

- National Symposium – Opening session

I am

It is a pleasure to welcome all of you on behalf of the sponsors of this symposium – the Johns Hopkins Center for Civilian Biodefense Studies, the Department of Health and Human Services, the Infectious Diseases Society of American and the American Society for Microbiology as well as the **12** cosponsors as listed in your program. This is the first national symposium on civilian bioterrorism whose intended audience is primarily public health and medical professionals. With the many developments in the field, it would now seem likely that an annual national meeting may well be warranted.

Why this symposium? Its provenance was a growing conviction in this and a number of other countries that the risk of a bioterrorist event has significantly increased but questions as to the real risks have largely remained unaddressed and, no less, there has been little consensus as to what should be done either in prevention or response. It was during attendance at several ostensible training sessions that several of us, both from academia and government, concluded that there was a desperate need for expert input from those whose training and experience has been in the realm of treating disease and coping with challenges to the public health. From that group came the planning committee for this conference. Their names are listed in your program.

Until recently, bioterrorism as a serious subject of study has been primarily the province of national security experts, law enforcement professionals and the

military. But bioterrorism, especially in a civilian setting, differs fundamentally from other national security threats in that the result of an attack using bioweapons will be an epidemic. It will not be over in a matter of minutes or a few hours as would be the case with a chemical or explosive event. The suffering and deaths will continue for weeks, perhaps months. The first responders to an epidemic will not be the police or the firefighters or the FBI or the National Guard. They will be physicians and nurses. And the institutions that will have to manage the aftermath of the attack and to assume responsibility for limiting the carnage and preventing additional deaths will not be our armed services, but hospitals, clinics and public health departments. To date, such groups have had little involvement in any strategic planning exercises.

Now, some of you may well be skeptical as to the real risks involved. Why spend time worrying about or preparing for a bioterrorist attack? After all, we've never experienced a serious incident. Is there more to the publicized fears of bioterrorism than science fiction? Is there really anything that can be done in the face of such a threat

I am hopeful that many of your questions will be answered, at least in part, over the next two days. For myself, events and revelations over the past 3 to 4 years have been transforming. Quite specifically, where once I believed the catastrophic devastation of smallpox to have been consigned to history. I regret to say that, in my assessment, this looms before us, once again, as a major threat, now joined by such as anthrax and plague. In my view, to remain unprepared is to invite disaster.

The primary purpose of these two days is to engage you in the medical and public health communities in a serious, in-depth discussion of the realities of a bioterrorist attack of modest, not catastrophic size. Based on a better understanding of the complex problems posed and of the array of challenges and alternative directions, we would hope that a framework for planning and problem solving might emerge.

It is critical that decisions about the country's response to the threat be grounded in fact, that plans be based on a realistic appraisal of the possible and the feasible and the needed. They must be based in good science and grounded in sound public health. Hard judgements about priorities and tradeoffs among competing goals and issues must be weighed in light of other compelling agendas and health needs. In brief, those of us in the health professions and medical sciences must take the lead role in shaping future plans and responses..

I would note, parenthetically, that plans for this meeting did not begin to evolve until last autumn. With comparatively short notice and a topic alien to the understanding of most, there was doubt expressed that as many as 200 or 300 persons would be likely to attend. Plans were eventually made to accommodate as many as 950 but none expected that we would begin to approach that number. Two weeks ago we had to close registration and we are doing our best to accommodate a response, a demand for attendance that has proved overwhelming. Please bear with us. You should know, however, that the proceedings will be published in the journal, *Emerging Infections*, and will be net

cast from the Johns Hopkins Infectious Disease Web site beginning about 1 March.

This morning, a number who have long been students of the threats of terrorism will describe for you the many changes which have taken place over recent years in the perception of the risk of a bioterrorist attack. They will focus primarily on revelations of activities in Russia and Iraq and the emergence of the threat of religious extremists such as the Japanese religious cult, Aum Shinrikyo.

The afternoon panel will discuss which of an almost infinite possible list of agents are the ones of greatest concern, agents that could seriously tax the medical and civil structure of a major city. Two, in particular, commend special attention – anthrax and smallpox – which, for reasons you will hear, are in a class by themselves.

Congress has played an interested and vital role in providing needed funds to deal with counter terrorism. Wrapping up this afternoon's session is Mr. Anthony Mc Cann, staff director of the Subcommittee on Labor, Health and Human Services of the House Appropriations Committee. He will provide a veteran's view from Congress. Tonight at dinner, we are privileged to have as our speaker, Richard Clark of the National Security Council, the National Coordinator for Counter terrorism programs.

Tomorrow at lunch will be an exploration of the scientific and regulatory issues pertaining to the development of new and improved vaccines as weapons in prevention.

Finally, a word about tomorrow's program. What has been all too apparent to those of us working in this field is that, amongst those now working in the field of counter terrorism, there is an all but total lack of understanding of the implications of serious epidemic disease in the civilian sector. In some ways, this is not surprising. Over the past 50 years there have been few major disease epidemics that have seriously taxed our national or local medical and public health infrastructure. In this country we would need to go back at least to the 1918 Swine influenza epidemic to identify an event which had an impact on the population similar to that of a modest-sized bioterrorist event. Thus, it was the view of the planning committee that we should tomorrow take a somewhat unconventional approach for a conference and undertake, with panel discussions, a step by step exploration of the development of a hypothetical epidemic. The plan includes a round table discussion involving key players from different sectors to explore what should be done and how and when and why and to offer an appraisal as to where we stand today in preparation, and what we now need to do. We hope that you will find it as illuminating as it was to those who crafted it.

This morning, to lead off the symposium, we are especially honored and privileged to have with us Dr. Donna Shalala, Secretary of the Department of Health and Human Services, which, with new funding provided by the Congress this year, has assumed a lead role in grappling with this knotty problem.

It is now my pleasure to introduce to you the Chairman of this morning's session, a member of the symposium planning group, a senior fellow at the Potomac Institute for Policy Studies and a long time student of terrorist issues. I

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National Symposium on Bioterrorism

Intro to Second Day

During the past three years, I have been asked to participate in a substantial number of conferences and planning sessions dealing with bioterrorism. Participants have primarily included traditional first responders (police, fire, emergency medical specialists, FBI), those concerned with arms control and the Biological Weapons Convention, members of the defense and intelligence communities and equipment producers. Occasionally, there has been a physician from the Defense Department or one trained in emergency medicine. Seldom have any been in attendance who would bear primary responsibility in the civilian sector for detection and identification of an outbreak of disease, for taking necessary measures to treat patients, for containing the spread of the disease, for communicating the nature of the problem and what needs to be done to policy makers and the public. Specifically, I am referring to local, state and federal public health staff, to infectious disease specialists, to hospital epidemiologists, to emergency room nurses and physicians and to the relevant scientific research community.

Today, a step-by-step scenario of a fictional smallpox epidemic will be laid out for you by Dr. Tara O'Toole. It was the hope of the planning committee that by walking through the stages in evolution of a modest sized epidemic, you would all gain a greater appreciation for the diverse array of problems which you might face, problems which extend far beyond the care and treatment of patients.

As I have described, smallpox is one of the most deadly organisms that could be used by bioterrorist, but it is not readily available. Indeed, an international black market is effectively the only route for acquiring the smallpox virus. Thus, it is felt that only a terrorist supported by the resources of a rogue state should be able to procure and deploy smallpox as a weapon. However, potential terrorist groups to do just this, are extant today.

Today's narrative is not intended to be sensational, nor is it a model description for the medical and public health response. Rather, it is a deliberate effort to present a plausible scenario as to what might happen if a small number of persons were to be infected today in the open, high mobile, urban population of modern America. It is based on our existing knowledge of smallpox, historic lessons regarding social reactions to epidemics and our speculation as to how contemporary institutions might be likely to respond.

It is not proposed to offer definitive answers to the many questions that will arise. Rather, it is expected that today's dialogue will, first of all, convey a vivid sense of the complexity of the issues at hand. It is hoped that the discussions will both delineate and raise questions about the respective roles, authorities, expertise and points of view among the various participants who would be called upon to respond. Finally, it is hoped that this exchange will highlight questions and issues that would benefit from further exploration.

The fictional narrative will be presented by Dr. O'Toole, its lead author, in four sections that develop chronologically. Successive panels will respond to events as though they were actual participants in management of the epidemic.

Panelists have been asked to accept the facts of the scenario at face value and to respond as tho this were a live event with lives were imminently at stake.

Today's interactions are unrehearsed. The panelists have seen all but the finale to the scenario and were provided with a few general questions to ponder. Otherwise, they will be interacting spontaneously, hopefully with the passion many have displayed in discussing these matters in other settings.

At the end of the second panel discussion, there will be an opportunity for questions from the audience. At the conclusion, there will again be at least a brief opportunity for further comment and questions from the audience.

Microphones are distributed throughout the hall for this purpose.

We are extremely pleased today to have as our moderator, the highly respected, medical news director for ABC, Mr. George Strait.

With this introduction, let me introduce to you my associate at the Hopkins Center for Civilian Biodefense, Dr Tara O'Toole, Dr. O'Toole, who is a physician trained in internal medicine and occupational and environmental health , has spent a good portion of her career thinking about the public health implications of weapons of mass destruction. From 1993 through 1997, Dr. O'Toole served as Assistant Secretary of Energy for Environment , Safety and Health, and as such was the chief medical officer of the US nuclear weapons complex.

Smallpox: Clinical and Epidemiological Features

More than 20 years have now elapsed since the last cases of smallpox occurred in Ethiopia, bringing an end to a disease that is known to have plagued mankind since the time of the pharaohs. With the passage of time and the cessation of vaccination, many have consigned smallpox to memory, only one in a collection of tropical diseases of little concern or interest to the industrialized world. We forget that smallpox was feared world-wide as no other disease. Until eradication, every country sustained vaccination programs; quarantine officers demanded that travelers produce a vaccination certificate attesting to having been successfully vaccinated within the preceding three years. Some countries, including Britain and Germany maintained fully equipped smallpox hospitals through the 1970s, to be opened only if cases were introduced into the country. Deities specifically for smallpox were a unique part of the culture in parts of Africa and Asia. In the United States, vaccination against smallpox was compulsory at school entry. *The only cases were in 1949.*

There were good reasons for this universal fear of smallpox. The case-fatality rate among the unvaccinated was 30%; there was and is no treatment. Those who recovered were extensively scarred and many were left blind.

This afternoon, I would like to provide to you an overview of the principal clinical and epidemiological characteristics of the disease. These will be translated into more specific meaning in the context of the scenario tomorrow.

Smallpox is a viral disease unique to man. To sustain itself, it must pass from person to person in a continuing chain of infection. It is spread by inhalation of air droplets or aerosols. Twelve to 14 days after infection, the patient typically develops a high fever, severe aching pains and prostration, usually causing him to take to bed. **(SLIDES 1, 2, 3)** Some 2 to 3 days later, a papular rash develops over the face and spreads to the extremities. The lesions over the trunk are usually less dense than on the face and limbs. **(SLIDE 4)** The rash soon becomes vesicular and later, pustular. The patient remains febrile throughout the evolution of the rash and customarily experiences considerable pain as the pustules grow and expand. Gradually, scabs form which eventually separate leaving pitted scars. Death usually occurs during the second week.

The disease most commonly confused with smallpox is chickenpox and, indeed, during the first 2 to 3 days of rash, it may be all but impossible to distinguish between the two. However, all the smallpox lesions develop at the same pace and, on any part of the body, appear identical. **(SLIDE 5)** Chickenpox lesions are much more superficial and develop in crops. **(SLIDE 6)** With chickenpox, scabs, vesicles and pustules may be seen simultaneously on adjacent areas of skin. Moreover, the rash in chickenpox is more dense over the trunk, the reverse of smallpox, and chickenpox lesions are almost never found on the palms or soles.

Some 5 to 10% of smallpox patients experience more rapidly progressive, malignant disease which is almost always fatal within a period of 5 to 7 days. In such patients, the lesions are so densely confluent that the skin looks like crepe

rubber; **(SLIDE 7)** some victims exhibit bleeding into the skin and intestinal tract. Such cases are difficult to diagnose but they are exceedingly infectious.

Smallpox spreads most readily during the cool, dry winter months but can be transmitted in any climate and in any part of the world.

The only weapons for combating smallpox are vaccination and patient isolation to prevent further spread of the disease. Successful vaccination before exposure or within 2-3 days after exposure affords almost complete protection against disease. However, vaccination as late as 4-5 days after exposure may protect against a fatal outcome. Because smallpox can only be transmitted from the time of the earliest appearance of rash, early detection of cases and the prompt vaccination of all contacts is especially important in control.

Some have questioned whether we should reinstitute routine vaccination or at least vaccination of health care personnel. It is important to recall that smallpox vaccination is associated with some risk of adverse reactions and thus in deciding how extensively vaccine should be given, it is necessary to weigh the risk of becoming infected with smallpox against the risk of vaccination. The two most serious complications of smallpox vaccination are post-vaccinal encephalitis and progressive vaccinia. Post vaccinal encephalitis occurs at a rate of 3 per million primary vaccinees; 40% of the cases are fatal and some are left with permanent neurological damage. **(SLIDE 8)** Progressive vaccinia occurs among those who are immunosuppressed whether due to a congenital defect, malignancy, radiation therapy or AIDS. The vaccinia virus simply continues to grow and unless these patients are treated with vaccinia immune

globulin, they may not recover. **(SLIDE 9)** Pustular material from the vaccination site may also be transferred to other parts of the body, sometimes with serious results.

At this time, routine vaccination is not recommended for any persons except laboratory staff who may be exposed to one of the orthopoxviruses. There are two reasons for this. First, is the risk of complications. Second the U.S. national vaccine stocks are sufficient to immunize only 6-7 million persons. This amount is only marginally sufficient for emergency needs. Plans are now being made to expand this reserve. However, even with priority effort, at least 36 months will be required before large quantities can be produced.

The potential of smallpox as a biological weapon is most dramatically illustrated by two European smallpox outbreaks which occurred in the 1970s. They were among the last in Europe. The first occurred in Meschede Germany in 1970 . That year, a German electrician returning from Pakistan became ill with high fever and diarrhea. He was admitted to a local hospital and was isolated in a separate room on the ground floor because it was feared he might have typhoid fever. He had contact with only two nurses. **(SLIDE 10)** Three days later, a rash developed, and on the fifth day, the diagnosis of smallpox was confirmed. He was immediately transported to one of Germany's special isolation hospitals, and more than 100,000 persons were promptly vaccinated. Hospital patients and staff were quarantined for 4 weeks and were vaccinated; very ill patients received vaccinia-immune globulin first. However, the smallpox patient

had had a cough, a symptom seldom seen with smallpox. Coughing produces a small particle aerosol similar to that which would be generated as a terrorist weapon. **(SLIDE 11, 12)** Subsequently, 19 cases occurred in the hospital, including four in other rooms on the patient's floor, 8 on the floor above, and 9 on the third floor. One of the cases was a visitor who had spent fewer than 15 minutes in the hospital and had only briefly opened a corridor door, easily 30 feet from the patient's room to ask directions. **(SLIDE 13)** This is a picture of one of the cases.)What was apparent from this outbreak is that smallpox virus in an aerosol suspension can spread widely and infect at very low doses.

An outbreak in Yugoslavia in February 1972 illustrates the havoc created even by a small number of cases. Prior to this outbreak, Yugoslavia's had not experienced a case of smallpox since 1927. Nevertheless, Yugoslavia, like most countries, had continued population wide vaccination to protect against imported cases. In 1972, a returning pilgrim became ill with an undiagnosed febrile disease. Friends and relatives visited from a number of different areas; 2 weeks later, 11 of them became ill with high fever and rash. **(SLIDE 15)**. The patients were not aware of each other's illnesses, and their physicians (few of whom had ever seen a case of smallpox) failed to make a correct diagnosis.

One of the 11 patients was a 30 year-old teacher who quickly became critically ill with the hemorrhagic form of smallpox, a form not readily diagnosed even by experts. The teacher was first given penicillin at a local clinic, but as he became increasingly ill, he was transferred to a dermatology ward in a city hospital, then to a similar ward in the capital city, and finally to a critical care unit

because he was bleeding profusely and in shock. He died before a diagnosis was made. He was buried 2 days before the first case of smallpox was recognized.

The first cases were correctly diagnosed 4 weeks after the first patient became ill, but by then, 150 persons were known to have been infected and it was feared that there might be more, as yet unreported. Of the cases, 38 (including two physicians, two nurses and four other hospital staff) were infected by the young teacher. The cases occurred in widely separated parts of the country.

Health authorities saw no option but to launch a nationwide vaccination campaign. **(SLIDE 17)** Mass vaccination clinics were held, and checkpoints along roads were established to examine vaccination certificates. Twenty million persons were vaccinated. Hotels and residential apartments were taken over, cordoned off by the military and all known contacts of cases were forced into these centers under military guard. Some 10,000 persons spent 2 weeks or more in isolation. Meanwhile, neighboring countries closed their borders. **Nine weeks** after the first patient became ill, the outbreak stopped. In all, 175 patients contracted smallpox and 35 died. Please bear in mind -- this was not a large epidemic.

It is notable that, despite routine vaccination in Yugoslavia, the first case resulted in 11 others; those 11, on average, each infected 13 more. Our first reaction on review of this outbreak was that the spread was unusually explosive. However, on examining other outbreaks occurring in Europe from 1958 onwards, it was clear that such explosive spread was not unusual during the seasonal

period of high transmission, i.e. December through April. One can only speculate on the probable rapidity of spread of the smallpox virus in a population such as our own where none under age 25 have ever been vaccinated and where older persons have little remaining residual immunity.

Where might the virus come from? At one time, it was believed that the smallpox virus was restricted to only two high security laboratories, one at CDC in Atlanta and one in Russia. By resolution of the 1996 World Health Assembly, those stocks are slated to be destroyed at the end of June this year. The desirability of such an action was reaffirmed by a WHO Expert Committee just last month. I strongly support that action as at least one step to limit the risk of smallpox reemerging. Unfortunately, it would appear that there are other laboratories with the virus in Russia and perhaps in other countries despite widespread acceptance of the 1972 Bioweapons Convention Treaty which called for all countries to destroy their stocks of bioweapons and to cease all research on offensive weapons. Iraq and the Soviet Union were signatories to the Convention as was the U.S. However, as reported to us by the former Deputy Director of the Russian Bioweapons Program, officials of the former Soviet Union took cognizance of the world's decision, in 1980, to cease smallpox vaccination and, in the atmosphere of the cold war, they embarked on an ambitious plan to produce smallpox virus in large quantities and to weaponize it. In this, they were successful. At least two other laboratories in the former Soviet Union are now reported to have smallpox virus and one is said to have a capacity to produce the virus in ton quantities at least monthly. More over, there is serious concern

that Russian biologists, like physicists and chemists, may have left Russia to sell their services to rogue governments.

Smallpox is rated among the most dangerous of all potential biological weapons with far reaching ramifications. It is a disease to be respected as the scenario tomorrow will more vividly depict. The release of virus into the general population would certainly rate as one of the most serious crimes against humanity. Unfortunately, that is today a possible scenario.

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CENTER FOR CIVILIAN BIODEFENSE STUDIES



SMALLPOX: A POSSIBLE CASE HISTORY

Presented at the
National Symposium on Medical and Public Health Response to Bioterrorism
February 17, 1999

Presenter:

Tara O'Toole

Moderator:

George Strait

Panelists:

Michael Ascher
John G. Bartlett
Robert M. Blitzer
Arne H. Carlson
Robert DeMartino
Julie L. Gerberding
Jerome H. Hauer
D.A. Henderson
Robert F. Knouss
Scott R. Lilibridge
Gregory Moran
Terry O'Brien
Michael T. Osterholm
Trish Perl
Joanne Rodgers

SMALLPOX SCENARIO
For the National Symposium, February 16-17, 1999

Prologue

Smallpox is among the most deadly organisms that might be used by bioterrorists, but it is also (presumably) not widely available. Indeed, the international blackmarket trade in weapons of mass destruction is probably the only means of acquiring smallpox virus. Thus, it is thought that only a terrorist supported by the resources of a rogue state would be able to procure and deploy smallpox as a weapon.

Today's narrative is not designed to be sensational, nor is it intended to be a model description of a medical or public health response to a bioterrorist attack. We have tried to present a picture of what might happen if a small number of persons were to be infected in the open, rapidly paced, highly mobile, urban population of modern America.

Our aim was to craft a plausible scenario, based on existing scientific knowledge of smallpox, historic lessons regarding social reactions to epidemics, and our understanding of contemporary agencies and institutions in the United States likely to respond to an intentional epidemic.

We do not propose to offer definitive answers to the many questions that are likely to arise should a bioterrorism attack occur. Rather, we expect that today's dialogue will, first of all, convey a vivid sense of the complexity of the issues at hand. In addition, we hope that panel discussions will promote a better understanding of the respective roles, authorities, expertise and points of view among some of the diverse participants who would be called upon to respond to a bioterrorist attack. Finally, it is our hope that this exchange will identify questions and issues that might benefit from further thought and effort on the part of medical and public health practitioners and their professional communities.

We will proceed as follows.

Dr O'Toole will read from a fictional narrative describing a bioterrorist attack using smallpox. As the story proceeds chronologically, she will stop at four points, and successive panels will respond to events as though they were actually participants in the management of the epidemic. We are asking panelists to accept the "facts" of the scenario at face value, and to act as if lives are at stake when interacting with one another and stating their positions.

Today's interactions are unrehearsed. The panelists have seen all but the finale to the scenario, and were provided with a few general questions to ponder, but otherwise will be interacting spontaneously, hopefully with some of the passion many have displayed in discussing these matters in other settings.

There are some changes from your printed programs. At the end of panel discussion number 2 members of the audience will have an opportunity - unfortunately a brief opportunity - to comment and ask questions. Following the fourth and final panel, Dr. O'Toole will read the conclusion to the story and the audience will again have a chance to ask questions and comment. Microphones will be available throughout the hall for this purpose.

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We are pleased to have George Strait serve as moderator. His role is to keep the discussion moving, provocative and non-violent, and we are grateful for his generosity in being here today.

PANEL 1 - THREAT INTELLIGENCE AND DIAGNOSIS OF SMALLPOX

Issues:

- Communication among law enforcement agencies and health community
- How to make clinical and lab diagnosis of smallpox
- Initial hospital response

Panelists:

Ascher
Bartlett
Blitzer
Carleson
Gerberding
Hauer
Moran
Osterholm

- o Diag moves too early
 - o Hospital panic & departure of patients
 - o Keep environment / vertical to state /
 - o Don't keep people in hospital.
- Need for medical & pub communities to join and plan.

April 1

The Vice President visits Northeast, a city of 2.5 million people. There are several public events on his itinerary, including attendance at an awards ceremony, an appearance at a local magnet school, and delivery of a major speech in the University auditorium where the largest crowd, about 1000 people including students and members of the general public, is gathered. Hundreds more wait outside, where the Vice President stops to shake hands and respond to queries from the media.

The FBI has information suggesting a possible threat against the Vice President from a terrorist group with suspected links to a rogue state. This group is known to have made inquiries about acquiring biological pathogens, including smallpox, and is suspected of having procured aerosolization equipment. The FBI decides its information is too vague and too sensitive to pass on to federal or state health officials or local law enforcement authorities.

April 12

A 20-year-old female university student presents at the University Hospital emergency room with fever and severe muscle aches. She is pale, has a temperature of 103, and is slightly leukopenic, but her physical exam and lab results are otherwise normal. She is presumed to have a viral infection and is sent home with instructions to drink fluids and take aspirin or ibuprofen for muscle aches.

Later that day, a 40-year-old electrician presents with severe lower backache, headache, shaking chills, and vomiting. He appears pale, has a temperature of 102, and has an erythematous rash on his face. The patient is a native of Puerto Rico where he visited 10 days earlier. A diagnosis of dengue fever is considered and the patient is discharged with ibuprofen and instructions to drink fluids.

April 13

Over the course of the day, four young adults in their 20s come to University Hospital emergency room with influenza-like symptoms and are sent home.

April 14

The female student returns to the emergency room after collapsing in class. She now has red, vesicular rash on her face and arms. The patient appears acutely ill. Her temperature is 102; her blood pressure is normal. She is admitted to a private room with contact isolation with presumptive diagnosis of adult chickenpox. She has had no contact with other known cases of chickenpox.

At 10:00 P.M.
~~April 14~~

The electrician first seen on April 12, returns to the emergency room by ambulance. He too has a vesicular rash, and appears very ill. He is admitted to an isolation room with presumptive diagnosis of chickenpox.

6:00 PM

The infectious disease specialist has just finished examining the student and the electrician. Both patients now have vesicular rash on their face, arms, hands and feet. Each patient's skin lesions are evolving in phase.

The infectious disease consultant meets the hospital epidemiologist on the elevator. During their conversation, the possibility that the patients have smallpox is raised. Both physicians become increasingly alarmed as they consider the likelihood of this diagnosis.

7:00

A senior faculty member with past smallpox experience overseas is consulted. He happens to be working in his lab across the street and agrees to examine the patients. He quickly affirms that both the student and the electrician have signs and symptoms consistent with typical smallpox. A stained smear from the patients' skin lesions shows large, uniform, deeply stained, elementary bodies under oil immersion microscopy consistent with smallpox. The course of the illness suggests that both patients were infected sometime around April 1.

7:15 PM

The hospital epidemiologist declares a contagious disease emergency. The two patients are moved to negative pressure rooms with HEPA filters. Visitors and hospital staff who are not already caring for and in contact with patients are forbidden to enter the floor. Infection control nurses begin interviewing staff to determine who has been in face-to-face contact with the patients during initial emergency room visits and since admission.

The hospital epidemiologist calls the Chair of the Department of Medicine and the hospital Vice President for Medical Affairs.

8:00 PM

The chair of the medicine department and the president of the hospital meet with the chief of infectious disease, the hospital epidemiologist, the hospital vice president for public relations, and the hospital's general counsel. The city and state health commissioners join the meeting by phone.

The need to vaccinate and isolate all contacts of the patients is recognized and discussed. There is particular concern that health care personnel who dealt with the patients three days ago be vaccinated as soon as possible.

It is decided that the hospital will be secured – no one will be allowed to leave – until all persons are identified so that they can be vaccinated as soon as vaccine can be obtained from the Centers for Disease Control (CDC). The possibility of identifying and vaccinating

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other patient contacts (e.g. family members not now in the hospital) is raised, but no decisions are made because the hospital's legal authority for doing this is unclear.

8:30 PM

The state health commissioner calls the FBI. He also contacts the CDC immediately to ask that it release smallpox vaccine for hospital staff and patient contacts. CDC notes that vaccine supplies are limited and requests that the diagnosis of smallpox first be confirmed at CDC.

9:30 PM

An FBI special agent arrives at the hospital, secures biological samples taken from the patients, and drives them to Andrews Air Force base where a military aircraft flies the samples to CDC's Biosafety Level 4 laboratory in Atlanta. The FBI requests that city police be called to help maintain order and to ensure that no patients, staff or visitors leave the hospital until all occupants have been identified and their addresses recorded. More FBI agents and city police arrive on the hospital grounds.

Hospital visitors are confused and angered by police refusal to allow anyone to leave the hospital. No explanation for the containment is given to staff, visitors or the police. Ambulances are re-routed to other hospitals. The rumor that smallpox has broken out rapidly spreads through the building. There are also rumors that a terrorist wanted by the FBI is in the building.

The local metropolitan TV networks report the scene outside the hospital on the late night news. The hospital public relations representative explains on camera that the lock-in is temporary and intended only to gather names and addresses so that people can be contacted and treated if a suspected, but unnamed "contagious disease" is confirmed. CNN arrives and demands access to the hospital and affected patients. There are numerous rumors about what the "contagious disease" might be, including Hong Kong flu, meningitis, Ebola virus, smallpox and measles.

The mayor and state Attorney General are contacted by the health commissioner. They, along with the hospital's general counsel and epidemiologist have a phone discussion about quarantine authorities and procedures. State law gives the state health commissioner the power to impose quarantines and to isolate individual patients to protect the public. It is decided that for now, visitors, unnecessary personnel, and new patients will be blocked from entering University Hospital. Visitors now in the building will be allowed to leave after their names and addresses are recorded.

The FBI, however, is reluctant to allow anyone to leave the building. This provokes a lengthy exchange among the FBI agent-in-charge, the city Police Chief, and hospital administrators and attorneys. The dispute is resolved after a series of phone calls between FBI Headquarters and the state Attorney General's office.

It is now 10 P.M. on April 15.

11:30 PM - The specimen arrives at CDC. At 3 A.M., the preliminary diagnosis of smallpox is confirmed. There is a phone conference that includes University Hospital staff, Northeast's Chief of Police, the state health commissioner and state attorney general, the Governor, representatives of CDC, FBI, and staff from the Department of Health and Human Services,

the National Security Council and the White House. Thirty-two people participate in the phone call.

Federal officials now assume that a bioterrorist attack has occurred in NorthEast. There is concern that other attacks might also have taken place but not yet come to light or that further attacks might be imminent.

Health officials demand full access to FBI intelligence information to help calibrate the strategy for vaccine distribution.

Whether and how to release the information to the media is also debated. It is decided that the Mayor and the Governor will go on television in the morning with the health commissioner. The FBI director will also make a statement. The President will address the country at noon.

CDC makes arrangements to have smallpox vaccine delivered to Northeast early the next morning for use by patient contacts and the health care teams caring for hospitalized victims.

PANEL 2 - Early Response

Issues:

- *Roles and authorities*
- *Tracking the epidemic*
- *Initial hospital response*
- *Media response; communication with the public*

Panelists:

Blitzer
Gerberding
Hauer
Lillibridge
Moran
Osterholm
Rodgers

April 16 — 7 A.M.

The FBI holds the first of what will be daily morning conference calls. Participants include representatives from the CDC, the FBI, HHS, the National Security Council, law enforcement personnel from Northeast and the state health authorities.

A representative from the Counter-terrorism Office of the National Security Council asks if it is necessary or desirable to attempt a complete quarantine of Northeast, including closure of the city airport and a ban on rail traffic leaving from or stopping in the city. There is agreement within the group that such a step is neither feasible nor warranted.

There follows a heated debate about the advisability of vaccinating all hospital staff and visitors at all facilities where a single case of smallpox is clinically suspected. The state health commissioner presses strongly for vaccinating the entire city of Northeast.

The FBI and CDC are reluctant to begin mass vaccination until the dimensions of the outbreak are better understood. It is decided to vaccinate all hospital staff and any visitors to the floor where the patients were located. All direct contacts of the patients will also be vaccinated. By the end of the long phone conference, the decision is made to vaccinate all health care personnel, first responders, police and firefighters in any city with confirmed cases of smallpox.

CDC Epidemic Intelligence Service officers arrive in Northeast and are assigned to the state epidemiologist, who is establishing a statewide surveillance and case investigation system.. An early task is the creation of a registry of all face-to-face contacts of smallpox victims and implementation of a process for daily monitoring all contacts of smallpox victims for fever. If any contact develops fever over 101 degrees F., they are to be isolated, at home if possible, and followed for rash.

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The state health department activates a prearranged phone tree to question all hospitals and walk-in-clinics in state about possible smallpox cases. Immediate isolation of all patients suspected of having disease and prompt vaccination of contacts is urged.

The phone tree inquiries turn up an additional 8 admissions for fever and vesicular rash around the city. All patients are extremely ill; two are delirious. University Hospital emergency room records are searched and staff attempt to contact all patients who presented with fever during the past week. Three more probable smallpox cases are discovered. Telephone follow-up reveals that one has been admitted to another hospital out of state.

Vaccine arrives in Northeast and the vaccination campaign begins.

After discussion among state health authorities and University hospital staff, it is decided that University will serve as the city's smallpox hospital and will accept transfers of smallpox patients now hospitalized at other facilities in the state. Other hospitals will refer patients to University or to the state armory, but will not admit people suspected of having smallpox. Physicians will be urged to avoid seeking admission for most smallpox patients and to care for patients in their homes.

Arrangements are made by the state health commissioner to activate a state disaster plan, which establishes the armory as an emergency hospital for the quarantine of smallpox patients, in case the number of smallpox victims exceeds hospital isolation capabilities.

The state health commissioner requests help from CDC in establishing telephone hotlines. One line will be available to the public; the other will provide information for physicians and health care providers.

CDC and state health officials discuss possible strategies for managing the epidemic if there is insufficient vaccine to inoculate all patient contacts, as seems likely. Home isolation of non-vaccinated patient contacts is considered, but the legal authorities, practical logistics, and ethical implications of such a strategy remain unclear and unresolved.

PANEL 3 – QUARANTINE AND VACCINATION

Issues:

Who to quarantine and how; responsibilities and logistics
Vaccination strategies, practicalities

Panelists:

De Martino
Hauer
Knouss
Lillibridge
O'Brien
Osterholm
Perl

April 16

At noon, the President goes on television to inform the nation that unknown terrorists have committed a “despicable crime against humanity” by initiating a smallpox outbreak in Northeast. He vows that the full force of the USA will be directed towards identifying the assailants and bringing them to justice and urges calm and cooperation with health authorities.

The initial epidemiological evidence and available FBI intelligence suggests that the release likely occurred during the Vice President's January appearance at the University. The female grad student was in the audience during the speech. The electrician made repairs in the auditorium shortly after the event. Efforts are begun to identify everyone who attended the VP's speech, determine if anyone is ill and vaccinate the contacts of all those who are sick. It is too late for vaccination to protect those who attended the speech. Additional health department personnel are assigned to help in the epidemiological investigation.

By evening, 35 more cases are identified in 8 different emergency rooms and clinics around the city, bringing the total number of smallpox cases in Northeast to 48. Ten cases are reported in an adjoining state. CDC alerts all state health departments to be on lookout for possible smallpox, urges prompt notification of federal authorities and strict isolation of patients and contacts should cases be discovered, and instructs states to send specimens from suspected patients to Atlanta for definitive lab diagnosis.

The media report that the government “still doesn't know how many people are sick or how widespread the outbreak might be”.

April 17

Vaccination of the entire University student body, faculty and staff is discussed and rejected by federal officials for fear that vaccine supplies will be needed for more targeted contacts of confirmed cases. State health officials continue to argue for a statewide vaccination effort.

Labor unions representing nurses and other health care workers publicly call for vaccination of all employees whose jobs involve direct patient contact.

By the end of the day, 10,000 persons in Northeast have been vaccinated by the city and state health departments with assistance from volunteer physicians and nurses.

April 18

An additional 20,000 people in Northeast are vaccinated.

The CDC and USAMRID determine that the infecting strain of smallpox is not a bio-engineered organism. The genomic sequence is entirely typical of known strains of smallpox.

The female student, the first diagnosed victim, dies. Ten more smallpox cases have been identified. The patients are located in 4 states, all in the mid Atlantic area. Suspect cases are identified in 5 other states.

April 20

Governors of affected and unaffected states press hard, both behind the scenes and publicly, for emergency vaccine stocks to be distributed to states so immediate action can be taken should an outbreak occur.

At the close of the fourth day of the vaccination campaign, a total of 80,000 have been vaccinated.

April 27

By now, 80 smallpox cases have been identified, 24 of whom have died. There have been no new confirmed cases of smallpox with onset after April 19, although many suspect cases with fever and rash due to other causes are being seen. In the states reporting confirmed smallpox cases, thousands of people are seeking medical care because of worrisome symptoms.

CDC and state health authorities issue a strongly worded directive that patients with fever who cannot be definitively diagnosed be strictly quarantined and observed until the fever subsides. The CDC and state health departments are flooded with calls from health care providers seeking guidance on isolation procedures. The telephone hotlines cannot handle the load.

April 28

Evening news broadcasts reports that, a college basketball star is rushed to hospital by ambulance with an unknown illness. Television commentators report that athlete has high fever but no rash.

Two young children in Megashopolis, a large city in another state, are diagnosed with smallpox. The FBI and NSC worry that these cases might signal another attack, since the children have had no discernable contact with any known smallpox victim or contacts. The possibility that there has been a new attack is weighed against the possibility that the children were infected by a contact of one of the "first wave" of victims who was missed in the epidemiologic investigation.

The members of Megashopolis' congressional delegation demand that the federal government implement a massive citywide vaccination program. CDC notes that a Megashopolis-wide vaccination program would deplete the entire civilian vaccine supply.

Media give extensive coverage to the argument between state and federal officials over the extent of the vaccination effort. The subject is a favorite for talk show hosts.

It is revealed that the President, Vice president, Cabinet representatives and prominent members of Congress have been vaccinated and that the military has quietly begun to vaccinate its own troops against smallpox.

Over the course of the day, CDC receives reports of over 100 new cases of potential smallpox. 60 of these are in the original state. The others are scattered over eight states. Two cases in Montreal and one in London are also reported.

April 29

CDC and health agencies now recognize that they are seeing a second generation of smallpox cases. It is presumed that the latest victims were infected by contact with those who attended the Vice President's speech, but a second bioterrorism attack cannot be immediately ruled out. CDC enlists additional epidemiologists from around the country to join teams tracking patients and their contacts.

Another 200 probable cases are reported in the course of the day. CDC receives thousands of requests for vaccine from individual physicians and goes on TV to announce that vaccine will only be distributed through state health depts. Governors of a dozen states are calling the White House, demanding vaccine. One state Attorney General announces a suit against the federal government to force release of vaccine for a large-scale vaccination campaign.

The federal government announces that 90% of currently available vaccine stocks will be distributed to affected states, but cautions that the available quantity of vaccine can only cover 5% of those state's populations. Governors are to determine their own state-specific priorities and mechanisms of vaccine distribution. Federal officials also announce the commencement of a crash vaccine production program that will reduce vaccine-manufacturing time to 24 months.

*Chicken - since credibility is low,
govt. loses control.*

PANEL 4 – THE EPIDEMIC EXPANDS

Issues:

- *Public response to the threat of smallpox*
- *Continuing communications among local, state and federal agencies and medical and public health communities*
- *Tracking the epidemic*
- *The role of the media*
- *International issues*

Panelists: All

April 30

The well-known college athlete who had been reported ill on the 27th dies of hemorrhagic smallpox. The rumor is reported that he was the victim of a new biological attack using a different organism since he never developed the rash associated with classic smallpox. Television commentators misinterpret technical statements from a health care “expert” and report that the athlete died of “Hemorrhagic fever” and read clinical descriptions of Ebola virus infection on the air.

The White House and CDC receive dozens of calls from furious governors, mayors and health commissioners, demanding to know why they were not informed of additional bioterrorist attacks using Ebola. Nurses, doctors and hospital support personnel in health centers walk off the job. Thousands of people who attended college basketball games where the deceased athlete played call the health dept and ask for treatment.

HHS issues a press release explaining that the athlete did not have Ebola virus. The FBI affirms that there is no reason to believe that an attack using any Hemorrhagic virus has occurred, but refuse to rule out the possibility that there has been more than a single bioterrorist attack using smallpox. They continue to worry that a second source of smallpox may have infected the children in Megashopolis.

April 31

The widely televised death of the college basketball star, plus dramatic footage of young children covered with pox drive thousands of people to emergency rooms and doctors’ offices with requests for vaccination and evaluation of fever and other symptoms. This escalation in requests for evaluation and care hamper the ability of state health authorities and CDC to confirm the number of actual new cases.

May 1

Epidemiologists are working around the clock to interview cases, to trace the chain of infection, place contacts under surveillance, and isolate smallpox victims. The evidence continues to substantiate the fact that the Vice President’s visit to Northeast was the occasion for the release, but a minority of authorities remains concerned that there may have been multiple releases.

May 14

The total number of smallpox cases continues to grow. There are now 700 reported cases worldwide; 240 have died. In Northeast, the number of patients exceeds the capacity of local

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hospitals. Smallpox cases and suspected contacts are being isolated in the local armory and convention center, where volunteer physicians and nurses are providing care.

May 15

The third generation of the epidemic begins. Over the next two week period, more than 7,000 cases are reported. The city of NorthEast is hardest hit by the epidemic, but smallpox has also infected victims throughout the country and abroad. The mortality rate remains around 30%.

All US vaccine supplies are exhausted. No other nation is able to provide vaccine.

Public concern is mounting rapidly. The President has declared states with the largest numbers of victims and people in quarantine to be disaster areas. Congress votes to release federal funds to pay for quarantine costs.

June 1

The fourth generation of cases begins.

By mid-June, 15,000 cases of smallpox are reported in the US alone. Twenty states report cases as do 4 foreign countries. Over 2000 will have died.

FINAL COMMENTS

June 15

The city of Northeast, which is hardest hit by the epidemic, has experienced several outbreaks of civil unrest. The National Guard is called in to help police keep order and to guard the facilities where smallpox cases and contacts are isolated.

Many conferences and business conventions scheduled to convene in Northeast during the early summer are cancelled. Tourist trade, a major source of state income, is at a standstill. Many small businesses in the city have failed because suppliers and customers are reluctant to visit the area. Attendance at theaters and sports events is down markedly.

In several states, public schools are dismissed a month early, in part because parents, fearful of contagion, are keeping their children home; and partly because teachers are refusing to come to work. Across the country, people refuse to serve on juries or attend public meetings for fear of contracting smallpox. In hospitals and HMOs where staff have not been vaccinated, health care personnel have staged protests and some have walked off the job.

Congress has begun oversight investigations into the epidemic. One Congressman accuses FDA of deliberately obstructing the development of smallpox vaccine and vows to hold hearings into the matter. Congressional investigations of what the FBI knew, when they knew it and whom they talked with are ongoing. Multiple lawsuits have been filed on behalf of and against HMOs, hospitals, and state and federal governments.

Several large HMOs refuse to pay states for costs associated with caring for patients in isolation wards and quarantine facilities. The states suffering the largest numbers of cases have spent millions of dollars on the epidemic – establishing quarantine operations, paying for added public health personnel, overtime pay for police, etc.

Domestic and international travel is greatly reduced. Travelers avoid countries known to have smallpox. Some countries refuse to admit Americans without proof of recent smallpox vaccination. Others have imposed 14-day quarantines on all persons entering the country from abroad. A lucrative black market in falsified vaccination certificates has sprung up.

In the US, there are periodic rumors of miracle treatments, many fueled by the media, which in turn provoke ardent demands on a beleaguered health care system. Since vaccine supplies were depleted, many have turned to ancient techniques seeking protection. Some physicians are practicing arm-to-arm transfer of vaccinia. A few are attempting immunization with inoculation of smallpox virus from pustules.

The exponential increase in cases around the globe has caused some governments to institute strict, harshly enforced isolation and quarantine procedures. Human rights organizations report numerous cases of smallpox victims being abandoned to die, or of recovering victims being denied housing and food.

Although new cases continue to appear, by late June the rate of development of new smallpox cases reported worldwide appears to be stabilizing and perhaps subsiding. Vaccination and isolation of contacts has undoubtedly been of benefit. Perhaps more important is the seasonal decrease in spread of virus as warmer weather returns.

Smallpox continues to spread in many parts of the world, echoing its formerly endemic character. Without vaccine, the only control method is isolation, which hinders, but cannot halt, the spread of the disease. By the year's end, endemic smallpox is reestablished in 14 countries. The World Health Assembly schedules debate on reenacting a global smallpox eradication campaign.

ANTHRAX SCENARIO

For the National Symposium, February 16-17, 1999

Prologue

Anthrax is among the most deadly organisms that might be used by bioterrorists. The powdered, weaponized preparation of anthrax spores is most feared because it would be capable of infecting the largest population. Most experts agree that the production of this type of anthrax is only within the reach of groups or states with advanced biotechnology capacity. However, given the lack of effective barriers against international transfer of such biological agents, terrorist groups with sufficient funding and initiative might well be able to acquire and disseminate anthrax in this fashion.

Such an attack could employ relatively sophisticated strategies and could deliberately be intended to cause public panic, disrupt and discredit official institutions, and encourage loss of public confidence in government itself.

The scenario we will describe today is not the most horrific tale of anthrax one might imagine. Other scenarios, also credible, but more grim, might be imagined, depending on the number and method of attacks; whether the attack occurs in a major transportation hub; the time that passes before medical authorities recognize that an anthrax outbreak was upon them and the availability of antibiotics and vaccine. In fact, other scenarios have been described in which the number of infected were orders of magnitude larger.

Our intent is to provoke sober reflection on what suffering might, heaven forbid, someday come to pass, and what we as medical and public health professionals could do to prevent such catastrophe.

??A series of rhetorical questions regarding preparedness for an anthrax epidemic in this setting naturally arise in this scenario. For clarity they will be posed to you explicitly.

Anthrax following use of a biological weapon: A possible case history

November 1st

In the past week, the FBI offices in 5 different US cities received warnings of an imminent terrorist attack by a group opposing certain US policies. The threats repeated the message that "showers of anthrax will be made to rain on U.S. citizens unless U.S. policies change."

One of these calls was made to the FBI office in the city of NorthEast. This is a large city located on the eastern seaboard encompassing a metropolitan population of 2 million. The series of anthrax threats were deemed credible threats by the FBI, but none of the information was relayed to city officials in NorthEast or elsewhere.

In NorthEast, a professional football game is being played before a sold-out audience of 74,000 in an outdoor stadium. The evening sky is overcast, the temperature mild, a gentle breeze blows from west to east. (**SLIDE 1)

During the first quarter of the football game, an unmarked truck drives along an elevated highway a half mile upwind of the stadium. As it passes the stadium, the truck releases an aerosol of powdered anthrax over 30 seconds, creating an invisible, odorless anthrax cloud more than a third of a mile in breadth. The wind blows the cloud across the stadium parking lot, into and around the stadium, and onward for a few miles over the adjacent business and residential districts. (**SLIDE 2)

Following the anthrax release, the truck continues driving, and by the time the game is over, is parked at a farm two states away. The release is detected by no one. The home team wins the game by three points.

(SLIDE 3)**

Approximately 16,000 of the stadium's 74,000 fans inhale enough anthrax spores to produce infection; another 4,000 people in the business and residential districts downwind of the stadium also are infected.

After the game, the fans disperse to their homes in NorthEast and the greater metropolitan area; some return to homes in neighboring states. A few spectators are from other countries. The driver of the truck and his associates leave the country by plane a few hours later. They will be many time zones away by the time their victims show first symptoms of anthrax 2 days later.

November 3rd

Two days after the game a wave of persons in and around NorthEast experience fever, shortness of breath, cough, headache, and in some cases, chest pain. Some individuals self-administer over-the-counter cold remedies; some seek advice by phone from physicians and nurses; and others are seen in a variety of clinics, doctors' offices, and emergency departments throughout the city.

(SLIDE 4)**

It is the start of the flu season, and flu activity had been seen in the city for the past 2 weeks. Health care providers treat most of the affected persons conservatively for presumed influenza. A few of the sickest patients get Chest X-rays to rule out pneumonia. Only in retrospect, long after the source of illness is clear, will the widened mediastinum seen on a number of chest radiographs be recognized for the signal it carries.

A few patients, most of whom are elderly, are hospitalized. A handful have blood cultures drawn and sent to the laboratory; and some have nasopharyngeal cultures sent to confirm or exclude influenza. Despite the hundreds developing illness, health officials have not yet noted anything unusual, because the ill are receiving care from a wide spectrum of clinics, Emergency Departments and HMOs throughout the region.

November 4th

Increasing numbers of people are becoming seriously ill across the metropolitan area. A few nurses and physicians sense that the volume of severe upper respiratory complaints is greater than usual, and some contact officials at the city health department.

Late in the day, blood cultures drawn from the earliest patients grow gram positive bacilli in 7 different laboratories around the city. The laboratories identify these as *Bacillus* species, per routine protocol, and do not attempt more specific identification. Initially, there are no physician requests for further identification.

(SLIDE 5)**

By nightfall, 400 people around the city have fallen ill, eighty of whom have died.

The illness is rapidly fatal, killing otherwise healthy young adults within 24 to 48 hours. Members of the medical community, now alarmed by these unexpected and unexplained deaths, urgently contact state and city health departments. Health department officials make immediate calls to the federal Centers for Disease Control and Prevention (CDC).

- *Should state and local health officials have been notified about the anthrax threats? Would this knowledge have led to earlier recognition of the epidemic or better preparedness for the response?*
- *Should health care workers be trained to recognize the sentinel early warning signs of anthrax?*
- *Can routine laboratory practices be changed to increase the chance of early detection of anthrax?*
- *In most communities, if a group of previously healthy persons begin to die, will health care workers notice and contact the health department*

November 5th

Word that formerly healthy persons are dying of a rapidly fatal illness spreads quickly among health care providers in the state, and is featured on local and national news shows. By noon, the state health department and CDC have begun an epidemiological investigation. News media interview families of the deceased, physicians, and city health officials. "Expert consultants" for television networks generate a list of potential diagnoses that includes influenza, bird flu, and other infectious and non-infectious diseases. One commentator raises the possibility of bioterrorism being the cause of the outbreak.

Meanwhile, the state health department, which has instituted a rapid survey of city Emergency Department's, learns that the number of people presenting with fever and severe upper respiratory symptoms has doubled since the previous day. The victims are all ages and come from all sectors of the city. Samples of blood and tissue are sent to labs and CDC for analysis.

The mayor convenes an emergency meeting of leading medical experts and health officials who debate possible diagnoses and responses to the outbreak while reporters and television cameras wait outside city hall. The assembled experts express fears that the cause of illness might be a contagious disease and recommend isolation of all persons with fever, cough and/or chest pain. The state health officials double the number of staff investigating potential common sources of exposure and request additional personnel from CDC.

During the ensuing news conference, the mayor appeals for public calm, but she is visibly surprised and unprepared when asked whether she believes a bioterrorist attack could be the cause of the outbreak.

Over the course of the day, emergency rooms become inundated with people complaining of fever, cough, chest pain and shortness of breath. Many people appear seriously ill; some are dying shortly after arrival in the hospital. Others appear healthy, but fearful. Protocols for isolating victims as recommended by the health department earlier in the day quickly fall apart as hospital and clinic staffs struggle to cope with the surge in the number of patients. State health officials also discover that unusual numbers of patients with flu-like symptoms are also being seen in city clinics and HMOs. At some locations, the shock of rapid and unexplained deaths has created an atmosphere of desperation and confusion among hospital and clinic staff.

By noon, intensive care units and isolation beds across the city are full. In spite of the most advance intensivists care, people continue to die. Victims are febrile, hypotensive, and apparently suffering septic shock, but these symptoms elude diagnosis. Some individuals

show evidence of meningitis. At University Hospital, a nursing supervisor and a doctor die within 6 hours of each other, heightening fears of a contagious disease and prompting emergency room staff to don protective positive pressure hoods. The local TV station shows physicians working in this gear and explains that there are only two dozen or so such hoods available in the hospital.

That evening, a university microbiology laboratory makes a preliminary diagnosis of anthrax following analysis of blood taken from a young patient whose death is unexplained. The laboratory notifies the city and state health departments, which in turn notify the CDC and the FBI. The CDC advises confirmation at United States Army Medical Research Institute of Infectious Diseases (USAMRIID); rapid transfer of specimen is arranged. Performing parallel laboratory analyses, experts at USAMRIID report that rapid diagnostic tests (that is PCR and antigen capture tests) are consistent with anthrax. Final diagnostic confirmation will require culture growth and will not be available for another 24 hours. It will take a second day before antibiotic susceptibility is known.

The mayor consults with city and state health officials and the CDC. The FBI joins the meeting. The assumption is that the disease killing NorthEast citizens is anthrax and is the result of a bioterrorist attack.

The mayor is infuriated to learn that she was not told FBI had warning of a bioterrorist attack on Northeast and other cities days earlier. She is also stunned and frustrated that its taken more than 80 deaths and hundreds of ill before anyone from the medical community had come up with the diagnosis.

She is informed that an anthrax vaccine exists, but it is not clear whether any will be made available for civilian use in the city. No one can yet estimate the probable scale of the outbreak or whether there has been a single or multiple attacks. The CDC is rapidly contacting other city and state health departments seeking news of similar syndromes in other locations around the country. The mayor's medical advisors recommend that

quinolone antibiotics be used to treat the sick and for prophylaxis of those exposed to the aerosol until antibiotic susceptibility testing can provide direction. There is unanimous agreement that post-exposure antibiotic prophylaxis is warranted for some portion of the city's inhabitants, but it is unclear who exactly should be treated. The amount and location of such antibiotics in the city and surrounding region are not known.

The source of the release remains uncertain, but state health officials report that many-but not all- of those dying had been at the football game 4 days prior.

The mayor is greatly disturbed to learn that to prevent death in those infected by the anthrax cloud, antibiotics must be given **before** symptoms occur, or at the latest, in the earliest hours after symptoms begin. She is told that patients who are already ill are likely to die, no matter what anyone does. Available information suggests that the local supply of appropriate antibiotics may be insufficient; many local pharmacies were already emptied of antibiotics as the initial rumors of anthrax spread through the city. Given this immediate shortage of antibiotics, one senior advisor asks her to consider a triage strategy that uses all available antibiotics to protect the well, holding them back from patients who are already sick, and thus likely to die. The mayor angrily responds that she will not be known as the mayor who abandoned her citizens to die.

She requests immediate federal assistance in obtaining and distributing large supplies of antibiotics. State officials notify hospitals around the city of the anthrax release and warn them to prepare for a new surge of patients in the wake of the mayor's forthcoming TV announcement. Recommendations for the care of the anthrax-infected patient are sent to hospitals and clinics around the city.

The late night news is interrupted by the mayor announcing that anthrax had been released in the city. She outlines the recommended medical response and describes the assistance NorthEast is seeking from federal government agencies. She urges that appropriate antibiotics should be taken by all those attending the football game. For those who attended the game and remain well, arrangements are being made to distribute antibiotics

at 20 police stations and schools around the city starting immediately. Antibiotics will be distributed in packages sufficient for 1 week supply. A second phase of distribution will commence with the arrival of new supplies of antibiotics—eventually all those exposed will need to receive enough antibiotics to take for 60 days. Persons feeling ill are instructed to report immediately to hospitals for treatment. She underscores that anthrax is not contagious. She appeals for calm.

Thousands rush to police stations. In some locales, the drugs have not arrived, and violence breaks out. Communication between the distribution centers, the mayor's office and the antibiotic suppliers is haphazard, No city plan exists or had even been considered for mass distribution of antibiotics. Some centers receive almost no antibiotic supplies. At other centers, antibiotic supplies are rapidly exhausted. By early morning, there are no antibiotics left in the city. Approximately 20,000 persons obtain some quantity of the recommended antibiotic. However, there is no record of who received medicine or what proportion of stadium attendees received antibiotics.

Antibiotic shipments from other states are urgently requested. The city's supply of antibiotics, both for the mass distribution program and the patients already hospitalized with anthrax is temporarily exhausted.

Most health care facilities are unprepared to cope with the situation. A few have prepared disaster plans, but only a handful had even exercised such plans. Maintaining public order and avoiding sporadic violence spurred by panic becomes a major issue at many hospitals and clinics.

(SLIDE 6)**

By the end of the day, 2,400 persons have become ill with anthrax, 300 of whom have died. Thousands more besiege doctors offices, clinics and Emergency Departments, fearing they too are infected with anthrax.

- *In most communities, are hospitals prepared to care for a sudden surge of seriously ill patients? Do hospital disaster plans address this type of scenario?*

- *In most communities, has there been any accounting of the local or regional availability of antibiotics?*
- *In most communities, has there been any planning for methods of effective, rapid mass antibiotic distribution?*

November 6th

The mayor is forced to call another press conference announcing that school gymnasias and homeless shelters will soon be opened and staffed by a mixture of public health service workers, health care workers from neighboring counties and volunteers. National guardsmen will keep order. The Federal Emergency Management Agency (FEMA) will provide some logistical support.

The media accurately report that despite proper antibiotic therapy, the great majority of individuals who were ill before getting antibiotics are still dying and begin to speculate that the city's plan to give protective antibiotics will not protect all citizens. It becomes apparent that some of the dead were not among the crowd at the football game and in fact were miles away from the stadium that day. News shows report variously 'that antibiotics are being held back by city officials', that 'insufficient antibiotics available to halt epidemic', 'local authorities are losing control of the situation'.

At a noon press conference, the mayor announces that new epidemiologic information has shown that some persons who have died of anthrax had lived or worked more than three miles from the stadium and had not attended the football game. In addition, computer models show that wind patterns may have blown anthrax spores downwind of the stadium for some miles. Recommendations to begin protective antibiotics are being expanded to include all citizens living or working within an area defined by 8 miles east and 1 mile north or south of the stadium on the day of the football game. By now, antibiotic stocks gathered from surrounding states are depleted. The mayor announces that there will be some delay in distributing additional antibiotics until the federal government delivers new supplies and federal public health service officers to distribute them. Additional antibiotic

distribution centers are being established in local schools. National guardsmen will help keep order at the centers.

In spite of assurances that anthrax is not contagious, people with the ability to do so flee Northeast, causing traffic jams and increasing the sense of desperation and panic. Some train conductors, engineers, intercity bus drivers and pilots refuse to travel to NorthEast, citing personal safety concerns and threaten to walk off the job if forced. Train and plane travel to and from NorthEast is disrupted, despite all attempts by city government to maintain commercial normalcy.

(SLIDE 7)**

At this point, 6 days after the stadium release but only 4 days after the first person developed symptoms, anthrax has sickened 3,200 people, 450 of whom have died.

- *In most communities, do plans exist to care for the sick and dying in alternative facilities if there is no room space left in hospitals?*
- *How should government or health officials interact with the media to most effectively inform the public, avoid falling credibility?*
- *What kind of federal material or personnel resources would be most useful to a city at this time?*

November 7th

The FBI has preliminary evidence that a truck may have been the source of the dispersal, though no individuals have been arrested and no group has claimed responsibility. They have confirmed reports that they had received a credible threat of an anthrax attack in the week before the event. On televised interviews, families of the deceased promise legal action against the FBI for not revealing the threats, and against local and federal government for not supplying sufficient antibiotics and vaccine. There is widespread suspicion that ongoing covert anthrax attacks continue in the city.

Management of dead bodies becomes a growing crisis. Hospital and city mortuaries are full. Many funeral homes have closed. The state health department and CDC recommend

cremating the deceased, given an inability to rapidly and safely bury contaminated bodies and warn that this is a grave matter of public health and there will be no other options. Some religious groups respond with outrage. There are threats that if mandatory cremation is to be enforced, there may not be full reporting of dead patients and private burial ceremonies would continue any way, out of sight of state health officials.

(SLIDE 8)**

A total of 4,000 persons have fallen ill, 1,600 of whom have died.

- *What kind of legal responsibility does local or federal government have for supplying sufficient antibiotics or vaccine in this crisis?*
- *How do state officials balance concerns about interrupting disease spread (in this case management of dead bodies) with the concerns of private citizens?*

November 8th

Increasing numbers of the city's critical workforce are absent, including police, firefighters, ambulance, bus and taxi drivers, subway operators, office building operators, sewage treatment plant workers, electricity and water officials, health care and supermarket workers. Some are absent because of illness or death due to anthrax. Many more skip work fearing additional anthrax attacks. Many continue to fear contagious spread of disease despite official statements to the contrary. The changing official health recommendations feed the uncertainty and rumor in the city. Others have left town. National guardsmen are able to fill some roles, but some tasks require specialized expertise. State and city officials become increasingly concerned about an imperiled city infrastructure.

The effects of absenteeism are noticeable everywhere. The public transit system is curtailed; some of the city's office buildings are temporarily shut down; response time for calls made to fire and police lengthen. Pharmacies receive only limited supplies of antibiotics and they are sold within hours of arrival. Schools and universities are shut down. Areas of the city believed affected by the anthrax spores are largely abandoned. Many of the middle and upper class citizens leave the city. Looting erupts.

The governor and mayor hold a press conference to address false allegations that anthrax vaccine is being administered to select individuals in the city. They report that federal authorities will make available some vaccine for those deemed at highest risk. But due to a national shortage of vaccine and military concerns that this attack may herald further attacks, there is only a limited amount of vaccine. For the most part, the city will have to manage with antibiotics alone. The stadium will remain closed indefinitely. They report that while there is no way to fully guarantee the safety of persons living and working downwind of the stadium, the risk of disease is very low.

(SLIDE 9)**

A total of 4,800 persons have become ill, 2,400 have died.

- *What size epidemic would result in absenteeism in the city's crucial workforce? When infrastructure is at risk, how would these absences be managed?*
- *Without anthrax vaccine available, would persons return to their homes where family members were exposed to anthrax cloud and died?*

AFTERMATH

By the eighth day, most citizens of the affected parts of the city have been able to reach antibiotics; though unfortunately, many persons had become ill before antibiotics could be distributed to them. Illness and death also have occurred in other cities and states where citizens attending that football game returned home. Cases in other countries occurred in persons who had been in the area at time of exposure, most of whom also died.

(SLIDE 10)**

Of the 20,000 persons infected in NorthEast, 4,000 died, most in the first 10 days after the attack. Occasional cases occur later among those persons refusing, or discontinuing their prolonged antibiotic course. In all, approximately 250,000 citizens of NorthEast received antibiotics, most of them eventually receiving enough antibiotics to complete a 2 month course.

The media reports that hundreds, if not thousands needlessly died because of delays in antibiotic distribution. Some report that life-saving antibiotics would have cost < \$100/person, vaccine < \$1/person, a price local and federal authorities hadn't been willing to pay.

Military intervention in the form of martial law is avoided, despite calls by some federal authorities for a 'modest military presence to keep peace and stability in a region clearly under attack.' No group can ultimately be identified as the perpetrators though the FBI continues one of the largest investigations in its history.

Many persons refuse to return to their homes downwind of the stadium and demand official compensation. Businesses downwind of the stadium are shut down, as employees and customers alike stay away. The stadium is largely abandoned. Newspapers brand the downwind area 'the dead zone.' Overall city commerce suffers tremendous losses. Tourism in NorthEast, one of its crucial industries, collapses. City and state officials estimate it will be months or years before the city resumes a normal routine. Fear of anthrax may keep some away from NorthEast indefinitely.

- *Questions?*

December 1

The FBI receives a threat that anthrax will be released in the next week in 5 major U.S. cities.

Concluding Statement

In conclusion, all would agree this hypothetical account is horrible to consider. In truth, such an epidemic would cause terrible human suffering and create serious challenges, unique to modern American city.

However, as also can be seen, there is no need to surrender to this outcome. Practical, modest preparedness efforts would make a difference, change the outcome; Some of the

most useful would be the product of low-tech ingenuity and the collaboration of experts from many disciplines.

Some are already beginning to answer questions, address challenges posed in this story. Others would pose new questions, different concerns.

Please remember and hold those questions and thoughts for tomorrow morning when the smallpox scenario will be presented. An expert panel will have the chance to respond. And so will you.