represent an NGO or a business, I encourage you to join us as members. We also wish to engage with all stakeholders interested in and willing to find a solution to the issues we are discussing today.

After we hear from our experts on each panel, we hope that you will ask questions and share your views with us.

Thank you all for being here today.

**MODERATOR:** Thank you very much, Mr. Barnett. I'd also just like to briefly welcome and recognize our President at the University, Bill Broody [sp]. Bill, glad to have you join us, please stand up and--.

I'd now like to introduce the Director of the Energy, Environment and Science Technology Program here at Sites and the person who put this conference together, Dr. Scott Barrett.

**MR. SCOTT BARRETT:** Thank you very much. It wasn't just me who put this conference together and I wanted to start by thanking in particular, two people: Tracey Howler [sp] and Novartis Corporation and Daniel Mesco [sp] of the East Program, both of whom have worked very hard to make this conference come off and I'm grateful to both of them. I also want to thank Novartis, not just for funding the conference, but for agreeing that this is an important topic that needed to be brought to the public's attention. Thank you.

I have an announcement, one of the speakers, Dr. Anthony Fauci at the National Institutes of Health has had to pull out of the conference because he is being conscripted by the White House to address the bioterrorism problem, but I'm also pleased to announce that Dr. Kenneth Berkley from the International Aides Vaccine Initiative will be speaking in the session this afternoon on institutions.

I finally wanted to say something substantive. It has to do with how this conference got to be organized in the first place, particularly thinking about the recent anthrax scares. When I first put this conference together and I included a session on bioterrorism, a lot of people raised their eyebrows wondering why are you including this in the conference. I organized this, by the way, last spring and the world was a different place then. And after the terrorist attack, then I got a different kind of response. Some people thought that I was to be congratulated for moving so quickly in organizing the conference. And other people thought that I was very far sighted and I was neither quick nor far sighted.

And I do want to explain why I included bioterrorism in the original conference proposal. And it really connects to my first meeting with one of our keynote speakers, D. A. Henderson, at a work shop at the Institute of Medicine last year when I met him. And D. A. Henderson is a man who ran the small pox eradication program which is probably the most successful example of international cooperation in history. And when I met him, he said that I needed to take the word eradication out of my vocabulary. Basically what he said was that what can be created can be destroyed. And I understood that the efforts to do good in the world trying to protect human health globally, has to take into account the problems of people who want to do bad in the world to harm people's health. And that is why I included bioterrorism in the original conference program.

The last thing I think I should mention is that while we've been concerned recently with anthrax scares, while there is heightened anxiety, I think justifiably so, about what may yet come, all the while in the last two months, tens of thousands, hundreds of thousands of people, mainly children, have been dying in poor countries of preventable diseases. And the reason we put this conference together was really to address that problem. We needed to include bioterrorism in the program because as Professor Henderson taught me, you really can't look at that problem without considering the bioterrorist threat. But, I do hope that we will bear in mind today that the world has lots of problems and we need to take a balanced approach in understanding all of them.

Thank you very much.

**MODERATOR:** I'd like to now turn the podium over to Laurie Garrett.

The way we'll operate it is she will speak for about 40 minutes or so and then we'll take questions and then we'll have the second keynote speech by Dr. Henderson.

You all have Ms. Garrett's biography in front of you. So, I'll be very brief just to say that she has won the Peabody, the Pope and the Pulitzer which is not bad. She has won the Pulitzer for her work on Ebola [sp] and she was won the Pope for her reporting on Crumbled Empire, Shattered Health. She

was with NPR for a while, is now at News Day and has written The Coming Plague and Betrayal of Trust. Thank you.

**MS. LAURIE GARRETT:** Thank you. You folks may want to sit down where you can see slides. Okay.

Well, good morning. I want to thank Scott Barrett for organizing this and for keeping me complementess [sp] which is difficult since September 11<sup>th</sup>.

On the morning of September 11<sup>th</sup>, I was getting ready to catch a plane to Detroit to give a talk, not terribly different from this one at the University of Michigan, when suddenly I heard this enormously loud boom noise and my building shook. And I stuck my head out the window and saw flames coming out of one of the World Trade Center Towers, grabbed my camera and my reporter notebook and a jar of water and a backpack and ran to the roof. Photographed the second one hitting the second tower. Saw a tidal wave of humanity running across the Brooklyn Bridge towards my Brooklyn Heights neighborhood, escaping Manhattan, ran down to the bridge and proceeded to run towards ground zero interviewing people all along the way. And it's really been non-stop since then.

I know that much of the country has forgotten about September 11<sup>th</sup>. It is sort of receded in the headlines, you know, along with Chandra Levy and Monica Lewinsky and it's been replaced by anthrax. And who—what will replace anthrax? What will be the next shoe to drop in this terrible series of events? I don't know. But, for those of us who live in New York, ground zero is very, very much a part of our lives. The smell never goes away. The fire has not stopped. The danger has not ceased. And what has happened to our landscape is something that brings tears to our eyes everyday. For us, those events live on and anthrax is just the thing that keeps us from being able to have post-traumatic stress disorder. We are still in trauma. I can't go post-trauma yet.

Well, the only good news I can see out of the whole September 11<sup>th</sup> series of events and post-September 11 events is that for the first time, we're hearing out of the mouths of politicians the phrase I'd never thought I'd hear them say, "Public health infrastructure." And it's a delight, I must say.

The bad news is they don't have a clue what they're talking about. Congress doesn't know what a public health infrastructure is and their eyes glaze over the moment anybody tries to explain it to them. The public doesn't know and most of the media doesn't know that it—though it's slipping into more and more articles.

Talk about a learning curve. There's a lot of condemnation out there for the learning curve that we very visibly see on the part of the CDC and the overall structure of government in its response to the events of September 11<sup>th</sup>. Every one of us is on a learning curve. We in the media are making mistakes, publishing errors, putting errors on TV because we're learning. Everybody in government and everybody in the public is learning. We haven't got a lot of time to catch up. We don't have the luxury of sitting back and reading even my book at 758 pages, you probably don't have time. Let me just give you a few synopses.

First of all, surveys of the American population show that before the events of September 11<sup>th</sup>, very few Americans in polls could define public health. Even when given a multiple choice quiz with the correct answer on the page. More than 80 percent misdefined public health. And then having done so, they're soundly against it. About 90 percent of Americans in surveys conducted earlier this year, find that they are against public health no matter what the heck it is, whether they defined it right or not.

Part of the problem is they've defined public health as poor people's medicine and since we're not really happy about poor people in this country and we think poor people should take care of themselves and get off the roll of the welfare, we don't much like services that are provided to poor people, including medicines. But that is not public health.

Public health is a trust between government and the citizens. It is a trust in which the citizenry says we will pay our taxes and we'll follow the--at least the less obvious of your regulations. And we'll give you a certain amount of transparency. You are allowed to know a little bit about our health records. You are allowed to know a little bit about what we do with our lives in order to protect us and follow our disease incidences. And, in exchange, you government, your side of the trust, is you guarantee that you will do your utmost to provide us with safe water, safe air, safe foods, safe school conditions for our children, mass immunization and a high standard of personal and public health.

What is public health and how do we know that public health is working or not? One of the problems for us politically is that when public health is really working, it's a negative. Nothing is happening. There are no epidemics, there's no increase in infant mortality, there's no declines in life expectancy. All goes merrily along. And, therefore, turn easy in budget cut times to slash public health budgets because the average politician cannot see their need. The need is a negative.

The best marker is life expectancy and we know from the wonderful work of Cambridge University's Thomas McCune, that the records of England, Sweden and Whales demonstrate that in 1700, the average male life expectancy was a mere 27 years. And that for those places by 1971, it had risen to 75 years. A similar rate of increased expectancy all over North America, Japan and most of western Europe. And it has been a fundamental tenant of the World Bank and the World Health Organization that this would be mirrored everywhere in the world, that the entire global population would see a steady trend in improving their life expectancy. There would just be a sort of quarrelet of overall economic development, so that as the wisdom of the northern hemisphere industrialized world to trickle down to the poor world, the poor world's life expectancies would miraculously rise.

Based on those assumptions, in 1990, WHO and the World Bank issued a joint global life expectancy forecast. They said in 1955 average male/female combined life expectancy was a mere 48 years, but that by 2025, it would reach 73 years globally. I think we have to admit to a very serious numbers problem. Not only will the world fail to meet that rosy forecast unless some very market improvements are made in how we deal with global health, but in many parts of the world, we're going backwards.

First slide, please. We have to look at where we're going backwards and get some clues about why. Maybe if the TV camera lights can go slightly off the angle of the slide, more of the audience can actually see the slide. We are reversing, going backwards in life expectancy in Sub-Saharan Africa. Next slide. In Central Asia. Next slide. And in the former Soviet Union region. In fact, next slide, the former Soviet Union has seen the sharpest drop in life expectancy witnessed in the northern hemisphere in the absence of war since the black death of the 14<sup>th</sup> century. Why has this happened? Next slide, please.

First, I think we have to look at why the life expectancy increased by 48 years between 1700 and 1971 in the Northern European region and North America. It's important to realize that more than 90 percent of that improvement in life expectancy occurred before the invention of a single antibiotic. In fact, half of it occurred before 1900. The key components of it are somewhat illustrated interestingly in this chart. This is a WHO chart. It's a little dated, 1993. The dollar figures obviously are dated. In parentheses you see average per capita GDP, not surprisingly, Japan is the longest living society on earth, they are a homogeneous society, very well fed and very rich. France follows, yes, the USA is up there. The United Kingdom is up there but, wait, let's go back. What's that? Costa Rica? Costa Rica with less than 10 percent of per capita GNP compared to the United States and they live longer than we do? How could that be? Especially since we spend about 15 percent of our GNP on health, compared to most of the other top leaders on that list, but spending less than 10 percent. In fact, in Japan less than eight percent. Costa Rica is only able to spend about five percent of its meager GNP on health, how is it they outstrip us in life expectancy? The key is where we spend our dollars. Is our focus on individual medicine or is it on public health? Costa Rica knows it can't afford to provide tertiary medicine and exotic multiple bypass surgery, cat scans, MRIs and so on to every single Costa Rican. It says to the population if you need that, scarp into your own pocketbook and find the wherewithal to pay for them. But, what we will provide you and where we will spend our money is on children. We will spend vastly in resources on the health of our children to let every single Costa Rican child who reaches the age of 21 that possibly can and does so with a fit body, well fed and well taken care of. The idea is you give them a good start on life, they are in better shape to face adulthood. Immunization is 100 percent universal across Costa Rica as are a host of other child nutrition and health programs.

Where do we spend our dollars? About 25 percent of our vast health expenditure, the largest expenditure in the world, predicted by the Health Care Financing Agency to reach 17.3 percent of GNP by the end of this decade. Where do we spend those dollars? About one out of four of them are spent on the unstaged disease. On the final—depending on whose data you look at, the final two to six weeks of life, we spent on heroic medicine. And one out of five of our children has no access to the health care system. It's marked difference in priorities.

Next slide, please. Well, if you look around the world and try to compare where the health calamities are today, to what lessons can be learned about the things we did that made the difference in life expectancy here in North America and Northern Europe. It's low tech stuff. It's not medicine that's made the difference, it's public health. It's improving housing everywhere in the world. Next slide. Especially as we see now on the outskirts of a newly burgeoning mega cities where people are pouring in from the rural areas and setting up flap dash housing in densely crowded conditions. Next slide, please. It's removing the livestock from human habitation. Something that, you know, most people

don't know that Rockefeller Center used to be affectionately known as "Hog Town" and was an area in which there was 30,003 roaming hogs and slaughter houses. A fine location for NBC. But at any rate—no, I have friends at NBC.

At any rate, we separated the livestock from human beings. Next slide, please. One of the things we see all over the world today right now is exactly the opposite. That people who are moving into the mega cities in the developing world are bringing their rural ecologies with them. In densely populated areas, living with pigs, chickens, cows, whatever they bring with them, creating fantastic conditions for epidurintic [sp] disease. Transmission of animal diseases to human beings. We've seen this in an escalation in the rate of emergence of new forms of influenza, in annual five folds we've seen this increasingly with other disease circumstances and I think if we don't pay heed to this, this very circumstance represents a very dire problem for humanity. Next slide, please.

We also created water systems that separated human waste from drinking water and purified and delivered as human drinking water. Unfortunately, according to Habitat for Humanity Conference put together in Istanbul three or four years ago by United Nations, the number one crisis in urban centers in the world today is, in fact, the opposite water usage. This is in downtown Calcutta, I'm trying to give you an idea of what I'm talking about. You see the girls in the foreground washing their hands in the same water supply that a pig is urinating in and the same water supply that girls are washing dishes in and the same water supply that further upstream a woman is urinating in. Single use, water supplies, that constitutes both waste and drinking water are a global catastrophe and one that we cleaned up in most of the Northern Hemisphere long ago, thus eliminating a tremendous burden of enteric and vector borne disease. Next slide, please.

We also drained our slots. I mean this city had stupidly been built right on top of a slot that used to be every summer besieged by Yellow Fever and Malaria. The death toll from Yellow Fever in Washington, DC, used to be so horrible that every external politician that possibly could left town come June 1<sup>st</sup>. Well, we went in and we sprayed once we discovered DDT during World War II, vigorously sprayed rain forests all over the world. And drained the slots and tried to bring mosquitoes under control. Next slide, please.

We also developed systems of transport that allowed—and more efficient agriculture that allowed for delivery of a very highly varied and nutritious diet at affordable prices to our population. So that people went from eating perhaps just potatoes and the occasional chicken, to a highly varied diet that included fruits and vegetables and milk for children. Today we see again quite the opposite in most of the world. Food prices continued to represent an ever higher proportion of the budgets—of the meager budgets of people in the poor world. I took this picture in Crooks, Siberia, because it most graphically illustrates the problem. These people, when it was the Soviet Union, would have had their rubles, but gone in and—to look at their shelves. Today, they have no rubles and go and look at food and market even rare tropical food and it's like going to a museum. They can't afford to purchase the food, but at least they can look at it and try to imagine what it would taste like in their kitchen. Most of the food in my experience, often goes rotten, never sold from the market in that region. Next slide, please.

And then came the real revolution about 110 years ago with the understanding of germ theory and its first application to public health. New York City really was the beginning, ground zero then, for a positive movement that had a creating of system of public health and an understanding of what that infrastructure might be. And, it was fundamentally an infrastructure based on identifying the sick and isolating them, whether it be by quarantine or other means. And it dramatically reduced the incidence of infectious diseases in not just New York, but as the pattern was repeated, all over the Northern Hemisphere. And, in fact, most startlingly, next slide, please, as we brought vaccines into the picture beginning in the 1940s, with the polio vaccine and instituted rigorous routine regular vaccine campaigns for children, we saw our child mortality rates go lower from an 1870 high of 40 percent down to less than one percent by the end of the 1950's.

Well, that was then, this is now. US Centers for Disease Control recently did a survey looking at causes of death between 1980 and 2000 and they found that the numbers of Americans who died of infectious diseases during that period doubled and now it's more than 180,000 a year. When they first saw this upward trend, everyone assumed, well, that's just the HIV effect. Except, next slide, please, we have the invention of highly antiretroviral therapy and mass distribution in 1996, which have dramatically lowered the death rate due to HIV infection and AIDS and yet, this trend in upward mortality due to infectious diseases have continued without any sign of leveling off or in fact, decreasing in the United States and is mirrored in much of the industrialized world today. Next slide, please.

Well, what is this about? What's going on? It's the downside of globalization. Next slide. It's pay back, if you will, for decades of shunning the desperate health needs of the poor world. Next slide. It's the boomerangs from the 20<sup>th</sup> century in which 20 percent of the world population stops having to worry about measles, next slide, malaria, yellow fever, tuberculosis and so on. But the remaining 80 percent struggled access to the most basic antibiotics, clean water, waste disposal, clinic dissent syringes and anti-malarial drugs. This by way, since we may face this agent if some malevolent dark forces that are—visit upon us, continue their activities and escalate to plan C, this is the play board of Syria, India [sp] 1994. Next slide, please. Which was maintained under quarantine by an army that arrived after 450,000 people had fled the city. Next slide, please.

The world is now a fluid place in which borders and territorial fantasies have ever left significance. The global morbidity makes some sense economically and politically, even culturally, next slide, please, but it poses some very serious challenges in terms of microbial disease. Next slide. Consider some findings that should sober us and give us a sense of the background against which we now put an over layer called bioterrorism.

Malaria was virtually eradicated from North America by 1950. When we came out of World War II, two vital tools for control of malaria had been tested and proven by the armed forces in the Pacific theater. That was chloroquine for treatment and prophylaxis and DDT for control of the mosquitoes and both were 100 percent effective. At that time, according to the WHO data, this was the distribution of malaria in the world. And it's pretty a little tough for you all to see in the slide, but the very dark areas are the endemic areas for malaria. And as you can see, we had plenty of malaria in the southern part of the United States and right up the Mississippi Valley, all the way into Minnesota. And

southern Europe, which still quite malaria, Russia still had more area all the way up to St. Petersburg and Moscow in the Summers and, of course, all of Latin America, except the Edina [sp] region was afflicted as was the Sub Saharan African region and south Asia.

Next slide, please. After vigorous attempts to control the mosquito, next slide, and spray rain forests right and left, next slide, this is where we stand today with the distribution of malaria. While it's true we don't have much malaria in North America, we certainly have more malaria in the world today than ever before. Actually, before we write off America and think we've eradicated our malaria problem, I should point out that between 1996 and '97 in a single year according to the CDC, the incidence of domestic malaria in this country increased by 11 percent and globally, according to WHO, more people died of malaria last year than ever before in human history. I mean a Harvard study assessing the rate of malaria in the world comes up with even higher numbers of recent deaths, somewhere between one and a half to three million people died last year of malaria. It's very hard to estimate because, of course, the deaths that are occurring in the background were such an excepted phenomenon, the numbers barely go recorded.

Worse yet, of course, is the impact of malaria on productivity in society. Huge numbers of adults are not—now suffering with relapsing malaria or cerebral malaria from newly introduced parasitic strains to which they may not have strong immunity. And chloroquine is no longer particularly helpful and useful anywhere in the world. Our armamentarium for malaria control has shrunk and many places in the world we essentially have incurable, uncontrollable malaria.

Next slide, please. We have tried to use the old technology of swooping in with our helicopters and our planes and our pesticides, but as we discovered sadly with the introduction of a Savannah-Nile-Delta virus [sp] carried by North African mosquitoes coming into the concrete jungle of Manhattan, carried by domestic mosquitoes, the introduction of what's now a fever showed us, that our technology has a powerful set of enemies.

We have spent hundreds of millions of dollars trying to control what's now a virus and it is now endemic in 11 states, surfaced in birds in 17 states this summer and there's no hope really of getting rid of it. It's now a new endemic disease. Fortunately, the death rate due to West Nile is very low, but there's a lesson there that we dare not ignore.

Next slide, please. Hepatitis C is now a global catastrophe. In the United States, a survey showed about 90 percent of our IV drug users are infected with the cancer causing virus and it's estimated that in the absence of efficacious and very expensive therapy, 25 percent of them will die of either sclerosis or liver cancer. This, too, reflects what's going on globally. This young man I met in Mustamae Hospital in Tallinn Estonia, aged 15, dually infected with Hepatitis B and C, acquired through IV drug use.

Most Hepatitis C is actually being acquired, however, not through use of narcotics, but as a result of reuse of non-sterile syringes in medical settings. About 170 million people globally are infected with Hepatitis C and unless breakthroughs are found in treatment that are affordable, 42 million of them will

die of cancer. The two countries with the highest burden of Hepatitis C infection are Egypt and Pakistan, in both cases directly as a result of massive use in the medical system of non-sterile syringes. Next slide, please.

Now, if there's one thing we learned in the late 1800's how to control, it was water borne disease, dysentery and parasitic diseases. Yet, they are on the up swing all over the world, completely preventable. No major technology here. This is a no-brainer, and yet, we have been unable to control the rates of water borne disease. In fact, this spring, WHO estimated that a billion people drink unsafe water everyday in the world, 2.4 billion lack any access to proper sanitation and water borne disease killed 3.4 million children just last year alone. This is true even in the so-called industrialized giant. I took this picture in downtown Novosibirsk [sp], Siberia and sort of chucked them to myself recalling growing up in a childhood when we thought the Soviet Union was an industrial giant that was outpacing us scientifically and technologically. And yet, in fact, in the largest city in Siberia, most of the downtown residents do not have drinking water pumped into their homes and share pumps like this even in bitter winter temperatures.

The truth is according to the Russian administrative health, half of the population of Russia lacks access to safe drinking water. Next slide, please.

We reached another dubious landmark last year with tuberculosis. This is a WHO slide, depicting the trend they see with TB last year more people died of tuberculosis than ever before in human history. At least two million people and 8.5 million people had active tuberculosis according to WHO.

We have seen a very striking trend and I'm going to show you very quickly as I describe this trend, a series of photographs I've taken in tuberculosis for the tuberculosis treatment centers in the former Soviet Union where TB is at its highest level in the world. Next slide, please.

We see striking trends in TB. They are extremely disturbing. Next slide. WHO and the CDC jointly did a series of surveys in 58 nations looking at multi-drug resistant tuberculosis incidents between 1995 and '99. Now, what they did, next slide, they simply asked question if we get a bunch of samples of randomly selected tuberculosis, bacilli, what percentage of our resistant to two or more of the ten available drugs, which must be taken in combinations of five at a time for effective treatment. What percentage of them are reduced, two or more? And, by the way, you need to keep in mind, lots of people think, well, 10 drugs to treat TB, why that's a good list to get through. Number one, you have to take minimally four at once. At this time, most of the experts are now insisting it should be five at once. And number two, some of them are sulfa drugs. So a very hefty percentage of the population doesn't have 10 on it because they are allergic to two or three.

What we see is that once you have resistance to two, you have a tremendous diminution in the efficacy of treatment and a much higher mortality rate. You get up to three drugs that your resistor—your strains are resistant to and you're in real trouble.

What we see in the crowded jails and prisons in the former Soviet Union, in the ghettos of Soweto, in the streets of Calcutta, is a rising incidence of multi-drug resistant tuberculosis. This survey conducted in a four year window, 1995 to '99, found that even in the industrialized world, multi-drug resistance increased three to four fold in four years. Next slide, please.

But that's nothing compared to what happened elsewhere in the world. In Russia, multi-drug resistance went from about 6.5 percent in 1995 to 26 percent in 1999 and the result is what happened to a fellow like Constantine, who was jailed without indictment because they couldn't find lawyers in Russia and spent time in a Moscow jail that was so crowded that the average prisoner had one square meter of space and had to rotate between standing and laying down with other prisoners. In that crowded environment, he acquired drug resistant tuberculosis, the jailers kept pushing treatment, turning every one of the prisoners into a walking petrie dish to breathe highly resistant strains. Ultimately, it was a fully resistant form of tuberculosis that had taken hold in every organ system in his body and not long after I interviewed him, he died of tuberculosis. That is the sorry truth. Next slide, please.

But the rates of increase in TB are even more striking in India where we see that they went from an eight percent rate of multi-drug resistant TB in 1995 to a 48 percent rate in 1999. Now, comes someone like this young man, [unintelligible], who acquired it in the community, he has no idea where he got his multi-drug resistant TB and who was sulfa allergic, who was—there was no available treatment for him except, next slide, surgical removal of one lung, half of another and punching in a tracheotomy hole through which he can breathe. About one out of five Russian TB cases are now treated surgically in methods we've not used since the 1940s. Next slide, please.

And all TB control is conducted in run down facilities like this one, which is headquarters for all TB control for Siberia. No running water, an outhouse, one light microscope and no protective gear for the staff. Next slide, please. In most of the world, the staff that are running TB wards does not have any protective equipment for themselves. This woman, a nurse working on a TB ward in Ercoth [sp] was sewing together bits of gauze and wrapping them around her face, hoping it would provide protection. Unfortunately, the micron size was insufficiently filtered. Next slide, please.

More of the dire commissions of TB controlled facilities, we should really be asking how much longer do we have before we have incurable tuberculosis on large scale in the world? There had been rosy forecasts that we had several decades before widespread multi-drug resistance would take hold. But, we can now see the pace is quickening and our timetable must really be looking at the end of this decade. If we haven't come up with a uniform of treatment for TB and one that is both easier to take, doesn't require a very disciplined schedule of four or five or six drugs for months on end and a—cheaper, can be afforded by the total global population of need, we're going to be in very desperate trouble and we will be revisited by tuberculosis on home shores as we were in 1991 and '92. Next slide.

The pace of drug resistance is partially being hastened by a burgeoning and widespread black market in antibiotics globally. I have seen it everywhere I've traveled outside of the multi-world and it is now very efficiently run, fueled by the Russian mob, the same folks that are distributing our code are in the

pharmaceuticals game, but it's illegal distribution. Many of the pharmaceuticals I find, whether they be in this case in Reese, Georgia, or you can shop Democratic Republic of Congo are expired drugs or our drugs that have stamps on them indicating they had originally been distributed for humanitarian relief and then probably stolen from warehouses by mobsters who then redistributed them all over the world.

But folks, like this young man making recommendations about how people should use the drugs to medicate themselves, have no medical training, of course, and are simply providing advice based on economics. Next slide, please.

Our precious armamentarium of antibiotics which has allowed a whole new two box—toolbox since the 1950's Republic Health to address everything from syphilis and gonorrhea to endocroicile diseases is now severely threatened. We are seeing drug resistance rising in every major bacterial family that we could possibly be concerned about from staph ducocous disorious [sp] and strep ducocous pneumonia E.coli and club siella [sp]. Next slide, please.

The real concern that we had here in the United States concerns the fact that intrococi [sp] has become ubiquitously resistant to make bancomicine, methycillin [sp], penicillin, the whole host of primary drugs that might be used in treatment. Intrococi are not usually lethal unless you are a severely immune deficient individual or you are taxed a post-op patient, something like that. However, they are very promiscuous and they rarely share their plasma carrying drug resistance with other microbes.

In subsequent studies, we can turn staph orious [sp] and strep dicoccus pneumonia into fully drug resistant bacteria by simply grilling them together with drug resistant intrococi. So, we've had a full vast concern about the loss of the utility of bancomicine in American hospitals.

The reason is that methycillin resistant staph ducocous orious has risen to epidemic proportions nationally. We can no longer really count on methycillin to be effective. It's starting with a child's ear infection due to strep pneumonia and working all the way up to toxic shock syndrome due to staph ducocous orious. The fall back positioned drugs, therefore, are really vital drugs with bancomicine and we set up whole systems to try and monitor for the emergence of bancomicine resistant strain of staph or strep. When they did emerge, very sadly, it was not in the atmosphere we had imagined, but was in hospitals and this is a crucial point for all of you to understand.

Drug resistance in bacterial populations usually originates in the community increasingly and if you saw the recent issues of New England Journal of Medicine documenting this in four dramatic studies based in Northern Europe and the United States, increasingly we're getting drug resistant strength from our food supply as a result of massive overuse of antibiotics as growth promoters in the livestock industry. Livestock meaning aquaculture fish, chicken, turkey, beef, pork, pretty much anything you put in your mouth. In fact, we even use them in citrus orchards and apple orchards for other reasons, so we are exposed to massive amounts of bacterial populations that have been themselves, heavily doused with and exposed to antibiotics. As a result, we're seeing a steady increase in the background of antibiotic resistance in the community.

And one striking study, in fact, shows that we're seeing an increase in urinary tract infection in young women in the United States. About a 51 percent spiking just in the last two years and it turned out to be largely due to drug resistant forms of E.coli and the drug resistant patterns genetically are identical to the patterns seen in E.coli in chickens purchased in the supermarkets from which these women who have urinary tract infections purchased their food.

Well, as we go down the list and look at what's happened with Vancomycin resistance, in every case, the new Vancomycin resistant bacteria have emerged in hospital settings. We could now find bacteria that actually directly colonized sutures and catheters lines that can live very happily in the tubing that is used in the multi-invasive drips and so on on our chronic diseased patients have in hospitals. And our hospital environments are becoming more expensive and more dangerous.

According to CDC, next slide, please, whether you are looking at a hospital environment like this one in Ukraine or our much more lovely hospital environments such as at George Washington University or Georgetown, you are seeing the threat of emerging bacterial drug resistant disease. In the 1990's, according to the CDC, some 40 million people acquired bacterial infections in hospital each year in the United States, about 2 million of which were drug resistant. Those infections killed annually about 100,000 people and increased the cost of medical treatment by \$4.5 billion. Well, we can say, gee, we don't have to worry about Vancomycin because now there's been divox invented, but Harvard University has discovered divox resistant cases in dialysis patients who succumb to forms of staphylococcus that can even resist that drug which was only introduced into medical use in the United States 17 months ago. Next slide.

Well, I want to quickly leap towards bioterrorism. I know our time is short and we got a little bit of a late start here this morning. So, I'm gonna try and speed up here. I was in the Ebola outbreak in [unintelligible], and the main reason I want to quickly run through a couple of points from there is that the same conditions that are allowing for the spread of the bacterial disease inside our hospitals, are also basically the reason why so many exotic diseases emerge and cause terror in desperately poor countries. This is the hospital in which the Minga [sp] family which had, within the family, been suffering Ebola for three months without it going into the external community or being noticed by anyone, finally staggered. This was a hospital that lacked any of the essentials of hospital environment. No running water, the generator had long since been stolen, there were no latex gloves—the surgical staff had no protective gear. The lack of a generator meant that there was no autoclaves to sterilize surgical equipment, I could go on down the list.

And Ebola like so many feared microbes took advantage of this ecology, finding that it could spread rapidly within the hospital. Next slide, please. In a hospital where this is the sum total of the medical microbiology laboratory, needless to say, making a diagnosis of what this new hemorrhagic disease was in their presence was not something this hospital had the skill capacity to do. Next slide, please.

While bringing the disease under control did not involve Dustin Hoffman in an outbreak movie outfit, sounding like Darth Vader speaking through his space suit, it did not involve high tech, it did not involve

anything that you would find pretty much making a difference in an American hospital. It was a simple cordon sony care [sp], isolate the patient. Next slide, please.

Remove the ailing from their family which minimize the spread within family settings. Next slide. Bury the dead well outside of town with no funerals and no rituals that could lead to a spread of disease. Next slide, please. That's what brought it under control.

Well, when you consider how abysmal our ability to execute infection control is in our own hospitals, much less overseas in settings in like [unintelligible] now I ask you to imagine a bioterrorist contagious element introduced into our community.

I visited the Vector Laboratory in—outside [unintelligible] in 1997. This was the center of Bio-Preperott's [sp] massive production of—weapons of mass destruction based on viruses. It was only one of 52 facilities Bio-Preperott had for production of biological weapons employing something in the neighborhood of 50 to 60,000 scientists, technicians and so on. And so, I've had people asking: what you doing crouching next to a washing machine? This is high-tech Russian style. He's wearing his version of a biohazard level for containment suit and that is a centrifuge at his back. Next slide, please.

Bio-Preperott was, in fact, producing massive quantities of microbes, many of which had been genetically altered to make them deliverable by ICBMs or short range missiles, had allowed for drug resistance in the case of bacteria. Next slide, please. They had even created a form of anthrax that actually was no longer anthrax. It was another species, creating a tri-mirror [sp] between bacillus seria [sp] and bacillus anthracis that turned out to be completely drug resistant and to have a different impact on the immune system that would challenge some anthrax vaccine, fortunately not the bioport vaccine as it turns out. Next slide, please.

What was going on there is only what we know about, fairly obviously, in a sense that Bio-Preperott came clean and western observers were allowed to get in and get a good look at it. We don't really know what was going on in the Ministry of Defense Program, which was another biological warfare program. They've never allowed external inspections.

We also were surprised to find out that small pox had been moved from its long-term sequestering sight and I'm sure Dr. Henderson will discuss this, in Evan Offsky Institute [sp] in Moscow to Vector where it had been exploited as a biological weapon. Many strains of small pox had been created or experimented upon and we now know from Tim Elebec [sp] and his book, Biohazard, that I'm sure most of you have read, there were quite a number of interesting and exotic experiments going on. Well, what the Russians were doing is nothing compared to what we now could do and can do just in the last 12 months as a result of having fully sequenced the human genome, fully sequenced the genome for usinia peskies [sp], for small pox, for influenza, for a host of micropathic organic organisms. These are published [inaudible] and they are sequenced publishings in which it's pointed out this is a gene for virulence, this is a gene for cell tropism. We found this stream, which has this additional cell tropism gene. By deleting this gene, we've read this summer from chicken—from a flu we turn it into a lethal human flu.

In another paper, we discover by adding this gene, a mouse pox virus turns into a super lethal form of mouse pox that kills all the mice in the colony. We are learning more than we could have imagined even a year ago about how to manipulate micro-organisms.

So next slide, please, very quickly finishing up. Next slide. And of course the thing we're worried about and I'm sure Dr. Henderson will discuss is smallpox and the possibility of what would happen to the world were someone to deliberately fiendishly release smallpox.

Next slide. Well, just a few key last points to again draw attention to the public health background we're dealing with here. According to Dr. Keith Sabin at the CDC in an exumate [sp] published this spring, there were 12 billion injections given for alleged medical purposes last year in the world, many of them unnecessary. But most alarmingly, 70 percent of the medical injections given in the former Soviet Union were non-sterile, 39 percent in Sub Sahara and Africa and a whopping 80 percent in Southeast Asia.

Most people here do not understand a fundamental point about spread of disease in the world today. And I mean, you could easily argue that up to half of all blood borne disease incidents in this world today is a direct result of non-sterile needle use. And the failure to understand that back when we had those cumbersome glass syringes and steel needles, at least they could be autoclaved, at least they could be heated up to a point where all viruses and bacteria within them would perish.

But now we've distributed all over the world so called saliuise [sp] syringes. They're plastic, they're delicate and they cannot really be sterilized. And yet of course we know full well they're not being single used because most of the world can't afford to purchase enough syringes to meet every single use as we do here.

We desperately need to address this or else face the fact that Hepatitis C and B and HIV and so on will continue to spread and whatever new blood borne disease gets introduced into the global system will rapidly take advantage of this vector.

Next slide, please. I don't have time to go into this but all over the world concepts of infection control are truly bizarre.

Next slide. And the global blood supply is in desperate condition. This is a blood bank in Bleethy [sp], Georgia and I'm sure you don't want any of that blood no matter how dire the automobile accident is that you were just in.

According to WHO, only about 10 percent of the global blood supply is currently screened for HIV, Hepatitis B and Hepatitis C. You know, a no brainer, people. This isn't high tech. This is political will. This is money. And yet we allow--an intervention we knew 20 years ago had to be changed to slow the spread of HIV. We allow it to remain in a horrible state of existence.

Next slide. Next slide. Next slide. Next slide. Next slide. Okay. Finally, I just want to close with HIV. Next week in Doha, Kattar [sp] comes the next round of discussions at the World Trade Organization and some of you are going to be hearing that a lot of people who have been involved for many years in dealing with AIDS pandemic are deeply upset about the negotiations carried out between Secretary Tommy Thompson and Bayer over the pricing of Cipro.

They're not upset that the price of Cipro came down from a general market price of \$4.67 per pill to 95 cents per pill under the stern negotiating power of Secretary Thompson. In fact, they applaud that and say, "Bravo, Secretary". What they're upset about is that that came down for a bioterrorism threat that so far thankfully has killed a handful of people. But in most of the world today, the price of drugs related to an epidemic that has taken the lives of 24-25 million people are completely unaffordable to those who need them.

And this has become a real point of rage and contempt from many people in the international community looking at the trade related intellectual property component of the World Trade Organization agreement. It will be a heated debate.

Now just before September 11<sup>th</sup>, we had a momentum under way in which we thought that the global community was finally really paying attention to Africa's AIDS pandemic. We were paying attention to the growing spread of HIV globally and realizing that it was a national security threat to every single nation, rich and poor alike.

We had a special session of the United Nations for three or four days and a resolution passed that called for a global fund to exceed \$7 billion, perhaps \$10 billion in order to address the crisis of the spread of HIV, of drug resistant tuberculosis and drug resistant malaria and to come up with viable means addressing the problem.

Then the World Trade Center was hit and all of a sudden the momentum and the whole discussion of HIV/AIDS plummeted and disappeared off the radar screen. I think that we ignore and forget about the HIV pandemic at great peril, great peril.

And I think with that, with time so short, I will close and I don't know if there's time for questions? We can bring the lights up, please, and light and slides off.

**MODERATOR:** We'll have ten minutes of questions. Please raise your hand if you have a question. You have to use a microphone because of the Webcast. Questions?

**MS. GARRETT:** This always happens after I finish a talk, everybody sits there.

**UNIDENTIFIED WOMAN:** Yeah. It's a pretty broad picture you paint of disaster on the horizon. One country you didn't mention at all specifically and yet I've been hearing a lot of dismal predictions and that is China. Could you elaborate a little bit on some of the same themes and give us some idea of what's happening in the world's most populous country?

**MS. GARRETT:** Thank you for that. China--there are, you know, the UN National Security used the phrase "transparency". That's an important phrase for public health as well. There's two sides to transparency. One is the willingness to let the world know what may be a disease incidence, epidemics and so on inside your borders. The other side is the wherewithal to know yourself. Do you even have a surveillance system?

For most of the world today, the real transparency crisis is the latter. They don't have the resources, they don't have the system in place so they really don't know how bad is anything, how bad is bad. And if a newer disease emerges, they don't spot it until it's well in place.

In the case of China, they claim the opposite. They claim to have a vast infrastructure for recognizing disease in their midst. They claim a sophisticated network out in the rural areas and they also claim vast improvements in public health achieved consistently with no downward trends and nothing worrying going on.

In fact, China is an aging population. Their life expectancies are going up quite strikingly and that is you know, cause for congratulations. On the other hand, they did cover up HIV and they have been lying about it. And I don't think any one of the HIV experts I've spoken to, and later today you should ask Dr. Seth Berkley this question, he's much more familiar in a first hand way with the Chinese situation with AIDS and I'm sure he'll be happy to tell you about it, but I don't think anyone really believes the government's numbers.

UN AIDS has issued their own estimates of China's HIV epidemic. They're about ten times the size China's willing to confess to. And certainly if you even hit only an incidence of 4 or 5 percent HIV in China, it would be of staggering numbers. I don't even want to imagine if China reached the Botswana level epidemic of more than 30 percent of their adult population infected.

Questions?

**MODERATOR:** Yes. Right here.

**UNIDENTIFIED WOMAN:** You've done a great job of laying out the horrible problems and I'm wondering obviously there are no quick fixes, but what would be your prescription or your top five things that you say that need to be done to address these issues? Thanks.

**MS. GARRETT:** Well, there's the domestic and there's the global. Domestically, I wish we could make everybody in the Senate and House, lock them in a room and most of the White House staff, lock them in a room and give them a three day intensive course on public health. They have no idea what they're talking about and the kinds of things they're considering throwing money towards in the long run will do nothing to protect the American people.

I'm very worried that in this atmosphere of fear that we are now experiencing about bioterrorism and concern about what may be the next shoe to drop, reactive measures may be taken that look good in the short term but make no sense in the long run and skew resources in dangerous directions.

I would hope very much that we don't sustain much more time in this country of our public health workers being diverted from their general task of overall disease surveillance, HIV control, monitoring our food supply, etc., etc., to responding to endless anthrax hoaxes and fears.

I recently was speaking to people in the health department from the state of Hawaii. I pick that because it's as far away from ground zero as I could get and be in the United States. Honolulu has been shut down twice due to Hazmat fears of an anthrax release, totally shutting down the economy, everything, just shut down along Waikiki. They've been averaging ten Hazmat calls a day and that's in a state that usually experiences ten a month. And their laboratory capacity is completely overwhelmed.

Meanwhile, an actually valid disease that has visited itself upon Hawaii, Dengue, introduced on September 10<sup>th</sup>, the day before the World Trade Center was hit, Asian mosquitoes carrying Dengue virus hit the Hawaiian Islands - hit Maui, Oahu, and Kauai. And there was nobody answering the phone at the other end at the CDC when the Hawaiian labs were saying, "Send us the reagents quick for diagnosis of Dengue."

So how did they have to do their lab work? They had to ship every lab sample all the way to San Juan, Puerto Rico to the Dengue lab and wait for the answers to come back - this is no way to run a railroad.

We have a system that is thoroughly exhausted. I mean, I'm talking to lab workers who are living in the lab with a cot in the lab, and I'm not just talking about CDC, I'm talking about local, regional, you know, Montana lab workers. The anthrax fear has absolutely exhausted the system. And this is a fear that is not a contagion. Take a look at this, people. Pay attention. I wish we could get the politicians to pay attention. The system was already operating on fumes before anthrax.

In fact, the metaphor I like to use since we've just come out of the World Series, although my Yankees lost, is that we're in a World Series and it's not a 7 game series, it's about a 3,000 game series. And we've got some great players on the field except we have nobody on the bench. And the players on the field are thoroughly exhausted and they're only at game 20. And that's how it feels right now at the basic front line level of the public health infrastructure.

Globally, you know, if you really sit down and look at the kind of money that WHO operates on and the kind of money that UNICEF programs on the ground are operating on, it's laughable, it's truly laughable. And our so called global surveillance for disease boils down to a group of people in Geneva who sit down at nine o'clock in the morning and go through a computer algorithm they created that scans the Internet for news reports in multiple languages of odd disease outbreaks around the world, and then go through a list of phone calls and e-mail messages they have received from various places in the world regarding disease sightings.

That's our global surveillance system. If that's comforting to you, then just fine, you'll be happy with a system that costs about \$1 million a year to run. But I for one take no comfort in that system. And I think if you- unless we can begin to really address what public health is at the grass roots level, at the grass roots of poor countries and the grass roots of our own country, we're vulnerable and we're not in any way in shape to defend ourselves both against a deliberately released microbe or a naturally introduced disease.

**MODERATOR:** Thank you very much. I think we're going to have to move on. I thank you so much for your comments.

I'd like to just now introduce our next speaker who I think is known to everybody here as well and that's Dr. Donald A. Henderson of the School--the Bloomberg School of Public Health at Johns Hopkins. He is university distinguished service professor. As you've heard before from Scott Barrett, he was very much involved in the campaign against smallpox with the World Health Organization before he joined Hopkins. He has been Director of the Center for Civilian Biodefense Studies and the Bloomberg School until three days ago when Secretary Thompson asked him to take over as head of the new Office of Public Health Preparedness.

**DR. DONALD A. HENDERSON:** Thank you very much and may I say it's a pleasure today to speak to the subject of successes and failures of globalization with respect to the infectious diseases. It seems to me I've done little in the last four weeks but talk about anthrax and bioterrorism and what we can do, should do, didn't do, might have done and it's quite a distinct relief to tackle quite another subject at this point.

I do so reluctantly because it's obviously a problem following Laurie Garrett who can paint a remarkable picture in a very short period of time. And secondly, there is the question of how extensively one can talk about globalization or what aspects of it is successes and failures.

And so my thought would be to talk about the subject of eradication and the lessons it brings because indeed we have had identified smallpox as being an extraordinary success - eradication of smallpox. And in some ways we've embarked I think in the global programs on a kind of evangelism about eradication as there's much discussion about eradicating everything from tuberculosis to leprosy. Some have talked about eradicating road accidents, some have talked about eradicating just about everything and I think a little balance is probably needed in this. And so let me talk about some of the implications of the smallpox eradication program, some of the things we learned and what it might mean to other programs.

Now, the eradication of smallpox removed one of the greatest of the pestilences, one of the worst of all the world's plagues hopefully forever. And I say that with some feeling because as you know, at this time there is great concern about once again having smallpox released as a result of progress made and I put that in quotes in the former Soviet Union in weaponizing this virus.

The achievement was an extraordinary cooperative effort and it involved under WHO leadership countries throughout the world. Perhaps as many as 150,000 field staff at various points worked on the program. It demonstrated dramatically the cost benefit ratios that might be achieved with eradication. The total cost of the entire program over 14 years was just under \$100 million in all international contributions combined.

The national investments we estimate to have been about \$200 million, few other countries spending much more than they were doing in control of the disease. But because at the end of 1980 when eradication was declared, we can stop our estimation, we can stop the quarantine measures, the savings now are in the range of somewhat over \$1 billion a year and these continue year after year after year.

Now having said that, what did this have--impact did this have--implications for other global eradication efforts? And in fact, eradication implies the total elimination of the disease in the human population and therefore it is a global effort. It has to be.

So far there have been seven eradication campaigns. And if we see the first slide, I hope we have a new--because I don't think I can talk from yours, Laurie. Maybe we should turn it upside down. It's going to be difficult to--.

**MS. GARRETT:** Well, gee if there's one backwards today, you get them all backwards.

**DR. HENDERSON:** Oh, my. It was my error, that's for sure. You just turn the whole machine upside down.

**MS. GARRETT:** You don't put little dots on them, do you?

**DR. HENDERSON:** No. It makes it more challenging that way.

**MS. GARRETT:** Well, make small talk [inaudible].

**DR. HENDERSON:** I think there are only seven slides so there weren't many to turn upside down.

**MS. GARRETT:** You know you broke the damn thing!

**DR. HENDERSON:** I'd rather do it without slides!

**MODERATOR:** Laurie, let's take the face around on the bottom of the carousel box.

**DR. HENDERSON:** Why don't we dispense with the slides. I didn't think this was high technology, but I guess it--.

All right.

**MODERATOR:** Okay.

**DR. HENDERSON:** I think what many people don't realize is that over the course of the years, there have been indeed seven global eradication programs intended to eradicate infectious diseases. Believe it or not, this began as early as 1909 with hookworm in which the Rockefeller Foundation undertook to do away with hookworm not only in the United States, but they worked in some 54 countries trying to get rid of hookworm using basically sanitation and treatment of people with hookworm.

In 1922, they went back to--they did a study to see how well they'd done in a particular area of Brazil only to find that at the end of the time there was still as many people with hookworm as before, they just had fewer worms and that's about it. At that time, they abandoned it.

And in 1915, again the Rockefeller Foundation launched a global program for yellow fever and it was thought that within five years yellow fever could be eradicated throughout the Americas, that the rest of the world would take just a little longer, and so it started in 1915.

After some 17 years and this was done with vector control I would note, trying to take—reduce the number of *aedes aegypti* mosquitoes, they found that indeed there was a jungle reservoir of yellow fever and that simply eradicating it in the city was not going to be possible. And so that drew to a close in 1932.

Yaws came along and the eradication of Yaws, this is a WHO program in which with the use of Penicillin in treatment of patients with Yaws, it was hoped that we would do away with Yaws in its entirety. What they discovered was that one could certainly treat Yaws with Penicillin. The results were very dramatic but at best, Yaws continued to spread even in spite of the Penicillin. And again, about 1973 the effort failed.

In 1967, actually 1966, the decision was made to do smallpox eradication. And here for the first time, the major method would be a vaccine. That began in 1967. It was hoped that it would end within 10 years and indeed, we missed the target of ten years, but the last case occurred 9 months and 26 days after the tenth year. It was not too far off the mark. And in 1980, it was declared eradicated.

Guineaworm began in 1986 and this involved better water and interruption of transmission of this agent. It's still going on and still we have--we do not have success.

Polio began--polio eradication in 1988, another World Health Organization Program, the two that are in place. That's now in its 13<sup>th</sup> year and heroic efforts are being made now to interrupt transmission of polio. There are many problems in a number of countries of Africa and in South Asia where indeed access to many of the populations is a problem.

Thus we have out of all these only one success so far out of seven efforts. You note that we seem to have a--seems to be a period here where one can go maybe 17-18 years before there seems to be a

fatigue, maybe its of the countries or the donors or what have you, but it seems to terminate somewhere along about the 17<sup>th</sup> or 18<sup>th</sup> year.

There has been only the one success as I noted, but at this time, we should have--we have a number of people speculating that there's a wide variety of diseases that could be eradicated if we had sufficient money and sufficient effort. It's just a matter of raising the funds and going after it.

I would note however, that throughout the entire course of the smallpox eradication campaign, the subject of what next should be eradicated was seldom a topic of discussion by a basically pretty optimistic group that directed the program and knew its problems well.

I think it was clear to all of us that there were many factors that uniquely favored smallpox eradication and contrasted to any other disease, these were very positive ones. Smallpox had a 30 percent case fatality rate, in other words, nearly a third of the patients died. It was in a class by itself as a global health problem.

No other disease had features that made diagnosis surveillance for the disease so easy. Every patient had a rash, which was a perfect and obvious rash. And when we sent new people into the field who hadn't seen a case, we simply said talk to the grandmothers. The grandmothers are very good at identifying smallpox and differentiating it from chicken pox. It was known to the villagers all over.

The next slide. It was an important problem to all countries. The presence of the virus was readily demonstrated. There were no sub-clinical cases so you knew where it was at all times. We could by vaccinating around a case providing if you will a barrier of immunity, you could keep--prevent the disease from spreading and it was a continuing chain of infection that had to be sustained because there was no animal reservoir for it.

Vaccination was effective even when given as much as two to three days after exposure of the individual to the disease. Very different from other diseases where you need vaccination well before exposure, you could vaccinate as much as two to three days after the exposure.

It provided permanent immunity so that we saw--never saw cases, the second cases in an individual. There were no chronic carriers. In other words, once the individual recovered, he was well, he was immune and there were no further infections. It's not like malaria or tuberculosis where individuals can be carriers for long periods of time.

And finally, we had a vaccine which we could buy at that time somewhere around 1 cent to 1-1/2 cents per dose. It was very stable, put in a little vial. We could keep it and did as high as a temperature of 100 degrees Fahrenheit for a month or more in the field and it was still very good. You gave one inoculation and we were to determine in the developing countries that one single inoculation was effective in preventing the disease as much as 20 years later levels of protection of 90 to 95 percent. You couldn't have asked for much more than this.

Now given the fact that all the countries were so deeply concerned about smallpox that all were vaccinating including our own country, vaccinating against smallpox in 1972 despite the fact that it had been 25 years since we'd had a case, all countries were very much afraid of this disease. And one would think that it would have commanded the highest possible political commitment.

However, we had expected voluntary contributions to the program and at the end of our first seven years of existence, we added up what we'd received in cash and it was \$75,000 from all countries combined. That was not 75,000 per year, it was 75,000 in total after all of that time. And this was despite plea after plea after plea to make money available.

We had a number of the endemic countries that had to be cajoled into doing anything at all. In fact they had other problems and the question was what did they do--where did they put their resources. And even though this was a bad disease, were they willing to make that effort to do the eradication.

And more than once during the course of the program, we felt that the success of the program really hung in the balance. It could have gone either way and it had very little to do with what we could do about it. We had in the middle of the program just as we were finishing up the program with smallpox only in Bangladesh that the Sheik Mujibur Rahman, the father of his country, was machined gunned along with his entire family and the country for a time went into civil war. Had it gone on to civil war, smallpox would have erupted again--excuse me, all over Bangladesh and indeed would likely have come back to India.

We had other instances, as we were just finishing the program in Somalia, we had cases and just at the time we still had cases around as a fairly mild smallpox, it was in Ramadan and the Haje had begun and there were people moving to Mecca. And we could just imagine Somalia is very near to Mecca, thousands of Somalians moving and this millions of people--thank you, millions of people in Mecca contracting the disease and the spinning out again all over the world.

So there were a number of issues--a number of times where this came very close to not succeeding. And in fact, I would say that not until we were into the program for some seven years did we finally believe that we actually could achieve eradication. And even this last 12 months of the program, we really wondered if it could happen.

Twenty years ago, I summarized some of these considerations in a forum called the World Health Forum in which I expressed the belief that at least for the next decade I could see no foreseeable candidate for eradication. That was given by the way as an opening address at a new conference on eradication and the--what do we eradicate next was the theme of the symposium. And that was the last time I was invited to one of those symposiums.

Now 20 years later, frankly the situation doesn't look a great deal different to me with a possible exception of polio myelitis which most people have generally considered this to be the most likely candidate for eradication after smallpox. And an intense effort is being made to do this.

Unfortunately however, it's very difficult to tell where polio is. You only have paralysis in 1 patient in 100 who's infected, only 1 of 10 die from the disease. For most of the developing countries, this is not a major problem at all, it's more or less of an incidental problem. The vaccine has to be given in many doses in developing countries, we're talking about 5-6 doses to get effective protection. So it's a much more difficult problem than was smallpox. And yet I think the general consensus is that polio is the next easiest disease to eradicate.

I won't go on to comment about how easy it would be to eradicate tuberculosis or leprosy or goodness knows how many other diseases. Those would be even more difficult.

Thus was the first lesson from the smallpox campaign. Let me see the next slide maybe. Oh. This is the situation now. This is smallpox in 1973 and polio in the year 2000 in which it had been forecast this would be the last year of polio. It is now forecast to be 2002. And as you can see, the area involved, the geographic area isn't as good as it was with smallpox. And at that time we were four years away from the eradication.

To see polio right now to the year 2000-2001, it isn't much changed to anticipate eradication in the year 2002 is totally unrealistic. It's I think possibly 2005, perhaps 2010 but it is not going to happen in 2002.

Thus I feel that instead of indulging in extended discussions about what might be done or might not be done post-eradication which many of our polio colleagues are doing, it would be productive to ascertain whether in the cold, hard light of accumulating experience and technology there are reasonable prospects for the eradication of any other disease within the next 20 years. I don't think the prospects are very good.

Vaccine played an especially critical role in the smallpox program however many other contributing factors there were such as political commitment in the health, transportation and communication infrastructure. A heat stable vaccine of assured potency was far more vital than most people appreciated.

As many of you know, the vaccine was discovered as long ago as 1796. It was the first vaccine we had. It was obtained actually from dairy maid and as you know the story, Edward Jenner took this cowpox lesion from the dairy maid and inoculated little Jimmy Phipps and he was protected when challenged with smallpox - not a test we do today. I think the institutional review boards might have difficulty with that one.

But at any rate, he demonstrated that there was protection against smallpox. From that time until the late 1800's, it was grown on the flank of a calf or it was grown by--I'm sorry, by arm to arm transfer. And only in the latter part of the 19<sup>th</sup> century did we begin to grow it on the flank of a calf so if you scarified the flank of a calf, slathered on some vaccine, it grew for seven days and then you sacrificed the calf, scraped it off, purified it a little bit, put it in a jug and vaccinated people. Fairly crude but it worked.

But it did not hold up very well with the heat. And so as we went on, smallpox continued to spread throughout most of the developing countries although with refrigeration in the industrialized countries, this made a very big difference.

Finally, there were some developments in France and in Holland where they began to dry the vaccine and found that it could hold up with very good temperature--at very high temperature and still produce a protection.

So we see in the next slide, limited global program began and the red countries are those where it was endemic - it was present. The blue ones were where it was imported that year. But you'll see large parts of the world were free of smallpox. It wasn't as though we started with smallpox everywhere. It was not. And what's happened--had happened at that point was that in many of the former French colonies and in some parts of Latin American, they had begun to introduce a good vaccine with no intention of eradicating the disease at all. They didn't talk about it, they just--it worked so well that it was already becoming--these areas were becoming free of the disease.

In other words, it was a pretty basic point that this disease was very susceptible to being eradicated. And I think the point to be made is that technology is necessary. We have to advance the technology sufficiently before we're ready to go with an eradication program or a significant control program. And regrettably and I think Laurie Garrett had made the point, very little money has gone into developing technology for third world problems until very recently when we've had the Gates Foundation, International AIDS initiative and vaccine initiative - we've got a number of things now happening, but it's very recent. We've tended to ignore the problem until very recently.

Now during the course of the campaign we did very little planning for what we would do after eradication was achieved. In fact, not until late 1975 when we had smallpox only in Ethiopia did we begin to look at the question of what should be done to define a strategy post-eradication.

In major part it reflected our belief that the margin for error was pretty small and that unless we devoted all our resources to the goal of interrupting smallpox transmission, there would never be a post-eradication era to worry about. And indeed after we thought we had it pretty well in hand, it escaped us and did go into Somalia and required another year of work before we completed the job.

Now finally in December of 1979, we were two years passed the last cases, a global commission for smallpox eradication wrote its final report and made a whole series of recommendations of what should be done and a committee was constituted which has met every year for approximately the past 20 years overseeing the question of preservation of smallpox virus, question of the vaccine, question of documentation of the program and so forth.

Most of the countries discontinued vaccination by 1982, all of them by 1984. The last country to officially stop vaccination was very interestingly, France which we always found very amusing. A few

countries continued to vaccinate the military but that practice pretty well stopped in 1990, certainly in our own country about that time.

We distributed seed lots of the vaccine to all of the institutes that had produced it in the past to assure that should we ever need vaccinia virus, it would be in many different locations available for use.

We stored vaccine that had been donated to the program in remple [sp] storage in two locations near Geneva and every three years, we would re-tiger it to be sure it was maintaining its potency and it did very well. And we had indeed some 200 million doses of vaccine in cold storage. In fact, it became apparent that the vaccine was pretty much good forever because the tigers were remaining very steady throughout the whole time.

But in 1990, we began to run into a problem. WHO was desperately short of cash. You may recall we had a--President Reagan and a group in the Congress who felt that we would not support the United Nations and so funds were not going to WHO as well as the United Nations. And so the question what do we do about this vaccine because every three years you had to re-tiger the batches of vaccine, you had cost of cold storage and at that time, 1990, we were 12 years, 13 years since the last case.

At that time, our belief was that no one had done any research on this virus at all. We were later to learn that the Russian bioweapons program was continuing its research but that was all. And so we recommended that the vaccine be returned to those who had donated it and so away went the reserve of vaccine and we had some 500,000 doses in stock in Geneva, that's all. Meanwhile, the other countries have pretty well destroyed their vaccine so we had worldwide probably not more than 60-70 million doses of vaccine.

We had a concern about its possible re-introduction from a laboratory or perhaps from one of the bodies frozen in the tundra, something of that sort. There was no animal reservoir and the concern was about laboratories, could it escape from laboratories. In 1975, we undertook a survey to determine which laboratories possessed the virus and we surveyed all countries, some 820 laboratories which are included in the master WHO list of laboratories. We reviewed all the literature up to that time.

And, see the next slide. And--all right. Well, we missed one there. That's all right. So we discovered that indeed there were 75 laboratories that reported holding the virus at that point. We recommended that they all destroy--that they either destroy their batches of virus or transfer them to a WHO reference laboratory.

This did not go down very well. Nobody was very eager about getting rid of the smallpox virus until a couple of events happened. One was that in Germany, there was one laboratory which was doing its best to try to infect chimpanzees with smallpox virus and did succeed but the chimpanzee sort of got away and was seen to be swinging through the park for several days and finally, they nailed him. But this persuaded the German government that maybe that laboratory kept its virus long enough and closed it down.

The second event was in 1978 when one of the British investigators at Birmingham was working with the virus and some of it escaped to a room above the laboratory infecting a woman who subsequently died of smallpox. She infected her mother. Her father died of a heart attack in the middle of this and the investigator himself committed suicide. And it was a real tragedy. But that persuaded a great many countries that it was maybe a good idea to get rid of the smallpox virus. This was probably the most persuasive event of all and with this, we eventually came down to having the virus in just two laboratories.

So this was very successful. There was a question of how do we know that they did transfer the virus. We don't know. Virologists by and large are squirrels and they isolate a virus or a bacteria, they put it in a little vial, put it into a deep freeze and with the thought that later on they may want to retrieve this and look at it, compare it with another specimen.

Well, many of them are not very good librarians for one thing. Many of them have problems with the vials having little labels on them and they keep falling off.

Virologists leave laboratories and there's always a collection of stuff in various deep freezes that nobody sure who belongs to it. And so to try to do a search of all deep freezes to see that all countries had turned in their smallpox virus was not possible. But we did have assurance from all countries that they have done so. We don't know that they all did but we finally wound up with just the two laboratories in Russia and the United States.

In 1994, the committee after having arranged to have the virus sequenced and having developed clone fragment libraries of the virus, having defined the genetic material and after having then consulted with the five major professional organizations about the desirability of destroying the virus and receiving from all of them unanimous agreement that this should be done, it was decided at that time to recommend to the World Health--to the Director General and the World Health Assembly that we destroy the virus. And in fact there had been no research done for something like 12 years and in fact no one had an idea--have any desire to do so.

We later were to learn that the laboratory in Novocibirsk under Dr. Sabikhev [sp] had been involved in doing a great deal of work with smallpox, indeed trying to combine it with Ebola virus to make a new virus which would have certain interesting properties. And he admitted finally that he started work on this in 1996 he but maintained before that that there was nothing going on.

And in fact in 1994, the only stated reason for retaining the virus was a hypothetical one, that perhaps someday someone would wish to undertake some type of research that would require the intact viralla [sp] virus but at this point in time, it was purely a hypothetical idea and so the recommendation made that we should destroy it.

However beginning in 1995, some of our US scientists and some Russian scientists argued that the virus should be retained for research let alone that we haven't been doing research with it and maybe to make an anti-viral drug that could treat smallpox should it arise. All acknowledged that to do so would be

costly and time consuming. Our record of producing anti-viral drugs is not very good, very few anti-viral drugs. And finally our US and Russian officials persuaded the World Health Assembly to defer destruction of the virus until the year 2002.

Meanwhile as you know, we began to be concerned that smallpox might be used as a biological weapon and so we began, in the US, we ordered a year ago 40 million doses of virus.

Now what lessons do we have and let me summarize and conclude by saying first of all - could we see the next slide if we may? That was the laboratories. Next. Okay. That first of all, the eradication of a disease is extremely difficult even when we have highly--and political commitments should be easy because of the severity of the disease, even when the epidemiological characteristics are good.

We found that the health authorities were very receptive to stopping smallpox vaccination and there were some that thought this would be a problem, but it proceeded with no difficulty.

Next slide. The laboratories we found to be generally cooperative in destroying or arranging the transfer of the virus and although the virus destruction was supported by most countries, we've had last minute objections by the US and Russia. But it's now stated that it will be destroyed and this will be the resolution which is in force at the present time in the World Health Assembly at December 31<sup>st</sup>, 2002.

Our other lesson is that a failed eradication can have serious--effort can have serious repercussions on other programs. As we started into the smallpox program, the malaria program was failing. And as the smallpox program was being voted on, about half of the delegates in the Assembly said we really don't believe that eradication is feasible. UNICEF said we put a lot of money into malaria eradication, we will not support this program. They said at the beginning--promised they wouldn't and they did keep their promise. They never gave us a penny.

And there was a great deal of negative feeling, so much negative feeling the decision to eradicate smallpox passed by only two votes in the World Health Assembly. But now we have a situation where there is again enthusiasm about doing all sorts of eradication efforts and so the problem.

Lastly, sustaining interest and support for a special program for long periods especially when transmission has been stopped is extremely difficult and has to be recognized in the planning of the global program. We wanted every country to do intensive surveillance for fully two years after the last case and I can assure you, this is one of the most difficult tasks of all because understandably they're short of personnel, the disease is gone, they "know it's gone". And so why don't we take the people and put them on other things?

And this is the problem that's now being faced with the polio program - how do we maintain, how are we sure that polio is not continuing to spread. And all of the countries wish to transfer people but we still have polio circulating and the potential for importations of polio in the polio free areas remains. And so there's a real struggle going on trying to sustain interest.

Bottom line is an eradication is not a program to be undertaken lightly. And to do so before it is clear that we have the needed technology and before the practicability of eradication has been demonstrated in the field is really to invite a very costly failure and more important, a real loss of professional public health and medical credibility.

Today, some question whether even the smallpox eradication program was a positive value. I mean, after all here we are, we're back and worrying about smallpox again. We're producing now a lot of smallpox vaccines although we do not advocate its use. But I think I would say I believe it was a good investment.

The fact that we are now obliged to undertake an heroic effort to establish the vaccine stockpile is counterbalanced by the fact that if smallpox had continued as it was in 1967, we would in the interim have had not less than 300 million cases and 60 million deaths.

This is a disease about which we need to be concerned. It was the worst of the world's pestilences. To see it return would be a great tragedy. On the other hand, I think as Laurie Garrett has pointed out, there are a lot of things we need to do in a lot of different diseases. We don't need to eradicate them but we certainly can do an awfully lot about controlling them and we don't need to distort what we're doing with another eradication effort.

Thank you.

**MODERATOR:** Thank you very much. We have about 15 minutes and Laurie, microphone please so that we can get the Webcast and hear what you're saying.

**UNIDENTIFIED WOMAN:** First a quick clarification please, and then a thoughtful question I hope. The clarification, when you were speaking about the Vector work on the kinera [sp] smallpox and Ebola, you said 1996. Did you mean '96 or '86 that they were doing--.

**DR. HENDERSON:** That they were working on it?

**UNIDENTIFIED WOMAN:** Yeah.

**DR. HENDERSON:** It was early 90's.

**UNIDENTIFIED WOMAN:** You said 1996, supposedly they stopped everything in '92.

**DR. HENDERSON:** No. I'm sorry. We received from that laboratory a very lengthy document explaining how they didn't have any smallpox research going on until 1996 which indeed we did know they had it. We discovered by inspections teams that it was, that it was going on in this laboratory.

**UNIDENTIFIED WOMAN:** So '96 at Vector, they were still trying to make an Ebola smallpox kinera?

**DR. HENDERSON:** No. We're mixing things up here.

**UNIDENTIFIED WOMAN:** That's what I'm asking about. You said '96.

**DR. HENDERSON:** The information from the early 90's and this is from Ken Halibek and from others and from the director of the lab is that they did work with Ebola virus and to see what they could do in combining that with smallpox. And that was going on right on through from 19--they were doing a lot of work on the smallpox virus in 1980 right on up till now. When they did the Ebola virus work I think is the early 90's.

However, just to indicate we have a certain amount of duplicity here, we received in WHO a great thick paper explicitly telling us that--by the director of the Vector laboratory that they didn't have the smallpox virus until 1996 and were doing no research on it whatsoever. And we all looked at it, rolled our eyes, and sort of smiled as he presented it. But he presented it as though this was real fact. So I think it's only to illustrate that today, we have--we do not have confidence that the Russians are not at this time proceeding with research on biological weapons.

**UNIDENTIFIED WOMAN:** Well, my other question is right now there is a sort of competition under way among molecular biologists to see who's going to be the first guy to make a completely artificially generated microbe starting from nucleotide by nucleotide. And certainly the technology is there. There's also several groups working on artificial chromosomes and again the technology is there. It's just a few leaps and bounds and it will be achieved.

Since we already have the sequences for at least a couple of smallpox strains and probably within a year or two we'll have sequenced most of the primary strains that we know of, doesn't it sort of become a mute point whether or not we destroy the virus stocks in that anybody who's really motivated probably within two or three years will be able to construct a smallpox virus nucleotide by nucleotide?

**DR. HENDERSON:** Point well taken and I think the feeling is that in theory knowing the nucleotide sequences is fully mapped, that one should be able to recreate it, that's quite correct. Still in all, I think the general feeling, the feeling of many of us is that to put the maximum pressure on all laboratories, countries, scientists to destroy the virus at least will hopefully the decrease the likelihood that it would be released.

More than that, that it would--by putting the pressure on, it would at least mitigate the likelihood of a release and certainly it would make it harder for the ordinary terrorist to get a hold of it. And certainly the likelihood that a terrorist group is going to be able to reconstruct a virus like this as complicated as smallpox I think is a very long shot.

So it's one more step. There are no guarantees here at all. But it's only the thought that we would at least decrease the likelihood of problems eventually.

**MODERATOR:** Thank you. Yes, in the back.

**UNIDENTIFIED WOMAN:** You said last year you ordered 40 million doses of the virus. How readily would those be activated? I'm not--I don't have a scientific background about this stuff, but if there were to be an outbreak of smallpox, if it did take the route of the anthrax route, what would you recommend in terms of all those viruses--the 40 million cases that are available.

And if you could just expand a little bit on what you said before, if Russia and the US are the only two labs that have this virus, how easy do you think it would be for terrorists to get their hands on something like this?

**DR. HENDERSON:** Two parts to it. First of all, the vaccine is a totally different virus than the disease virus. In other words, we have measles vaccine which is a derivative of the wild strain, we have polio vaccine which is the a derivative of the wild strain. The smallpox vaccine is very different. We think it's a derivative of cowpox and so it's a cousin of smallpox but you don't need the smallpox to generate it.

The vaccine, we have at present 15 million doses roughly in the United States. They're left over from 1975 but they're a good tiger. They've just been re-triggered and they're in good shape. We probably could dilute that vaccine and studies are under way right now to demonstrate that so that we probably could vaccinate between 50 and 70 million people were we at this point to require it. 40 million doses was ordered a year ago and that will begin to be delivered early in the coming year. Negotiations are just being completed for the purchase of 250 million more doses to be delivered by the end of next year and they will be coming in gradually during the year.

I think the concern that we have, that other countries have, we've met with a number of them just in the last couple of weeks, is that a smallpox outbreak anywhere in the world is an international--potentially an international catastrophe and that we need to be able to move quickly to deal with it.

So that we are anticipating having quite a large amount of vaccine in the US, certain other countries are also producing it - probably Brazil and Mexico will in the Americas and there are several European countries doing this. The Japanese are also producing vaccine again. And so that would be the type of--what we're looking at with regard to the vaccine.

Your second question, I'm--.

**MODERATOR:** The probability of the terrorists getting it.

**DR. HENDERSON:** The probability of the terrorists getting it, our concern with regard to virus getting out primarily relates to Russia. The Russian centers, particularly this one at Vector and Novocibirsk undertook to weaponize smallpox, that is to put it in a form that it could be put into intercontinental ballistic missiles, fired with reentry warheads that would break up and make little melon-

like balls which would contain smallpox virus which as they got near the ground would begin spinning and produce an aerosol of smallpox. And they were successful in doing that.

They also developed a way to produce smallpox in very large scales so that they developed a production line and facilities to produce between 80 and 100 tons of smallpox virus in a year. That facility is at Sergiyev Pasad outside of Moscow. It is under the Ministry of Defense. It is a secret facility never seen by anybody from outside Russia and not many from there.

The concern is that there are many of the Russian scientists are not being paid at all well. Most of the laboratories are about half staffed or less. Their people are--many of the scientists are really quite desperate for money and families are not being fed.

And so there has been a number of these people have recruited for other countries, we know that. Whether they've taken material with them, we don't know. It's very hard to tell. And certainly we know of numbers being in North Korea, Iraq, Iran, Syria, Libya. Iran has been most recently the most active in recruiting so that is the likely place. If material is going to get out, I think it's more likely it's going to come from that source rather than from terrorists breaking into a place to obtain it. But that's a very great worry.

**MODERATOR:** We have a question here.

**UNIDENTIFIED MAN:** D.A., thank you very much and I realize that you've only been at your new job for two or three days now and of course you've mastered it and can tell us all about it. But if you can say anything about what you're planning on doing, I'd be interested in hearing that, I'm sure the audience would. But even if you can't, one specific question which is is the vision of this new Office of Public Health Preparedness to include the international sector as well or is it purely a domestic based program? I know you personally believe and understand the linkage between those two, but is that something that's being seen because traditionally the US has not seen the linkage between the two and I think as Gloria has said over and over, that has been to our peril.

**DR. HENDERSON:** The intent of the office is to bring together and under one head all activities pertaining to bioterrorism in the Department of Health and Human Services so certainly this is of interest also to state department and others. But I think the concern we have is an international one and must be an international one because this is a problem which is a real concern to everybody. And the production of anthrax, the production of smallpox for example, we as well as all other countries are concerned about this and what we do about it. So yes, the intent will be to incorporate a concern there.

I should say our major thrust is--I've been talking or testified a number of times in the Congress, I think our most important steps to take relate to strengthening our public health infrastructure. That is key. And to hear senators and congressmen actually talking about this, as Laurie said, this is a new phrase that I had not heard from them before. But that's the strength in that.

We need to have--our hospitals are really in difficult straits because they're running at occupancies close to 100 percent. They have very little surge capacity to take care of patients and there's very little planning among hospitals to work together. They're all competitive entities which makes it even more difficult to work with this.

We do need to have hospital planning and regionally hospital planning. We need to have the emergency rooms where serious patients are going to be taken. The docs there are to be aware of what might happen who are and then in contact with local health officials with 24 hours a day, 7 days a week access which is very unusual in public health in most health offices today or was until just the last few months. And they in turn in contact with the state health officials for with an ability to respond and develop a laboratory network developed which is now well advanced so that we can run specimens very quickly.

So this is kind of a basic structure. We see stocking the smallpox vaccine. We see stocking drugs to treat anthrax in particular. With sufficient drugs to deal with the anthrax in a preventive mode, we will have enough to deal with the other diseases of plague or Tuleremia. Drugs are interchangeable. And then we do need yet a great deal of education and we need a great deal better communication of the public and we're working on both of those things now.

So that's about where we are at the moment. We expect to see rather substantial support for both hospitals and public health infrastructure from legislation--appropriation legislation before the Congress.

**MODERATOR:** We have a lot more questions but no more time unfortunately. I'd like to ask before we break, Professor Barrett to give us an update on the program and where we're going to be going next.

**PROFESSOR BARRETT:** Thank you very much. Due to scheduling confusion, I'm afraid we're going to have to do a slight reshuffling. So the next session which begins at eleven o'clock and which will be chaired by my colleague Frank Fukuyama, the speakers will be Dr. Seth Berkley from International AIDS Vaccine Initiative and Jeff Sachs of Harvard University. And then after lunch, the session beginning at 1:45 which I'll be chairing, the speakers will be David Fidler from Indiana School of Law and Klaus Leisinger of the Novartis Foundation.

So with that, let's thank Dr. Henderson again and then take a brief coffee break. Thank you very much.

END

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