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BIOTERRORISM PREPAREDNESS: PEOPLE, TOOLS, AND SYSTEMS FOR DETECTING AND RESPONDING TO A BIOTERRORIST ATTACK

FIELD HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

SECOND SESSION

MAY 3, 2004

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BIOTERRORISM PREPAREDNESS: PEOPLE, TOOLS, AND SYSTEMS FOR DETECTING AND RESPONDING TO A BIOTERRORIST ATTACK

MONDAY, MAY 3, 2004

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 10:00 a.m., in the Shawnee Mission Room, Shawnee Mission Medical Center, 9100 West 74th Street, Shawnee Mission, Kansas, Hon. Randy Neugebauer [Acting Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Bioterrorism Preparedness: People, Tools, and Systems for Detecting and Responding to a Bioterrorist Attack

Monday, May 3, 2004
10:00 a.m.-12:00 p.m.
Shawnee Mission Room, Shawnee Mission Medical Center
9100 West 74th Street, Shawnee Mission, Kansas 66204

Witness List

Mr. Charles A. Schable
Director, Bioterrorism Preparedness & Response Program
Centers for Disease Control & Prevention

Mr. Samuel H. Turner, Sr.
Chief Executive Officer
Shawnee Mission Medical Center

Mr. Richard J. Morrissey
Acting Director of Health
Kansas Department of Health & Environment

Ms. W. Kay Kent
Administrator/Health Officer
Lawrence Douglas County Health Department

Mr. Brad Mason
Division Chief of Special Operations
Johnson County Med-Act

Dr. Ronald J. Kendall
Director
The Institute of Environmental and Human Health

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Bioterrorism Preparedness: People, Tools, and Systems for Detecting and Responding to a Bioterrorist Attack

MONDAY, MAY 3, 2004
10:00 A.M.—12:00 P.M.
SHAWNEE MISSION MEDICAL CENTER
SHAWNEE MISSION, KANSAS

1. Purpose

On Monday, May 3, 2004, the House Science Committee will hold a field hearing to receive testimony on state and local preparedness for a bioterrorist attack, on the role of the Federal Government in supporting local efforts to prepare for, detect, and respond to a bioterrorist attack, and on the development and deployment of tools and systems for detecting and responding to a bioterrorist attack.

2. Witnesses

Mr. Charles A. Schable is the Director of the Bioterrorism Preparedness & Response Program at the U.S. Department of Health and Human Services' Centers for Disease Control and Prevention (CDC). CDC's bioterrorism and public health preparedness activities include support for strengthening of regional and state laboratories' capacity to detect different biological and chemical agents, upgrading of state and local health agencies' capacity to detect and communicate different health threats, and working with pharmaceutical companies and other partners to create regional stockpiles of the drugs needed to treat intentionally-launched disease outbreaks.

Mr. Samuel H. Turner, Sr. is the Chief Executive Officer of Shawnee Mission Medical Center (SMMC). SMMC has mutual aid agreements with local government agencies to monitor and respond to potential biological events, and uses bio-surveillance software to coordinate and communicate with other local hospitals to track outbreaks of diseases.

Mr. Richard J. Morrissey is Acting Director of Health at the Kansas Department of Health & Environment (KDHE). The KDHE responds to potential public health emergencies resulting from bioterrorism events and natural disease outbreaks. The KDHE Bioterrorism Program includes preparedness planning and response assessment, surveillance and epidemiologic capacity, laboratory capacity, health alert network/communications and information technology, risk communication and health information dissemination, and education and training.

Ms. W. Kay Kent is the Administrator/Health Officer at the Lawrence-Douglas County Health Department. Her expertise is in community health nursing, and she serves on the Bioterrorism Preparedness Planning Committee for the Kansas Department Health and Environment and Kansas Association of Local Health Departments. Lawrence-Douglas County experienced an outbreak of cryptosporidiosis in September of 2003, so Ms. Kent has recent practical experience in disease/outbreak management, treatment, and prevention, as well as in working with CDC in outbreak response efforts.

Mr. Brad Mason is the Division Chief of Special Operations at Johnson County Med-Act, where he directs the emergency medical services (EMS) Special Operations Teams. He is responsible for EMS emergency planning for mass casualty, mass fatality, incident management, hazardous materials, and weapons of mass destruction incidents. He is also the Chairman of the Mid America Regional Council Emergency Response Committee, through which he has worked on regional incident response and communications plans and metro-wide hospital diversion protocols.

Dr. Ronald J. Kendall is the Director of The Institute of Environmental and Human Health (TIEHH) at Texas Tech University/Texas Tech University Health

Sciences Center. He is an expert in environmental toxicology. TIEHH leads the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats, which includes work on detection, biological mechanisms, physical and medical countermeasures, modeling, and education, training, and outreach.

3. Overarching Questions

The hearing will address the following overarching questions:

- How do first responders, Federal, State and local governments, and health services providers work together to prepare for, detect, and respond to bioterrorist attacks?
- What tools and systems are used to detect and respond to bioterrorist attacks? What tools need to be developed? Who is developing these tools? Who is deploying them? What barriers exist to their use?
- How does preparedness for bioterrorist attacks affect our ability to meet day-to-day health care needs and respond to natural disease outbreaks?

4. Brief Overview

- To be properly prepared to detect and respond to a bioterrorist attack, numerous governmental and private entities must coordinate their efforts and plan for targeted and prioritized use of public health resources. Key players include federal agencies, state and local health departments, first responders, and hospitals.
- Development and deployment of information technology systems for the detection of bioterrorist agents or other infectious diseases, the surveillance of unusual symptoms, and rapid communication during incident management is significantly improving capabilities to detect and respond effectively to bioterrorist incidents and natural outbreaks of infectious diseases.
- After the anthrax attacks in the fall of 2001, the Department of Health and Human Services (HHS) expanded its programs to fund state, municipal, and territorial governments' efforts to upgrade their bioterrorism preparedness and response capabilities. In fiscal years 2002 and 2003, HHS distributed a total of $2.5 billion.
- Great strides in preparedness have been made. However, a 2003 GAO report found that workforce shortages and gaps in disease surveillance and laboratory facilities continue to potentially limit state and local jurisdictions' ability to response to a bioterrorist attack. Further strengthening public health systems will not only improve bioterrorism preparedness, but will also improve our capability to detect and respond to natural outbreaks of infectious diseases.

5. Background

Vulnerability to Infectious Disease Crises

We live in a mobile, highly interconnected society. Infectious diseases can be spread rapidly via people's movement across countries and across oceans on planes, and hazardous substances can be spread broadly via the mail system. The dangers and potential impact of a bioterrorist attack can be seen in recent examples of intentional and natural disease outbreaks—the anthrax attacks through the postal system in the fall of 2001 and the severe acute respiratory syndrome (SARS) epidemic experienced by China and internationally in 2003. These incidents highlight the challenges inherent in identifying and addressing gaps that could impair health systems' capacity to respond to sudden infectious disease outbreaks. To be properly prepared for a bioterrorist attack, plans for targeted and prioritized use of public health resources must be made, and these plans will have the added benefit of improving our capability to detect and respond to natural outbreaks of infectious diseases.

Efforts to Improve Preparedness

After the anthrax attacks in the fall of 2001, Congress was concerned that the Nation was not prepared to respond to a bioterrorist attack that resulted in a major public health threat. Therefore, several months after the incidents, Congress appropriated funds to strengthen state and local bioterrorism preparedness. The Department of Health and Human Services (HHS), through the CDC and the Health Resources and Services Administration, provided funds through cooperative agreement programs with state, municipal, and territorial governments. These agreements were aimed at upgrading bioterrorism preparedness and response capabilities at state and local public health agencies, hospitals, and emergency medical service

agencies, and the participants were required to complete specific activities designed to build public health and health care capacities. In fiscal years 2002 and 2003, HHS distributed a total of $2.5 billion toward this effort.

The General Accounting Office (GAO) has performed several studies relating to the public health system's preparedness for bioterrorist attacks and natural infectious disease outbreaks. In testimony last year,[1] GAO described how efforts of state and local public health agencies to prepare for a bioterrorist attack have improved the Nation's capacity to respond to infectious disease outbreaks and other major public health threats, but also noted that gaps in preparedness remain. For example, most hospitals reported participating in basic planning activities for large-scale infectious disease outbreaks and training staff about biological agents, but most hospitals also lacked adequate equipment, isolation facilities, and staff to treat the large increase in the number of patients that could result from a bioterrorist attack. Not surprisingly, GAO found that jurisdictions that have had multiple prior experiences with public health emergencies, including natural disasters, demonstrated the highest levels of preparedness. In another study, GAO also found that while contingency plans for disease outbreaks or bioterrorist events are being developed at the state and local levels, planning for regional coordination that transcends state boundaries was lacking.[2]

Information Technology for Disease Surveillance and Information Sharing

Information technology (IT) systems can play a critical role in both detecting and responding to a public health emergency. Relevant examples of IT-facilitated information gathering include systems for environmental sampling and detection of bioterrorist agents or other infectious diseases; surveillance systems that provide ongoing collection and analysis of data related to behavior or symptoms potentially associated with disease outbreaks; and systems that facilitate the timely delivery of information to relevant responders and decision-makers. Ongoing advances in the development and deployment of sampling and surveillance systems are particularly critical, as early detection of a bioterrorist attack or disease outbreak enables public health officials to issue warnings and execute containment and treatment plans to mitigate the potential effects of the incident.

A large number of surveillance and information sharing systems are operational or planned throughout the country. In spring of 2003, a GAO survey of just six federal agencies identified about 70 such systems.[3] One example is the Department of Defense's Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE). This system is designed to support early identification of infectious disease outbreaks among personnel using military treatment facilities. The system works by gathering daily data on symptoms reported by patients and alerting officials when data show abnormal patterns. Another federal system is the CDC's Health Alert Network, which is aimed at ensuring communications capacity at all local and state health departments; ensuring that these departments have the capacity to receive distance learning offerings from CDC and others; and ensuring that the public health system has the capacity to broadcast and receive health alerts at every level.

6. Questions for Witnesses

Questions for Mr. Schable

- How does the CDC work with State and local governments on preparedness for a bioterrorist attack?
- What tools and systems has the CDC developed, or is in the process of developing, to assist State and local governments in detecting and responding to a bioterrorist attack?
- If a bioterrorist attack occurred, what role would the CDC play in the response and how would the CDC coordinate with first responders, State and local governments, and health services providers?

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[1] U.S. General Accounting Office testimony before the Committee on Government Reform, House of Representatives on April 9, 2003; GAO–03–654T.

[2] U.S. General Accounting Office testimony before the Subcommittee on Emergency Preparedness and Response, Select Committee on Homeland Security, House of Representatives on September 24, 2003; GAO–03–1176T.

[3] U.S. General Accounting Office, Information Technology Strategy Could Strengthen Federal Agencies' Abilities to Respond to Public Health Emergencies, May 2003, GAO–03–139. The six agencies surveyed were the Department of Defense, the Department of Health and Human Services, the Department of Energy, the Department of Agriculture, the Environmental Protection Agency, and the Department of Veterans Affairs.

Questions for Mr. Turner

- Please describe the elements of the Shawnee Mission Medical Center (SMMC) bioterrorism response plan. How has the plan been tested? Was the plan employed during last year's cryptosporidiosis outbreak? What lessons were learned from that experience and any other tests of the plan?
- How would you compare the SMMC bioterrorism response plan with the plans in place at similarly-situated hospitals throughout the country?
- How have Federal, State, and local governments provided coordination and assistance in SMMC's efforts to prepare for a bioterrorist attack? What could these governments do to improve their efforts to help hospitals be better prepared for a bioterrorist attack?

Questions for Mr. Mason

- How does the current system for communication and coordination between hospitals and public health officials throughout the region work to facilitate overall first responder performance? How has this system changed or improved over the past several years?
- How have recent technology advancements improved the performance records of first responders?
- What could the Federal Government do to improve its efforts to help Johnson County be better prepared for a bioterrorist attack?

Questions for Mr. Morrissey

- What are the elements of the Kansas Bioterrorism Preparedness Program? What level of readiness currently exists in each of these elements, or "focus areas"?
- What systems have been put in place by the Kansas Department of Health and Environment for early detection of a possible bioterrorist attack? Is there clear integration and coordination among the public health system, first responders, and government officials about what to look for when trying to detect an attack and how to track information that may be useful for detection?
- In Kansas, how do federal, state, and local officials interact in developing bioterrorism preparedness plans? What could the Federal Government do to improve its contributions to support state and local preparedness?

Questions for Ms. Kent

- What is the Lawrence-Douglas County Health Department's role in regional preparedness for a potential bioterrorist attack?
- How have Federal and State governments facilitated Lawrence-Douglas County's efforts to prepare for a bioterrorist attack? What could these governments do to improve their efforts to help the county be better prepared for a bioterrorist attack?
- Last summer, when the Kansas City area experienced an outbreak of cryptosporidiosis, how did your department interact with the CDC? Did the CDC offer the department and other local organizations an appropriate level of support during that outbreak?

Questions for Dr. Kendall

- What tools and systems is the Institute of Environmental and Human Health (TIEHH) working on to detect and respond to a bioterrorist attack? What organizations provide the funding to support this research and development? How are the resulting technologies transitioned to users?
- How does the TIEHH work with first responders and State and local government organizations to understand their needs for the technologies being developed at TIEHH? How do you work with them on education, training, and outreach?
- How can the Federal Government, particularly the Department of Homeland Security, improve its efforts to help communities be better prepared for a bioterrorist attack? Are there specific areas that demand increased attention?

Mr. NEUGEBAUER. We will call to order the Science Committee hearing for *Bioterrorism Preparedness: People, Tools, and Systems for Detecting and Responding to a Bioterrorist Attack.* It's good to be here at Shawnee Mission Medical Center.

Mr. Turner, thank you for allowing us to have this hearing here today. We appreciate that very much and it's good to be with my friend and colleague, Congressman Moore from Kansas.

I want to say to the people in Kansas that you are well represented by Mr. Moore and other great Members from the Kansas delegation and so it's a pleasure to be in Kansas today.

Before I read my opening statement, I was thinking flying here yesterday about this hearing and those of us that, I look around the room, some of us grew up during the Cold War era and we remember the threat of a nuclear attack and the drills and the preparedness that we went through in our nation for a different kind of attack. Today, we're going to be talking about becoming more prepared for a different kind of threat to our nation and how we begin to, as we did in the Cold War, detect that threat, to respond to that threat and to mitigate that threat.

And so I'm looking forward to today, and I know that we have a very distinguished group of panelists and we're looking forward to hearing from them.

So I'll read my opening statement. First, I'd like to thank again my friend, Mr. Moore, Congressman Moore, for hosting this field hearing, his home state of Kansas. And I'd like to thank our panel of distinguished witnesses, Dr. Charles Schable; Mr. Turner, our host; Mr. Richard Morrissey, Ms. Kent and Mr. Brad Mason and my good friend, Dr. Ron Kendall, appearing before the Science Committee today.

I'd like to recognize Dr. Kendall because he's from my home town of Lubbock, Texas. Dr. Kendall is Director of the Institute of Environmental and Human Health or what we like to call TIEHH at Texas Tech University. He's an expert in environmental toxicology. He leads the Admiral Elmo R. Zumwalt National Program for Countermeasures to Biological and Chemical Threats, which includes work on detection, biological mechanisms, physical and medical countermeasures, modeling, education, training and outreach. Thank you, Dr. Kendall, for being here today. Thank you for taking time out of your busy schedule.

At this time in American history, our national security has become the most important issue facing our nation. The events of September 11, along with our anthrax attacks in 2001, have increased the Nation's concern about bioterrorism and our ability to respond to those attacks.

Public health professionals play a vital role in preparing and coordinating emergency personnel for such events. They are responsible for detecting, investigating and identifying disease outbreaks and simultaneously communicate effective information for our first responders, the media and the public. The capacity to fulfill these responsibilities depends on the strength of the infrastructure that supports our public health services. Today, we are going to receive testimony on state and local preparedness for bioterrorist attacks and discuss the role of our Federal Government in supporting local efforts to prepare for, detect and respond to these attacks. We will

also talk about developing and deploying the necessary tools and systems for detecting and responding to those attacks.

Again, I thank you for being here and I look forward to hearing your testimony.

Mr. Moore.

[The prepared statement of Mr. Neugebauer follows:]

PREPARED STATEMENT OF REPRESENTATIVE RANDY NEUGEBAUER

First, I'd like to thank Mr. Moore for hosting this field hearing in his home state Kansas; and I'd like to thank our panel of distinguished witnesses, Mr. Charles Schable, Mr. Samuel Turner, Mr. Richard Morrissey, Ms. Kay Kent, Mr. Brad Mason, and Dr. Ronald J. Kendall for appearing before the Science Committee today.

I would also like to recognize Dr. Kendall as he is here from my hometown, Lubbock Texas. Dr. Kendall is the Director of the Institute for Environmental and Human Health, or what we like to call TIEHH, at Texas Tech University. He is an expert in environmental toxicology. TIEHH leads the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats, which includes work on detection, biological mechanisms, physical and medical countermeasures, modeling, and education, training, and outreach.

Thank you Dr. Kendall. And thank you all for taking time out of your busy day to be here to talk about this important issue.

At this time in American history, our national security has become the most important issue facing our nation. The events of September 11th along with the anthrax attacks in 2001 have increased the Nation's concern about bioterrorism and our ability to respond to attacks. Public health professionals play a vital role in preparing and coordinating emergency personnel for such events. They are also responsible for detecting, investigating and identifying disease outbreaks and simultaneously communicate effective information with first responders, the media, and the public. The capacity to fulfill these responsibilities depends on the strength of the infrastructure that supports public health services.

Today we are going to receive testimony on state and local preparedness for a bioterrorist attack and discuss the role of the Federal Government in supporting local efforts to prepare for, detect, and respond to an attack. We will also talk about developing and deploying the necessary tools and systems for detecting and responding to a bioterrorist attack.

Again, thank you all for being here. I look forward to hearing your testimony.

Mr. Moore.

Mr. MOORE. Good morning. I'd like to thank my good friend, Randy Neugebauer for being here from Texas this morning and all of you, the witnesses and people who have attended this hearing.

I want to invite all of you to participate in this important hearing this morning and we're fortunate to have, we're very fortunate to have the opportunity to hold this hearing at the Shawnee Mission Medical Center and I thank my friend Sam Turner for letting us use this great facility.

And Randy, thank you, for traveling up from Lubbock, Texas to be with us here today. He does a great job in Congress and I really appreciate his willingness to hold a hearing here in our Congressional District.

I feel fortunate to serve on the Science Committee for Republicans and Democrats who are able to work together in a bipartisan spirit toward many common goals on issues that have a day to day impact on the quality of an American's life.

We have assembled an impressive panel of witnesses. Mr. Neugebauer has already introduced those, so I'm not going to read all the names again, but I think each of them has a great deal to contribute to the goals of our hearing here today. And I want to thank each of the witnesses for taking their time out of their busy schedules to come here and share their expertise with us.

You will have an opportunity, and I'm going to ask the Chairman for an opportunity, five days after the conclusion of this hearing, for people to submit written statements, if we can do that, Mr. Chairman?

Mr. NEUGEBAUER. Without objection, so ordered.

Mr. MOORE. Thank you, sir. I'll never forget my first visit to the World Trade Center or actually, it was my second visit to the World Trade Center, about two weeks after September 11. I don't think any of us will ever forget the thousands of people who died and the children who lost a parent that day. Shortly after those vicious attacks at the World Trade Center and at the Pentagon, another kind of terror was encountered in Washington, D.C. and throughout our nation's postal system. Anthrax was found to have killed two postal workers and the contamination had spread through numerous federal buildings. The containment and clean up following that event was extraordinarily expensive, complicated and disturbing for all those who were involved in the clean up process.

Since the months that followed those attacks of terror, we've been confronted, both as a nation and as a community here in the Kansas City area, with more naturally occurring, but significant infectious disease outbreaks. Whether we're dealing with vaccine shortages for an unusually tough strain of influenza or something more disturbing like anthrax infections, we know that our preparedness to deal with a bioterrorist attack can have a positive bearing on overall public health and infectious disease challenges.

In October of 2001, I co-hosted the Metropolitan Meeting on Biological and Chemical Weapons. Three hundred law enforcement, emergency response and health care professionals were invited and we had a tremendous showing at that first meeting about two weeks after September 11, excuse me, about a month after September 11. In fact, we invited first responders. We invited public health officials, law enforcement personnel, firefighters, emergency medical service personnel, elected public officials and people from various hospitals throughout the greater Kansas City metropolitan area and again, we had a tremendous attendance.

My objective in that first meeting was to find out, about a month after September 11, where we were as a nation and specifically, in the Kansas City metropolitan area, in terms of being prepared to deal with a bioterrorist threat, attack in the Kansas City area. At that time, we really discovered, I think, and we listened. Karen McCarthy, Representative McCarthy from right across the state line and myself were the co-hosts, and we listened to the various people who appeared and testified. And I think at that time, we were light years from where we needed to be in terms of preparedness. And we have come a long way since mid-October of 2001 in terms of being prepared for something further in this area, but we still have a ways to go.

And last June, I co-hosted the Homeland Security Forum in the Greater Kansas City Area for additional follow-up. This brought together regional stakeholders like each of you, to assess how far our region has come in its efforts to promote a regional response to homeland security issues. While throughout the country as a whole, we still have room to improve on that score, I am pleased

that we have come a long way here in the Kansas City metropolitan area.

Some of you may have experienced delays and difficulties in obtaining funding that you need to provide the level of preparedness that's needed by our communities. And I want to learn about these roadblocks you may have experienced as you've sought funding, as well as other difficulties you've had.

I also want to hear about success stories, and to remind you that I'm available to support your efforts to request grants, assist in grant searches and provide information about potential funding.

Kansas City is one of the 30 cities to receive the High Threat Urban Area Security Initiative Account Program funding. In Fiscal Year 2003, the metropolitan area received $9.6 million and $13.2 million for Fiscal Year 2004. This federal funding recognizes some of the serious needs and drastic funding shortfalls created in the federal formulas for distributing homeland security funding to communities most vulnerable to terrorism, but there are still other problems. We've read and heard a great deal about how state lines and other jurisdictional boundaries have become unnecessary obstacles and the efforts to achieve much needed communication and cooperation between people and organizations. Yet, I think in this area, particularly, I'm very proud of the fact that we're working very well together, Missouri and Kansas residents and the whole metropolitan area, in Kansas City to address this very serious threat.

We hope that another attack never happens, but we have to be prepared and expect the worse in case it does and make provisions for that. Great strides are being made, yet local public officials just like the panel before us today, continue to report shortages of adequate medical equipment and work forces to handle potential sudden surges from epidemic levels of infection.

We can make great strides here. I'm really anxious to hear all of you, so I'm going to stop talking now and again, thank Congressman Neugebauer for coming here today to chair this hearing in Kansas. Congressman Neugebauer has already indicated that if you're not one of the witnesses or if you are a witness, please if you have additional statements to submit within five days of today's hearing, please do so and they will be made part of the record.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Moore follows:]

PREPARED STATEMENT OF REPRESENTATIVE DENNIS MOORE

Good morning. Welcome to all of you who have come to listen and participate in this important hearing today. We are fortunate and very appreciative to have the opportunity to hold this hearing today here at Shawnee Mission Medical Center, I extend my gratitude to you, Mr. Turner as well as all of your staff here at SMMC, for making this space available to us today. I also want to extend my warm welcome to my Colleague, Mr. Neugebauer and to thank him for traveling to Kansas today to preside at this hearing. I feel fortunate to serve on the Science Committee, where Republicans and Democrats are able to work together in a bipartisan spirit towards many common goals, on issues, that have a day to day impact on the quality of life for all Americans.

We have assembled an impressive panel of witnesses with vast expertise in many technical and administrative areas that bear upon our readiness to face the challenges of preparedness for a bioterrorist attack. I want to thank each of our witnesses for the time and energy they expended in preparing for this hearing. Your

carefully written and informative testimony is a reflection of your commendable dedication to your jobs and the people that you serve.

I will never forget my visit to the World Trade Center site shortly after September 11th. None of us can ever forget the thousands who died and the children who lost a parent that day. Shortly following those vicious attacks at the World Trade Center, and at the Pentagon, another kind of terror was encountered in Washington, and throughout our nation's postal system. Anthrax was found to have killed two postal workers, and that the contamination had spread through numerous federal buildings. The containment and clean-up following that event was extraordinarily expensive, complicated and disturbing for all those who had been at risk of being exposed.

Since the months that followed those attacks of terror, we have been confronted both as a nation and as a community here in the Kansas City area with more naturally occurring but significant infectious disease outbreaks. Whether we are dealing with vaccine shortages for an unusually tough strain of influenza, or something more disturbing like anthrax infections, we know that our preparedness to deal with a bioterrorist attack can have a positive bearing on overall public health challenges.

In October 2001, I co-hosted the Metropolitan Meeting on Biological and Chemical Weapons; 300 law enforcement, emergency response and health care professionals were invited. At that time, we discovered how little coordination there was between local, State and federal agencies. In June of last year, I also co-hosted the Homeland Security Forum in the Greater Kansas City Area. This follow-up event brought together regional stakeholders like each of you to assess how far our region has come in its efforts to promote a regional response to homeland security issues. While throughout the country as a whole we still have room to improve on that score, I am pleased at how far we have come here in the Kansas City metropolitan area.

Many of you have experienced delays and difficulties in obtaining the funding that you need to provide the level of preparedness that is needed by our communities. Today I want to learn about these roadblocks you may have experienced as you have sought funding, as well as other difficulties you may be having. I also want to hear some of your success stories, and to remind you that I am available to support your efforts to request grants, assist in grants searches, and provide information about potential funding.

I am pleased Kansas City is one of 30 cities to receive High Threat Urban Area Security Initiative Account program funding (UASI). In fiscal year '03 the metropolitan area received $9.6 million dollars and $13.2 for FY04 from UASI. This federal funding recognizes some of the serious needs and drastic funding shortfalls created in the federal formulas for distributing homeland security funding to communities most vulnerable to terrorism. However, we know that it is not enough; problems remain.

We have read and heard a great deal about how state lines and other jurisdictional boundaries have become unnecessary obstacles in the efforts to achieve much needed communication and cooperation between people and organizations. Yet, everyone on both sides of a political boundary or state line, face the same urgent challenge: to be prepared for whatever bioterrorist or other wide-spread infectious disease threats whenever they may strike. We of course all hope that we will never be confronted with a bioterrorist attack. But after September 11th, we all have a stronger sense of the value of being prepared.

In conclusion, numerous governmental and private entities must be effectively coordinated for a bioterror related event to be met with the appropriate level of response. We have many new and impressive technologies available to aid in the task of early detection, containment and treatment for victims. We also have access to sophisticated state-of-the-art communications equipment to aid in the task of issuing early warnings to potential victims, and directives to health professionals in the field. Great strides are being made. Yet, local public health officials, just like the panel before us today continue to report shortages of adequate medical equipment, and work forces to handle potential sudden surges from epidemic levels of infections. This is a challenge that we must be prepared to meet and I believe that this hearing today will offer us some information to help us in reaching toward that goal.

Mr. NEUGEBAUER. What we'll do is we'll give each member of our panel an opening statement, your statement, the written testimony will be entered into the record as the gentleman mentioned. And then if we ask you questions and you want to submit some additional information, you have five days to do that.

And we're going to start with Mr. Schable, and if you would just kind of introduce yourself, a little bit about what capacity you're in today.

Welcome, Mr. Schable.

STATEMENT OF CHARLES A. SCHABLE, DIRECTOR OF THE BIOTERRORISM PREPAREDNESS AND RESPONSE PROGRAM, CENTERS FOR DISEASE CONTROL AND PREVENTION, U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Mr. SCHABLE. Thank you, Congressman. Good morning, everyone. I am Charles Schable and I am Director of the Bioterrorism Preparedness and Response Program of the National Center for Infectious Diseases, the Centers for Disease Control and Prevention in Atlanta.

Thank you for the opportunity to join you to testify today about CDC's bioterrorism preparedness efforts. I was last in Kansas City in 2001 when the investigation of the anthrax attacks through the mail led us to a mail sorting facility here that was contaminated and I was part of the response team CDC sent here to work with state and local officials. Fortunately, no human cases occurred here, but the experience afforded me the opportunity to witness an example of productive collaborations between federal, state and local public health, law enforcement and postal officials, under extremely trying circumstances. These types of working relationships are part of the foundation of a strong public health system that leads to effective preparedness for and response to threats to health, whether they be manmade or naturally caused.

With our partners, CDC continues to make vast strides toward achieving optimal terrorism preparedness and emergency response capacity at the federal, state and local levels and is committed to strengthening the capacity of the public health system to respond to both routine and emergent health threats. In 1999, CDC began a program of providing technical assistance and funding to state, local and territorial public health departments to develop capacity to respond to terrorism events and related public health emergencies.

In FY 2002, Congress appropriated a substantial increase in funding for this preparedness effort and CDC's state and local cooperative agreement program has grown rapidly as a result. The resources provided through this program support 62 grantees in the development of critical public health preparedness capacities, including preparedness planning and readiness assessment, surveillance in epidemiology, biological and chemical laboratory capacity, communications systems and information technology, health information dissemination and risk communication and education and training.

States and localities have made substantial progress toward achieving optimal levels of preparedness since the terrorist attacks of fall 2001. For example, every state has developed an emergency preparedness and response plan and nearly 90 percent of states have trained public health practitioners to respond to terrorism. Recent events such as the SARS, monkeypox and avian influenza outbreaks, have underscored the essential role early detection systems play in mobilizing rapid response. Detection of a disease al-

most always occurs at the local level where health care professionals encounter patients seeking medical assessment or treatment. A clinician's ability to quickly recognize and identify symptoms of unusual illnesses on the front line has been critical to the CDC's ability to recognize unfolding disease events and implement containment measures to prevent further spread of disease.

For many years, CDC has made significant achievements in building or enabling state and local health agencies to build information systems that support the practice of public health, however, many of these systems operate in isolation, not capitalizing on the potential for a cross fertilization of data exchange. The Public Health Information Network provides a framework to better integrate these data streams.

Another tool in development to address the detection of threats is the recently announced biosurveillance initiative, which is part of an interagency effort that crosses multiple sectors including food supply, environmental monitoring and human health surveillance, and its benefits will be felt in all state and local health departments. By integrating these otherwise isolated data sources, potential public health emergencies can be identified more rapidly.

In conclusion, CDC is committed to working with federal, state and local partners to protect the Nation's health. Our best public health strategy against disease is the development, organization, and enhancement of public health disease detection systems, tools, and the people needed to wield them. While we have made substantial progress towards enhancing the Nation's capability to rapidly detect disease within our communities, improving our response and containment strategies, and developing plans to recover from tragic events, much remains to be done.

CDC is very grateful for the congressional support received to date and looks forward to continuing to work with Congress and Members of this committee as we strive to protect the public's health from terrorism and other public health emergencies.

Thank you for the opportunity to testify on this most important topic. At this time I am happy to answer any questions you may have.

[The prepared statement of Mr. Schable follows:]

PREPARED STATEMENT OF CHARLES A. SCHABLE

Good morning, Mr. Chairman and Members of the Committee. I am Charles A. Schable, M.S., Associate Director for Emergency Response and Preparedness, National Center for Infectious Diseases (NCID), Centers for Disease Control and Prevention (CDC), and Director of NCID's Bioterrorism Preparedness and Response Program. It is a pleasure to testify before your committee. CDC's mission, as part of the Department of Health and Human Services, is to protect the health and safety of the American people through activities that range from terrorism preparedness and response, to promoting worker safety, to preventing birth defects and limiting the spread of infectious diseases. The program I lead provides agency-wide coordination, with CDC's Office of Terrorism Preparedness and Emergency Response, to prepare our nation for and rapidly respond to a bioterrorism event anywhere in the United States. Thank you for the opportunity to join you in Kansas to testify today about CDC's bioterrorism preparedness efforts.

CDC continues to make vast strides toward achieving optimal terrorism preparedness and emergency response capacity at the federal, State, and local levels and is committed to strengthening the capacity of the public health system to respond to both routine and emergent health threats. To achieve this imperative, we must continue to prepare the broader public health infrastructure to respond to a wide range of public health emergencies. Today, I will address how CDC works with state and

local governments to prepare for a bioterrorist attack, explain some of the systems and tools used by CDC to detect and respond to a bioterrorist attack and describe CDC's role in response and coordination with other state and local health officials, and other health service providers.

State and Local Readiness

Today, as a result of the more than $3 billion investment Congress and the Administration devoted over the past three fiscal years, the front-lines of public health are better prepared to detect terrorism and deal with its consequences, and there are specific initiatives underway at CDC and in each state to make America safer.

While much progress has been made strengthening the Nation's defenses against biological attacks, President Bush instructed his administration to review its efforts and find new and better ways to secure America. The result of this review is Biodefense for the 21st Century, a recently approved presidential directive that builds on our past accomplishments, specifies roles and responsibilities, and integrates the programs and efforts of various communities—national security, public health, law enforcement, etc.—into a sustained and focused national effort.

In 1999, CDC began a program of providing technical assistance and funding to state, local and territorial public health departments to develop capacity to respond to terrorism events and related public health emergencies. In FY 2002, Congress appropriated a substantial increase in funding for this preparedness effort, and CDC's state and local cooperative agreement program has grown rapidly as a result. The resources provided through this cooperative agreement program support 62 grantees in the development of critical public health preparedness capacities, including preparedness planning and readiness assessment; surveillance and epidemiology; biological and chemical laboratory capacity; communications systems and information technology; health information dissemination and risk communication; and education and training.

States and localities have made substantial progress toward achieving optimal levels of preparedness since the terrorist attacks of fall 2001. For example, every state has developed an emergency preparedness and response plan and nearly 90 percent of states have trained public health practitioners in responding to terrorism. In addition, every state either has achieved or is moving toward around-the-clock capacity to send and receive critical health information, and 42 states can transmit information among state and local public health officials, hospitals, emergency departments, and law enforcement. CDC's overarching goal in this arena is to have systems in place in each community that protect citizens from infectious diseases, environmental threats, and terrorism, and these achievements represent substantial progress toward that end.

Commensurate with CDC's agency-wide emphasis on rigorous measurement of programmatic impact, CDC will begin pilot testing performance indicators in FY 2004 in an effort to better define and establish a fundamental level of public health preparedness. The data generated by these standardized indicators will provide a framework for future cooperative agreement guidance, allow for accurate evaluation of grantee progress, and enable more targeted technical assistance. Moreover, these data will make an essential contribution toward defining what it actually means to be "prepared" at the state or local level. CDC anticipates incorporating the goals, objectives, and measures of this performance indicators effort into the state and local cooperative agreement guidance for FY 2005.

CDC's Role in Response

In the event of a bioterrorist attack in the United States, CDC would provide public health advice to and support the Department of Health and Human Services in orchestrating the public health response to the attack. CDC would confirm that a biological agent had been released, identify the agent, determine how the agent was or is transmitted, and provide guidance in the development and implementation of effective control measures. CDC would assist the state and local health agencies in addition to the efforts described above, by providing federal resources in support of critical health and medical efforts, to include medical materiel housed within the Strategic National Stockpile; deploying public health subject matter experts and technicians to assist in managing efforts necessary to detect possible additional bioterrorist attacks; and providing recommendations on immunization and prophylaxis of the at risk population and guidance and recommendations for the treatment, isolation or quarantine of infected individuals. CDC would provide recommendations related to occupational safety issues for first responders and work on risk communication issues related to public health.

Systems and Tools

An important element to successful defense against any threat to the Nation's public health, whether naturally occurring or deliberately caused, continues to be accurate, early recognition of the problem.

Disease surveillance systems can prepare the Nation for potential terrorist threats. "Disease surveillance systems" or disease detection systems, address one important aspect of our nation's overall public health preparedness. CDC, in collaboration with our federal, State, and local partners is working to build systems that can: (1) rapidly detect an event in our communities; (2) mobilize the appropriate response to contain the event, and (3) ensure affected communities quickly return to a sense of normalcy. These are what we refer to as our foundations of public health readiness.

National disease detection can best be described as the ongoing collection, analysis and dissemination of public health data related to illness and injury. These ongoing data collection and analysis activities enable public health officials to detect disease early, thus resulting in faster intervention to control and contain the consequences created by the causative agents. Without these early detection systems, the consequences of outbreaks of infectious disease and human exposures to agents such as chemicals and radiation would take a much greater toll by way of increased illness, injury, and in some cases death. Recent events, such as the SARS, monkeypox and avian influenza outbreaks, have underscored the essential role early detection systems play in mobilizing rapid response. Detection of a disease almost always occurs at the local level where health care professionals encounter patients seeking medical assessment or treatment. A clinician's ability to quickly recognize and identify symptoms of unusual illnesses on the front-line has been critical to the CDC's ability to recognize unfolding disease events and implement containment measures to prevent further spread of disease, thus mitigating further harm to the public.

Awareness and diagnosis of a condition by a clinician or laboratory is a key element of our current disease detection systems. Clinicians and laboratories report diseases to state and local health departments, which in turn share information with CDC. CDC works with its public health partners to define conditions that should be reported nationally. Health departments share these definitions and guidelines with health care providers, infection control practitioners, emergency department physicians, laboratorians, and other members of the health care system to ensure accurate and timely reporting.

Many local reporters of disease incidence still report to public health authorities on paper via facsimile. If a case of illness is particularly unusual or severe (such as a case of anthrax), the local health care worker may call the local health department immediately to report the case. Current reporting systems are largely paper-based and burdensome to both providers and health departments, often resulting in reports which are neither complete nor timely. In addition to initial detection, these detection and reporting systems play a pivotal role in the detection of subsequent cases and help support the management of the event once a response/investigation are initiated. Such information is vital to coordinating response decisions, which ultimately lead to the containment of an outbreak.

A comprehensive detection and reporting system requires a strong foundation at all levels of local, State, and federal public health agencies. CDC has been working with state and local health agencies for many years to build the public health infrastructure to improve disease detection and reporting systems.

Some examples of how states use their bioterrorism funding include:

Initiating implementation of a secure web-based disease detection and reporting system to improve the timeliness and accuracy of disease reporting.

Implementing a new hospital tracking system to detect possible outbreaks by monitoring the number of patient admissions and ambulance diversions at hospitals. This system provides a way for hospitals to obtain instant messages and alerts.

Developing early warning systems based on symptom data from emergency departments to detect unusual patterns of illness and automatically alert hospitals and public health agencies when the incidence of disease exceeds a critical threshold. Use of such early warning systems might enable the earliest possible response and intervention before an outbreak or epidemic spreads.

Other related activities useful for early detection of emerging infections or other critical biological agents include CDC's Emerging Infections Programs (EIP). Through the EIP, state and local health departments receive funds to conduct population-based surveillance that goes beyond their routine function to develop "next

generation" surveillance science, and often involves partnerships among public health agencies and academic medical centers. In addition, CDC has established networks of clinicians that serve as "early warning systems" for public health by providing information about unusual cases encountered in the clinical practices. As noted earlier, these relationships, particularly between health care providers and local health departments, are the foundation on which disease detection systems operate.

Public Health Information Network

For many years CDC has made significant achievements in building or enabling state and local health agencies to build information systems that support the practice of public health. However, many of these systems operate in isolation, not capitalizing on the potential for a cross-fertilization of data exchange. A crosscutting and unifying framework is needed to better integrate these data streams for early detection of public health issues and emergencies. The Public Health Information Network (PHIN) provides this framework. Through defined data, vocabulary standards and strong collaborative relationships, the PHIN will enable consistent collection and exchange of response, health, and disease tracking data among public health partners. Ensuring the security of this information is critical as is the ability of the network to work reliably in times of national crisis. PHIN encompasses four key components: (1) detection and monitoring; (2) analysis and interpretation; (3) information dissemination and knowledge management; and (4) public health response. Each of these components is briefly described below.

Public health information systems must support functions that include:

Early event detection—BioSense (described later in this testimony) is being developed to support early event detection activities associated with a possible bioterrorism threat. Regional health data will be sent to authorized health officials detailing health trends that could be related to a possible bioterrorism attack.

Routine public health surveillance—The National Electronic Disease Surveillance System (NEDSS) supports routine surveillance activities associated with the rapid reporting of disease trends to control outbreaks. The NEDSS platform allows states to enter, update and electronically transmit demographic and notifiable disease data.

Secure communications among public health partners—The Epidemic Information Exchange, or Epi-X, technology allows for the secure exchange of communications among participating public health partners via the web by providing up-to-the-minute information, reports, alerts, and discussions about terrorist events, toxic exposures, disease outbreaks, and other public health events.

Management and dissemination of information and knowledge—The Health Alert Network's architecture upgraded the capacity of state and local health agencies to communicate different health threats such as emerging infectious and chronic diseases, environmental hazards, as well as bioterrorism related threats.

Other functions include—Analysis and interpretation of relevant public health data and public health response systems.

PHIN will provide the framework for these functions to serve as part of an integrated and inter-operable network critical in establishing a more effective public health system.

Since the majority of the data management needs come after disease is detected, CDC through PHIN is investing in information systems to support our public health response teams and our Director's Emergency Operations Center (DEOC) in Atlanta and to assist state and local health agencies in tracking and managing vital public health information before, during, and after an event has occurred. CDC's DEOC, which opened in 2003, serves as the centralized facility for collaboration to gather and disseminate information to ensure a timely, coordinated and effective public health response.

Biosurveillance Initiative

Recognizing the need to increase our current disease surveillance and detection capabilities, the President, on February 3, 2004, issued Homeland Security Presidential Directive 9 (HSPD–9), which states in part:

"The Secretary of Homeland Security shall coordinate with the Secretaries of Agriculture, Health and Human Services, and the Administrator of the Environmental Protection Agency, and the heads of other appropriate Federal depart-

ments and agencies to create a new biological threat awareness capacity that will enhance detection and characterization of an attack."

CDC's role in this biosurveillance initiative focuses on human health and involves three distinct but interrelated elements. The first is BioSense, a state-of-the-art, multi-jurisdictional data sharing program to facilitate surveillance of unusual patterns or clusters of disease around the country. This data sharing effort will support early detection of potential terrorism events while minimizing the reporting burden for state and local health departments and clinical personnel.

The second element of the initiative centers on the addition and expansion of quarantine stations at U.S. ports of entry and assigning multi-disciplinary teams of quarantine officers, public health advisors, epidemiologists, and information technicians to these sites. This effort will assure effective monitoring of U.S. and international regulatory requirements for travelers, rapid communication of disease intelligence information to federal, State, local and international partners, and consistent supervision of clinical and research material movement through ports of entry.

The Laboratory Response Network, which serves as a point of integration for federal, State, local and territorial laboratories to ensure rapid and proficient laboratory diagnosis of emerging bioagents and environmental contaminants, is the third and final component of the biosurveillance initiative. Additional resources in FY 2005 will allow the Laboratory Response Network to expand its reach into food safety and animal diagnostic labs, thereby strengthening the Nation's laboratory infrastructure for timely and accurate reporting of a potential bioterrorism attack.

The biosurveillance initiative is part of an interagency effort that crosses multiple sectors, including food supply, environmental monitoring, and human health surveillance, and its benefits will be felt in all state and local health departments. By integrating these otherwise isolated data sources, potential public health emergencies that may have gone undetected can be identified more rapidly. Through the biosurveillance initiative and ongoing capacity-building efforts at the state and local levels, the FY 2005 budget request will continue to enhance front-line emergency preparedness.

Conclusion

CDC is committed to working with federal, State, and local partners to protect the Nation's health. Our best public health strategy against disease is the development, organization, and enhancement of public health disease detection systems, tools, and the people needed to wield them. The astute clinician remains the critical link in disease detection and reporting. The first case of West Nile in 1999, and the first case of anthrax reported in early October 2001, were identified by astute clinicians. Training and education of these front-line health protectors remain a high priority for CDC and will continue to be a priority as we strive to improve all components of the Nation's disease detection systems.

While we have made substantial progress towards enhancing the Nation's capability to rapidly detect disease within our communities, improving our response and containment strategies, and developing plans to recover from tragic events, much remains to be done. CDC is very grateful for the congressional support received to date and looks forward to continuing to work with Congress and Members of this committee as we strive to protect the public's health from terrorism and other public health emergencies.

Thank you for the opportunity to testify on this most important topic. At this time I would be happy to answer any questions.

BIOGRAPHY FOR CHARLES A. SCHABLE

Mr. Schable is currently the Director of the Bioterrorism Preparedness & Response Program at the U.S. Department of Health and Human Services' Centers for Disease Control and Prevention, National Center for Infectious Diseases. At CDC, Mr. Schable has also served as Deputy Director (1998–2002), Division of AIDS, STD & TB Laboratory Research, NCID; Chief (1984–1998), HIV Serology Section, Immunology Branch, DASTLR, NCID; Chief (1976–1984), Serology Section, Hepatitis Branch, DVRD, NCID, Phoenix, AZ.; Microbiologist, (1967–1976), Serology Section, Hepatitis Division, NCID.

Mr. Schable received his B.S. in Microbiology in 1967 and his M.S. in Microbiology/Immunology (1976) from Arizona State University, Tempe, AZ. His honors include USPHS Commendation Medal (1986), Outstanding Unit Citation (1989), Citation (1992), Outstanding Service Medal (1994), Achievement Medal (1996); CDC

Group/Professional Honor Award (1982, 1994, 1998), American Society for Microbiology Elizabeth O. King Award (1982).

Mr. Schable is a member of the Commissioned Officers Association, the American Society for Microbiology, the National Registry of Microbiologists, and Sigma Xi, National Committee for Clinical Laboratory Standards. He is the author/co-author of 85 research and review articles.

Mr. NEUGEBAUER. Thank you, Mr. Schable. What we're going to do is go through the entire panel and then we will come back in for individual questions.

Our host, Mr. Samuel Turner.

STATEMENT OF SAMUEL H. TURNER, SR., CHIEF EXECUTIVE OFFICER, SHAWNEE MISSION MEDICAL CENTER

Mr. TURNER. Thank you, Mr. Chairman and Congressman Moore. There are few things that scare a hospital administrator more than the threat of bioterrorism. There are issues like staffing shortages, reimbursement for patient care, capital needs for aging facilities, the list is endless. However, many of these issues are within our creative control and can be addressed through diligent efforts to make change.

The threat of bioterrorism isn't so easily controlled. We don't know when it will strike. It could be an hour from now or 10 years from now. We don't know in what form it will take hold. It could be anthrax or smallpox. There's no way to estimate the scope of the event. It could affect 10 people or 10,000 people. These are the thoughts that challenge us during the day and keep us up at night.

I am pleased to have the opportunity to share information with you today about the current situation at Shawnee Mission Medical Center. We have the largest emergency department in Johnson County serving nearly 50,000 patients annually. In the entire State of Kansas, only three other hospitals report as many visits.

Over the past several years, community demand for services here has grown steadily, and as a result, we are substantially expanding our facility. The expansion is desperately needed, particularly to accommodate the estimated 60,000 emergency room visits expected by 2007. As part of this effort, we also believe it is incumbent on us to incorporate features to deal with the very real issues of bioterrorism in any of its various forms. We sit along Interstate 35 with a number of both truck and auto traffic passing by with hazardous materials on a daily basis. In addition, we are in close proximity to major rail lines that can pose considerable threats to our region from either deliberate or accidental causes. It is urgent that the hospital be prepared for potential chemical accidents, natural disasters and terrorist attacks.

Due to the projected high costs of our expansion, we will not be able to incorporate many of the readiness proposals we feel are needed without federal funding and partnerships. The cost of incorporating bioterrorism readiness into the proposed expansion is estimated to be at least a third of the emergency department expansion costs. There are a number of design modifications and requirements we feel are necessary to deal with requirements of contamination mitigation or mass casualty treatment that we would like to incorporate into the new facility.

For instance, to plan for a more secure environment, we need a long access road to allow hospital officials to detect incoming

threats. We need separate ambulance and walk-in entrances so if one has to be shut down due to a biothreat, the other entrances can be still usable. In addition, design and equipment modifications must be incorporated into the air handling mechanical systems to isolate the different air flows so as not to contaminate the entire emergency department and/or the hospital. We need to be prepared to stand alone for 48 to 72 hours. This includes vaccinations, antibiotics, chemical antidotes, personal protective equipment and supplies. Emergency department associates must be trained to handle bioterrorism response and hazmat.

There are also needs for space and equipment to perform triage, decontamination, mass vaccination and a temporary mortuary. Development needs to occur to make the equipment that is available on the market applicable to the health care environment.

For years, the Kansas City metropolitan area has been performing city-wide disaster drills; however, guidelines and best practice recommendations from the Federal Government are needed to ensure efficiency and that all communities are as prepared as they can be. We have put countless resources into upgrading our preparation, but a wide gap still exists.

In 2002, software was made available at no cost to local hospitals that already operated Cerner lab information systems. The HealthSentry tracking tool gets information from the existing systems without extra technical work and cost. Most importantly, health department officials are able to see the data two to three days earlier than they would without this technology.

The data made available through this system could be one of the first signals that a bioterrorism event has occurred. Through automated systems like this and the constant vigilance of our front line providers, trends can be identified and more appropriately responded to in order to minimize the potential loss of human life.

According to Solucient, the leading source of health care business intelligence, the median profitability for community hospitals like Shawnee Mission Medical Center is only 3.64 percent. Although here at Shawnee Mission we reinvest all profit back into the hospital for the benefit of the community, there simply isn't enough money to make all of the needed improvements and preparations while maintaining a financially viable organization.

Nationally, hospitals are being asked to improve overall quality, including reducing clinical errors and infection rates. The solutions that are in place to help with this effort come at no small price. For instance, we are currently in the process of implementing a comprehensive clinical informatics system that will launch next year at a cost of $4.5 million. Clearly, in this time of real threats, we must be prepared for possible attack.

We firmly believe that our new facility could greatly assist in overall emergency preparedness for our area by designing the emergency department to provide the space, equipment and trained personnel that are needed to ensure that our first responders have been given every opportunity to save precious lives.

I'll defer the rest of my statement for further questions. I see I've run out of time.

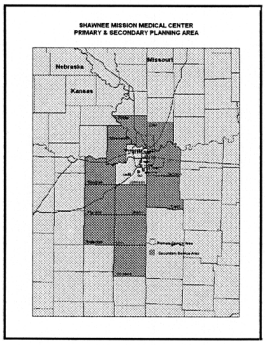
[The prepared statement of Mr. Turner follows:]

PREPARED STATEMENT OF SAMUEL H. TURNER, SR.

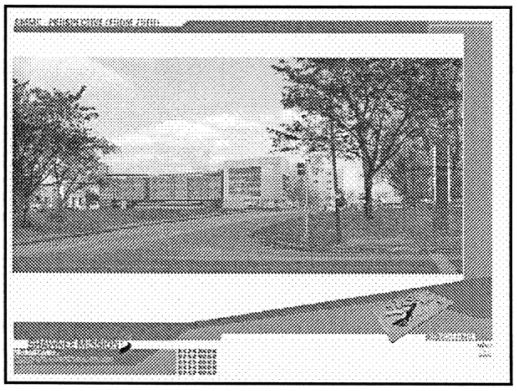
INTRODUCTION

There are few things that scare a hospital administrator more than the threat of bioterrorism. There are issues like staffing shortages, reimbursement for patient care, capital needs for aging and undersized facilities, specialty hospitals. . .the list is endless. However, many of these issues are within our creative control and can be addressed through consistent and diligent efforts to make change. The threat of bioterrorism isn't so easily controlled. We don't know when it will strike. It could be an hour from now or 10 years from now. We don't know in what form it will take hold. It could be anthrax or smallpox. . .or any other number of destructive agents. There's no way to estimate the scope of the event. It could affect 10 people or 10,000 people. These are the thoughts that challenge us during the day and keep us up at night.

THE SITUATION

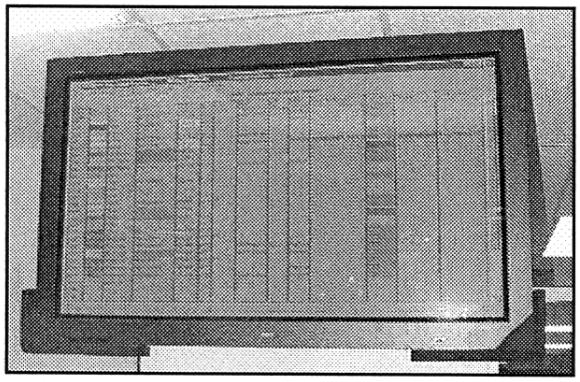


I am pleased to have the opportunity to share information with you about the current situation at Shawnee Mission Medical Center. To give you some perspective, Shawnee Mission Medical Center is located in a southwestern suburb of the Kansas City metropolitan area. There are roughly three million people in the metropolitan area with about one million in Shawnee Mission Medical Center's primary service area. We have the largest emergency department in Johnson County serving nearly 50,000 patients annually. It is the third-busiest emergency department in the entire metropolitan area behind only two designated Trauma Centers that are located on the Missouri side of the metropolitan area (Truman Medical Center and North Kansas City Hospital). In the entire state of Kansas, only hospitals in Topeka and Wichita record as many visits as Shawnee Mission Medical Center. This volume is particularly impressive when taking into consideration that the current Emergency Department is one-third the size recommended by current planning standards to accommodate this volume.



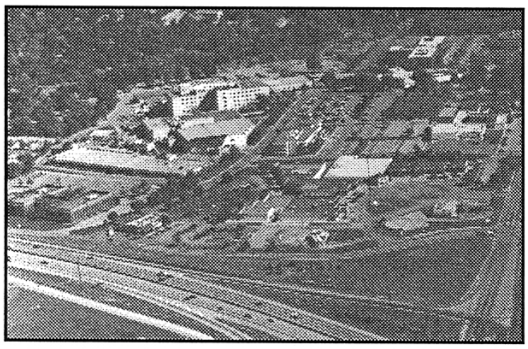
Over the past several years, community demand for services at Shawnee Mission Medical Center has grown steadily and as a result, the hospital is substantially expanding its facility. The mission of this expansion project is to create a state-of-the-art medical services destination point in an optimal environment for healing and whole-person health. Improving the patient experience and provider workflow is being integrated in every aspect of design along with the concepts of adaptability and continual collaboration. The new Emergency Department will feature a hub-like triage station that is surrounded by disease specific treatment pods and decentralized waiting areas. It is our desire to implement a number of bioterrorism readiness features into this expansion.

CURRENT FACILITY CHALLENGES & FUTURE SOLUTIONS



In 2002 and 2003, Shawnee Mission Medical Center was forced to go on diversion for 60 and 40 days respectively. Diversion means that the hospital cannot accept any additional ambulance traffic. All operational efficiencies have been investigated and implemented. The best hope is to maintain the 2003 diversion days and not increase days on diversion. The lack of an adequate number of telemetry beds contributes greatly to this forced diversion. Currently less than 30 percent of the Medical-Surgical beds have monitoring capability. Without this $84.2 million expansion, there will continue to be times when we cannot meet the community need for our services, particularly emergency services. And in the case of a disaster situation, we

would be even less able to accommodate the community's needs without this expansion in its entirety.



The expansion is desperately needed, particularly to accommodate the estimated 60,000 visits by 2007. As a part of this effort, we also believe it is incumbent on us to incorporate features to deal with the very real issues of bioterrorism in any of its various forms (i.e., biochemical or biological). Shawnee Mission Medical Center sits along Interstate 35 with a number of both truck and auto traffic passing by with hazardous materials on a daily basis. In addition, we are also in close proximity to major rail lines that can pose considerable threats to our region from either deliberate or accidental causes. It is urgent that the hospital be prepared for potential chemical accidents, natural disasters and potential terrorist attacks.

Due to the projected high costs of our expansion, we will not be able to incorporate many of the readiness proposals we feel are needed without federal funding and federal partnerships. The cost of incorporating bioterrorism readiness into the proposed expansion is estimated to be $4.5 million of the entire $12 million Emergency Department expansion. The following information outlines a number of design modifications and requirements we feel are necessary to deal with the requirements of contamination mitigation or mass casualty treatment that we would like to incorporate into the new facility.

Security

— Long access road to allow hospital officials to detect incoming threat
— Dedicated security vestibule with metal detectors and security guard station

Bioterrorism Readiness

— The Emergency Department must be built next to a flat parking area that can allow for rapid expansion of the facility. If a bioterrorism threat is detected, the hospital can accommodate First Responder/National Guard/Emergency Services personnel to quickly locate temporary treatment units next to the hospital. The design will allow us to quickly turn our parking areas into extra treatment areas for mass casualties.
— Separate ambulance and walk-in entrances must be built. If one entrance has to be shut down due to a bio-threat, the other entrance can still be useable.
— A treatment pod system must be incorporated into the design to allow for flexibility and containment of an infectious agent that would not necessarily force us to shut down the entire Emergency Department. In other words, a contaminated patient will be able to enter from the outside into an isolated room that provides privacy for decontamination. After becoming decontaminated, the patient will then be able to directly enter the Emergency Department. In addition, design and equipment modifications must be incorporated into the air handling mechanical systems to isolate the different airflows so as to not contaminate the entire Emergency Department and/or hospital.

— A triage area made up of a large area and treatment rooms needs to be positioned adjacent to the Emergency Department to rapidly distinguish medical cases.

—

* The Emergency Department should occupy the first floor and have the capability to completely contain itself and be under lockdown from the rest of the hospital if needed.

— The various medical technology labs must be located in close proximity and within the containment space.

— The patient areas must be directly above the Emergency Department for easy access for other hospital personnel in case of terrorism events.

— Dedicated security stations, including screening stations and restricted access areas must also be incorporated into the design and construction.

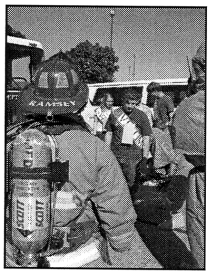
ADDITIONAL PREPAREDNESS NEEDS

Infection Control Concerns

Infection Control specialists, although always important, have become indispensable in the post-9/11 environment. These experts fully understand the impact of bioterorism threats and how quickly, if implemented, they could have a significant impact on our society. Following are some of the concerns of Infection Control staff and the needs that exist to be as fully prepared as possible for possible attack.

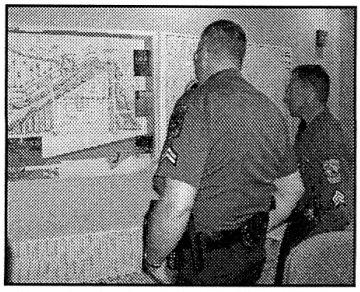
- Resist contamination of the hospital environment by staging triage of incoming suspect patients at a point outside of the hospital.
- Mechanical/equipment resources are needed (ventilators, negative air flow rooms, masks, gloves, and gowns) which could take 24 to 48 hours to access, and may deplete vendor supplies in a short period of time.
- Prophylaxis of healthy individuals coming to the hospital must be carried out away from contaminated areas, but will require staffing.
- Trained Infection Control personnel to monitor wearing of Personal Protective Equipment (PPE) and placement of patients in negative air isolation rooms. SMMC currently has 14 isolation rooms.
- Educating staff about the signs and symptoms of bioterrorism agents must be ongoing. Additional staffing and educational funding is needed for this purpose.
- Communication among hospitals, health departments and emergency personnel must be standardized so that the same definitions and control techniques are put into place. With standardization, help from staff can be distributed where it is needed and at any facility. Ideally, this would come from the federal level so that if help is needed, anyone from around the country could be called in to help.

Emergency Planning Integration



There has been a citywide initiative to coordinate efforts for emergency preparedness and these efforts have served the city well. There needs to be continued planning integration between our hospital and other community resources to ensure that the community will be adequately served in a time of need. Good guidelines and best practice recommendations from the Federal Government are needed to ensure efficiency and that all communities are as prepared as they can be. Locally, there

have been great strides in this area and an EMS system supports hospital coordination. However, not every hospital has access to the Hospital Emergency Administrative Radio system due to cost constraints, so again our ability to be most effective for our community is jeopardized due to lack of funding.



Self-Sustaining Protection

Funding is needed to allow Shawnee Mission Medical Center to stand-alone for 48–72 hours before help arrives. This includes vaccinations, antibiotics, chemical antidotes, personal protective equipment and supplies.

Additional Space and Equipment Needs

Although we feel that we are addressing many of the space needs in our expansion planning, there are additional needs for space and equipment to perform triage, decontamination, mass vaccination and a temporary mortuary. In addition, the current personal protective equipment is either not protective enough or so cumbersome it inhibits our provider's ability to provide care to patients. Development needs to occur to make the equipment that is available on the market applicable to the health care environment.

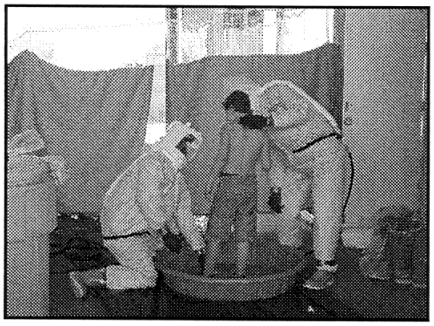
The Best Laid Plans

The best laid plans are just that without trained personnel to carry out the actions. Additional funding is needed for training Emergency Department associates including bioterrorism response and Hazmat.

Increased Security

Shawnee Mission Medical Center has increased its security efforts since 9/11, but there is so much that is still at risk. Funding is needed to improve access control and security for prevention through increased surveillance and tighter access and preparedness for a response to a terrorist attack.

PRACTICE, PRACTICE, PRACTICE



For years the Kansas City metropolitan area has been performing city-wide disaster drills. Only a couple days before the drill and in the midst of our preparation for the drill in 2001, we all sat in shock at the horror we were seeing on television the morning of September 11. Since that time, the drills have taken on a whole new meaning and there is a greater sense of reality. We have put countless resources into upgrading our preparation, but a wide gap still exists. We have upgraded our emergency preparedness manual to include bioterrorism. We have changed our Medical Staff bylaws to give temporary status to physicians in a disaster situation. We have created a large notebook that is utilized in the lab so they can be vigilant in their efforts to swiftly identify any trends as they are occurring. Unfortunately, our day-to-day operations limit our preparation. There are several hundred patients who need the attention of our caregivers on a daily basis. The "what ifs" are endless and it is almost overwhelming to think about all that needs to be done and know that there is no way with our current financial resources to accomplish all that we want to.

In addition to the citywide disaster drills, we also conduct periodic table top drills. Before and after all drills, citywide or tabletop, we conduct preparation meetings and then following the drill, critique our performance. Everyone involved in the drills are included in the critique, not just Shawnee Mission Medical Center associates. The Merriam Fire Department noticed that our incident command process needed some improvement and offered to conduct a training session. This type of cooperation has contributed greatly to the improvements our hospital and other community resources have been able to make.

In addition to the drills, there are periodic "live" situations that help us think through our preparedness for something bigger. In the past two years, we have had a severe ice storm that left us without our normal power supplies and there was a major water main break that left us without running water supplies. Although we were pleased with our overall preparedness for these situations, there are things we have been able to tweak in the plans that will be valuable for similar situations or even more severe ones. In addition, last fall there was a local outbreak of cryptosporidiosis that gave an opportunity for the state to communicate an outbreak and keep everyone abreast of the situation. Because of the media coverage, we encountered a large number of patients coming to the Emergency Department for fear of having this parasite. There were some confirmed cases, but many others were not. This gave both the lab and the providers in the Emergency Department an opportunity to be aware of possible patients with a condition.

We believe that we are virtually as prepared as we can be with our current resources, but the limitations we are aware of and do not have the ability to overcome are terribly concerning. Our constraints are not vastly different than other hospitals in the area, the region or the country. We all are faced with many of the same challenges and it is clear that federal assistance is needed to address these issues for the good of our country.

THE COMPETITION FOR CAPITAL

According to Solucient, a the leading source of health care business intelligence, the median profitability for community hospitals like Shawnee Mission Medical Center is 3.64%. Although Shawnee Mission Medical Center reinvests all of its profit back into the hospital for the benefit of the community, there simply isn't enough money to make all of the needed improvements and preparations while maintaining a financially viable organization.

Nationally, hospitals are being asked to improve overall quality including reducing clinical errors and infection rates. The solutions that are in place to help with this effort come at no small price. In 2005, Shawnee Mission Medical Center will be installing a comprehensive clinical informatics system. Utilizing this system, Shawnee Mission Medical Center will be able to gather a wide variety of clinical and financial data. This will provide a solid data baseline in which to compare with after the project is completed in 2008. This state-of-the-art system will provide the opportunity to allow health care providers more time at the patient's bedside and less time locating and maintaining paper records. In addition, Shawnee Mission Medical Center will be able to deliver enhanced care more quickly with this system in case of a disaster. This system is expected to cost the medical center approximately $4.5 million.

SILENT PROTECTION

If only there were more safeguards in place that like that of HealthSentry. In 2002, the Cerner Corporation launched a software application as a pilot program in the Kansas City area. Cerner estimated that the startup investment over a five-year development and rollout period would cost approximately $2 million. This software was made available to the local hospitals that already operated Cerner lab information systems at no cost, however. The HealthSentry tracking tool gets information from the existing systems without extra technical work and cost. The program automatically operates in the background and is monitored and maintained through connections to Cerner's data center. A data file of each provider's lab information is sent daily through a secure network with encryption processes to protect patient identity to Cerner. After the file arrives at Cerner, the data are analyzed and released in a series of reports and regional maps that are made available to the health department the next morning. Less than a day later, public health officials can log onto a secure web site to view which diseases were reported in the field. Health department officials have reported that through this system, they are receiving information 2-3 days earlier than without this technology.

The data made available through this system could be one of the first signals that a bioterrorism event has occurred. Through automated systems like this and the

constant vigilance of our front-line providers, trends can be identified and more appropriately responded to in order to minimize the potential loss of human life.

IN SUMMARY

Clearly in this time of real threats we must be prepared for possible attack. We firmly believe that our new facility could greatly assist in the overall emergency preparedness for our area. Again, due to the location of the hospital, our Emergency Department sees significant volume and is strategically located to provide community support in the event of a terrorist attack. Therefore, we must design the Emergency Department to provide the space, equipment and trained personnel that are needed to ensure that our first responders have been given every opportunity to save precious lives. However, we know that we cannot do this alone. We will continue to make our best efforts to prepare our facility, physicians, nurses and staff to the best of our ability. We will continue to work proactively with other local health care providers and emergency services providers to ensure the most coordinated effort should an incident occur. And we will continue to ask for the Federal Government's support in these efforts. The residents of our community, and others across the Nation, deserve nothing less.

BIOGRAPHY FOR SAMUEL H. TURNER, SR.

Samuel H. Turner, Sr., presently serves as President and Chief Executive Officer of Shawnee Mission Medical Center. Mr. Turner has nearly 20 years experience in the industry having served as a health care consultant as well as a hospital executive.

His career began with a position as General Attorney at Aluminum Company of America in Pittsburgh, Pa. After eight years in that position, he decided to enter the health care arena. Mr. Turner became the General Vice President at Hyde Park Hospital in Chicago, Ill. Within several years, he was recruited to be a Senior Vice President and Chief Operating Officer at Lakeshore Health System, Inc., in East Chicago, Ind. In 1993, Mr. Turner became President and Chief Executive Officer at St. Vincent Charity Hospital in Cleveland, Ohio. From there, he entered private law practice offering consulting for physicians and hospitals. Mr. Turner also started his own company, Custom Title and Settlement, Inc., during that time. He joined Shawnee Mission Medical Center in 2000.

Mr. Turner received his Bachelor's degree from Tennessee State University in 1974, and three years later earned a law degree from Vanderbilt University School of Law. Mr. Turner served in the United States Army from 1969–1971 and received a Bronze Star for Valor and a Bronze Star for Merit during his tour in Vietnam.

Mr. Turner is active in the community serving on various boards including the American Heart Association, Boys & Girls Club of Eastern Jackson County, Midwest Bioethics Center, the Johnson County Community College Foundation, Country Club Bank, Shawnee Area Chamber of Commerce, United Way of Johnson County and Kansas City's public television station KCPT.

He is also a member of the Overland Park Rotary Club and the Northeast Johnson County Chapter of NAACP.

He and his wife, Sharon, reside in Leawood, Kansas.

Samuel H. Turner, Sr.
President & Chief Executive Officer

April 30, 2004

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to testify before the U.S. House of Representatives Committee on Science on May 3rd for the hearing entitled *Bioterrorism Preparedness: People, Tools, and Systems for Detecting and Responding to a Bioterrorist Attack.* In accordance with the Rules Governing Testimony, this letter serves as formal notice of the federal funding I have received in support of Shawnee Mission Medical Center Bioterrorism Readiness Program.

- $25,000.00, Grant #2 U3RMC00020-02-00, HRSA Fund, Bioterrorism Hospital Preparedness Program, 2003
  This funding was noncompetitive and every hospital in Kansas received the same financial assistance. The money was granted to the State of Kansas for the HRSA fund and then distributed to all hospitals.

Sincerely,

Samuel H. Turner, Sr.
President and Chief Executive Officer

T (913) 676-2151
F (913) 676-7792

9100 W. 74th Street
Shawnee Mission, KS 66204
www.shawneemission.org

Mr. NEUGEBAUER. Thank you, Mr. Turner.

Mr. Richard Morrissey.

STATEMENT OF RICHARD MORRISSEY, INTERIM DIRECTOR, DIVISION OF HEALTH, KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT

Mr. MORRISSEY. Thank you, Mr. Chairman and Congressman Moore for this opportunity to testify on bioterrorism preparedness and response from the state perspective. I'm Dick Morrissey and I currently serve as the Interim Director of the Division of Health for KDHE and in that role I'm also the Executive Director of the State's Bioterrorism Program.

The current operating budget for the Kansas program is approximately $17 million. KDHE has worked closely with the associated local health departments and Kansas Hospital Association to develop and implement the State's program and plan of work related to public health and hospital preparedness. $6,125,000 for public health funding is being directly distributed to local health departments in the current fiscal year to support their implementation of the state work plan. And $4 million is allocated directly to community hospitals for that purpose.

The Hospital Bioterrorism Program required regional planning to provide a minimum level of surge capacity. For that purpose, the program adopted the same regions used for the State Trauma Program and used by the Kansas Hospital Association for those purposes. The Public Health Bioterrorism Program, on the other hand, did not have a requirement for regional planning and development, but the large number of small health departments in the State necessitated an approach that would foster shared planning and a mechanism for sharing resources locally.

Approximately $800,000 was made available in incentive grants to local health departments that participated in a regional collaboration. To date, 104 of 105 counties have chosen to participate in one of 15 regional groupings that they developed. The hallmarks of this process were that it was voluntary and it was bottom up. Local health departments decided the regions that they would participate with.

Kansas is focused on technology in the bioterrorism program in really three separate areas. The first was the development of an automated disease reporting system called HAWK. At the present time, 36 counties containing approximately 90 percent of the Kansas population now submit information regarding their cases of reportable disease through HAWK, which is a secure web-based disease reporting system. About 90 percent of all case reports from local health departments are received via the system.

The Public Health Information Exchange or PHIX, was developed with bioterrorism funding as part of the National Health Alert Network. That system provides a secure web and pager based two-way communication medium for exchange of alert messaging among public health, hospital and laboratory officials as well as partners in law enforcement, military, emergency management and so forth. Local health departments serving all 105 Kansas counties and more than 90 percent of the State's community hospitals participate in PHIX.

The State Public Health Laboratory has been upgraded to a biosafety level 3 and can now return confirmatory testing results on biological agents more safely, securely and rapidly. With the second year of federal funding, the focus in the laboratory has shifted to chemical agents in focus area D and we are now in the process of upgrading the laboratory for testing of chemical agents.

In the area of coordination, Governor Kathleen Sebelius has focused on coordinating Homeland Security efforts in the State since first taking office in January of 2003. In June of 2003, she created the Governor's Homeland Security Council, charged with coordinating policy for Homeland Security efforts and assuring that Homeland Security funds are being used to maximum effect. The Governor's objectives are to coordinate existing and federally required agencies and advisory groups, to reduce duplication, and to work toward assuring the highest possible level of preparedness and response capability at both the state and community levels.

Finally, funding for restoring public health and hospital capacity has long been needed. The neglect of many years has not been corrected with two years of funding. We have public health departments and hospitals still working to develop the capability to respond to disasters and to meet the surge capacity requirements.

We are grateful for the significant federal support you have provided, but it is critical that funding continue in order to further develop and sustain the local public health and hospital infrastructure.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Morrissey follows:]

PREPARED STATEMENT OF RICHARD J. MORRISSEY

Bioterrorism and First Responders: How Can Biosurveillance Technologies Help Front-line Public Health Facilities and First Responders?

Introduction

Thank you Chairman Neugebauer and Representative Moore for this opportunity to testify on "Bioterrorism and First Responders: How Can Biosurveillance Technologies Help Front-line Public Health Facilities and First Responders." My name is Richard Morrissey. I serve as Interim Director of the Division of Health for the Kansas Department of Health and Environment (KDHE). I also serve as the Executive Director of the Kansas Bioterrorism Program.

Background

The current operating budget for the Kansas Bioterrorism Program is approximately $17.1 million, which is received from the federal Department of Health and Human Services in two separate grant awards.

The first bioterrorism grant received by KDHE was the Public Health Preparedness and Response to Bioterrorism Cooperative Agreement, administered at the federal level by the Centers for Disease Control and Prevention (CDC). KDHE has received funds under the CDC program since it began in 1999. Between 1999 and 2001, Kansas received approximately $850,000 per year to meet state public health bioterrorism needs. In 2002, a total of $12.3 million was awarded to Kansas and another $12 million in 2003.

The second federal bioterrorism grant administered by the Kansas Bioterrorism Program is administered at the federal level by the Health Resources and Services Administration (HRSA). Kansas was awarded $1.3 million for FFY 2002 and $5.1 million for FFY 2003 under this program.

KDHE has worked very closely with the Kansas Association of Local Health Departments and Kansas Hospital Association to develop and implement the Kansas Bioterrorism Program's plan of work related to public health and hospital prepared-

ness. In 2002, $5,350,000 in grant funds was provided directly to local health departments throughout Kansas. An additional $6,125,000 is being directly distributed to the local health departments in the current federal fiscal year to support their implementation of the work plan related to the federal focus areas. Attachment A summarizes the activities for each of the seven focus areas in the CDC grant, and shows the allocation of grant funds for Federal Fiscal Years 2002 and 2003.

In FFY 2002, the Kansas Bioterrorism Program provided $945,000 directly to the state's six hospital regions and in FFY 2003, $4,000,000 is being provided directly to hospitals and other providers for implementation steps to improve surge capacity. Attachment B summarizes the planned activity by established federal priority areas.

Program Highlights:

- A statewide bioterrorism plan has been established and all local health departments have submitted local bioterrorism preparedness and response plans, including a smallpox annex. State and local response plans were tested and evaluated during six regional exercises in October 2003.
- The smallpox vaccination program implemented during fiscal year 2002 has resulted in the creation of 46 smallpox response teams in 23 counties. Development and training of these teams will be ongoing, with planning and development of additional response teams occurring at the local level. Training on smallpox vaccination has been conducted at six locations throughout Kansas using a live satellite uplink at the Bob Dole Media Center at Kansas State University. Pre-event vaccination of public health and health care response team members continues while the program's focus shifts toward post-event smallpox planning.
- Thirty-six counties (containing approximately 90 percent of the Kansas population) now submit information regarding their cases of reportable disease through HAWK, a secure, Web-based disease surveillance reporting system. About 90 percent of all case reports from local health departments are received via the HAWK system.
- The Public Health Information exchange (PHIX), was developed with bioterrorism funding as part of the Health Alert Network (HAN). The system provides a secure, web and pager based two-way communication medium for exchange of alert messaging among public health, hospital and laboratory officials, as well as partners in law enforcement, military, and emergency managers. Local health departments serving all 105 Kansas counties and more than 90 percent of the state's community hospitals participate in PHIX.
- The state public health laboratory has been upgraded and can now return confirmatory testing results on possible biological agents much more safely, securely and rapidly. These upgrades are direct outcomes of Bioterrorism Program funding. The laboratory is currently implementing similar upgrades to establish capacity for testing of chemical agents.
- A toll-free telephone hotline has been established for 24/7 disease reporting. A phone bank of volunteer staff has been recruited and trained to respond to calls from the public during widespread outbreaks.
- High-speed Internet connections are being provided to one third of the county health departments through the Health Alert Network (HAN) and funded by the Bioterrorism Program grant. All 105 Kansas counties participate in HAN.
- In October 2003, "Oktoberfest: An Exercise in Terror!" a regional bioterrorism exercise was conducted in each of the six hospital regions. Individuals from hospitals, public health departments, law enforcement, fire service, emergency management officials from each county and several state and federal officials participated. The two-day exercise, which included instruction on incident command and posed both chemical and biological scenarios was well attended, including 112 of 128 Kansas community hospitals. A total of 1,035 individuals participated in the exercise.
- Through regional hospital planning meetings, the lack of facilities in Kansas hospitals for patients requiring airborne isolation was recognized as the greatest need. Funds distributed to the regions were used to purchase portable equipment that allows Kansas to boast the availability of at least one airborne isolation room in each community hospital. This equipment will also be used to increase the state's ability to properly care for patients with tuberculosis and other infectious respiratory diseases.

Focus on Regional Planning and Development

The Hospital Bioterrorism Program required planning on a regional basis to provide a minimum level of surge capacity. The program adopted the same regions used for the State Trauma Program and by the Kansas Hospital Association for this purpose. Attachment C displays the six regions. Each of these regions developed a plan during the first year and is coordinating implementation activities during the current year.

The Public Health Bioterrorism Program did not have a requirement for regional planning and development, but the large number of small health departments in the state necessitated an approach that would foster shared planning and a mechanism for sharing resources. Approximately $800,000 was made available in incentive grants to local health departments that participated in a regional collaboration. To date, 104 of 105 counties have chosen to participate in one of 15 regional groupings that they developed. Hallmarks of this process were that it was voluntary and bottom up. Regional structures are contractual arms of local health departments that maintain the responsibility and authority of local health officers and county commissions. Attachment D displays the 15 local health department regions.

Federal, State, Local Partnerships

Partnerships have built the foundation for a successful, coordinated Bioterrorism Program in Kansas. As mentioned above, KDHE works hand-in-hand with the Kansas Association of Local Health Departments and Kansas Hospital Association in developing and implementing the CDC and HRSA Cooperative Agreements. Program priorities are developed collaboratively and implemented locally, regionally, and at the state level to assure a consistent approach at Bioterrorism planning and preparedness. Additionally, KDHE has built a very solid working relationship with the Kansas Division of Emergency Management (KDEM) and Kansas Highway Patrol (KHP), the two lead state partners in relationship to terrorism planning and preparedness. The KHP is the State Administrative Agency for the Office of Domestic Preparedness (ODP) grant program, while KDEM manages all Federal Emergency Management Association (FEMA) funds in Kansas. Through this ongoing collaboration, funds disbursement at the local level is coordinated to assure non-duplication of effort and integration of resources to build our state's capacity to protect Kansans from terrorism and other emergency situations.

Our direct federal partners are the Hospital Bioterrorism Preparedness Program in the Health Resources and Services Administration and the Public Health Preparedness and Response to Bioterrorism Program at the Centers for Disease Control and Prevention. Both of these programs have struggled to meet the great demands of getting these programs organized and have provided us with strong support and technical assistance. In doing so, they have to overcome the inherent fragmentation involved in the multiple federal programs providing support and guidance to the overall response to terrorism.

Early Detection Systems

KDHE's Bioterrorism Program considers development and expansion of epidemiologic and surveillance capacity at all levels among its highest priorities. Funding support for HAWK, a secure, Web-based disease surveillance reporting system, has allowed for further system development and an expansion of the user base over the past two years. Thirty-six counties (containing approximately 90 percent of the Kansas population) now submit information regarding their cases of reportable disease through HAWK, a secure, Web-based disease surveillance reporting system. About 90 percent of all case reports from local health departments are received via the HAWK system. In addition, funding is provided to local health departments to further develop their own surveillance capacity, with ongoing training on epidemiology and other surveillance issues provided by the state.

KDHE has placed renewed priority on recruiting and retaining an expanded staff of physicians, other health officers, and experienced epidemiologists to enhance our communicable disease management and bioterrorism detection capacity. Additionally, a team of seven Medical Investigators is being developed to provide regional epidemiology and surveillance support to local health departments across the state. These staff members will be the lead on our regional rapid response teams and will work with local health care professionals to manage outbreak situations. At the same time, local health departments are using bioterrorism funding to develop their capacity to support statewide surveillance and communicable disease control efforts, working within their newly established bioterrorism regions.

Kansas has not elected to invest bioterrorism funding in the development of new technologies for syndromic surveillance, but we have closely monitored those activities in other parts of the country. KDHE staff has been directly involved in the dis-

cussion at national levels about the usefulness of biosurveillance monitoring systems. While some of these systems look promising, their role in public health surveillance remains unclear, particularly in a predominantly rural state like Kansas. Important aspects (such as the presence of appropriate response plans when the system detects a potential abnormality) need to be addressed before such systems can be deployed on a large scale. Most importantly, the conditions under which these systems can be useful to assist in the detection of and response to a bioterrorism event or another public health emergency still need to be clearly understood and demonstrated. We do envision the opportunity in the future to participate in or implement systems that have been demonstrated effective in development efforts funded in other states.

Integration & Collaboration

As noted earlier, KDHE works closely with Kansas Highway Patrol (KHP) and Kansas Division of Emergency Management (KDEM) to assure integration and collaboration at all levels for terrorism preparedness planning in Kansas. KDHE's Director of Health serves as the Executive Director for Bioterrorism in Kansas, and represents the agency on the Governor's Bioterrorism Coordinating Council, Governor's Homeland Security Council, and Commission for Emergency Preparedness and Response. Through these avenues, KDHE has an opportunity to link with all members of the emergency preparedness and response community, including health care/mental health, law enforcement, fire, emergency management, elected officials, advocacy groups, and others.

KDHE's Bioterrorism Program Director serves along with the KHP's ODP Administrative Lead and KDEM's Administrator on a working committee to coordinate all terrorism-related activities funded by ODP, FEMA, CDC, and HRSA. This threesome meets weekly to discuss ongoing projects and issues, and to develop new and innovative methods of collaboration. Additionally, they facilitate communication between the cabinet-level representatives of their respective agencies related to policy making and consensus building.

Governor Kathleen Sebelius has focused on coordinating Homeland Security efforts in the state since first taking office in January of 2003. In June of 2003, she created the Governor's Homeland Security Council, charged with coordinating policy for Homeland Security efforts and assuring that Homeland Security funds are being used for maximum effect. The Homeland Security Council includes representatives of all the involved state agencies as well as representatives of the Kansas Association of Counties and the League of Municipalities. The Governor's objectives are to coordinate existing and federally required advisory groups, to reduce duplication, and to work toward assuring the highest possible level of preparedness and response capability at both the state and community level. Attachment E displays the Homeland Security organization for the state.

Federal Assistance

We have appreciated the funding and technical assistance received thus far from the federal bioterrorism programs. We have also worked, as noted above, to coordinate the program efforts with those of our sister Homeland Security agencies in the state. For example, we have allocated Office of Domestic Preparedness funding to support an integrated system of exercises that will support the needs of health agencies, emergency preparedness agencies, and first responders across the state. While the challenges to coordinating these programs at the federal level have been formidable, all that can be done to facilitate future coordination of federal guidance and policy can only enhance the ability to collaborate effectively at the state and local levels.

Funding for restoring public health and hospital capacity has long been needed; the neglect of many years has not been corrected with two years of funding. We are grateful for the significant federal support you have provided, but it is critical that funding continue in order to further develop and sustain the local public health infrastructure.

Accountability is a shared concern and we have worked to build into our programs, assessment and evaluation measures that monitor our progress against specified grant expectations and requirements. If there are to be other performance measures established at the federal level, it is critical that state and local officials have the opportunity to participate in the process of their development. To the extent that federal policy expectations are articulated across Homeland Security programs, it will enhance the process of setting functional performance expectations.

Conclusion

The Kansas Bioterrorism Program continues to improve the capacity, at both the state and local level, to prepare for and respond to public health emergencies. Co-

ordination and collaboration with partner organizations and federal funding agencies will remain a priority, and is required for continued progress toward our share goals.

Thank you for the opportunity to provide testimony on this critical issue for the Nation.

Attachment A

Budgeted Amounts
CDC Bioterrorism Cooperative Agreement

Focus Area	FFY 2002	FFY 2003
A - Planning & Preparedness	**$2,268,553**	**$3,148,459**
Direct Aid-to-Local (included in focus area total)	**$1,450,000**	**$2,150,000**
Capacity development for Focus Area A centered on Strategic National Stockpile (SNS) and state and local response planning during FFY 2002. As these activities continue, several new critical capacities have been introduced for FFY 2003. These include conducting integrated assessments of bioterrorism response capabilities across multiple agencies, including all local health departments. Also, activities to introduce 'scalability' into state and local response plans and to conduct regional and statewide exercises to test and evaluate these plans will be addressed in FFY 2003.		
B - Epidemiology & Surveillance	**$3,065,758**	**$2,663,628**
Direct Aid-to-Local (included in focus area total)	**$1,400,000**	**$1,400,000**
The method by which the Kansas disease reporting system is evaluated began to undergo review during FFY 2002. Enhancements to the system, including automated data analysis and feedback, will be incorporated based upon this review during FFY 2003. Efforts to recruit sentinel smallpox surveillance sites and educate reporting entities will continue and be enhanced. KDHE will also seek to strengthen ties with veterinarians and third-party data sources beginning in FFY 2003.		
C - Laboratory Capacity, Biological Agents	**$1,171,957**	**$443,367**
Many of the expenditures for FFY 2002 involved the purchase and installation of equipment to improve testing capability for Category A biological agents and to enhance physical security at the state laboratory. Focus Area C is now shifting emphasis to jurisdictional planning, partnership building, sample protocol development and other program development objectives.		

Focus Area	FFY 2002	FFY 2003
D - Laboratory Capacity, Chemical Agents	**$0**	**$1,207,270**
Kansas did not receive funding for this Focus Area for FFY 2002. Some of the capacities to be addressed during FFY 2003 include purchasing and installing equipment to safely test for Level Two chemical agents and establishing capabilities to safely and securely receive, store and ship samples containing these agents (which are classified as hazardous materials).		
E - Health Alert Network/Information Technology	**$3,718,314**	**$2,771,164**
Direct Aid-to-Local (included in focus area total)	**$1,400,000**	**$1,475,000**
Kansas has led the way in developing a statewide Health Alert Network (HAN), a secure, two-way messaging and alert system incorporating pagers and Web-based technology. FFY 2002 saw the 'roll-out' of HAN. Coverage was extended from a relatively few local health departments to include public health, healthcare, law enforcement, and emergency response agencies serving all 105 counties. Planned enhancements to HAN during FFY 2003 include continued expansion in the number of participating agencies, integrating voice access for non-confidential reports, and developing linkages with HAWK, the statewide electronic disease reporting system.		
F - Risk Communications	**$590,286**	**$574,832**
Direct Aid-to-Local (included in focus area total)	**$400,000**	**$400,000**
In FFY 2002, Focus Area F contracted with a national communications consulting firm to assess needs for developing and delivering health and safety messages for special populations in Kansas. The results of this assessment will be integrated into other ongoing communications efforts that are continuing into FFY 2003, including risk communication training, public health and safety education, media relations, interagency communications planning, and more.		

G - Education & Training	**$1,569,849**	**$1,202,320**
Direct Aid-to-Local (included in focus area total)	**$700,000**	**$700,000**
Primary activities in FFY 2002 involved establishing an infrastructure to support ongoing assessment, planning, implementation, evaluation and coordination of education and training. Focus Area G will also be responsible for planning and coordinating six regional and one statewide exercise during FFY 2003 (October 2003 and March 2004, respectively) to evaluate state and local plans.		
TOTALS	**$12,384,717**	**$12,011,040**
Direct Aid-to-Local (included in overall total)	**$5,350,000**	**$6,125,000**

12/03

Attachment B

HRSA Bioterrorism Hospital Cooperative Agreement

Priority Area

1. Administration

Full-time staff in the Hospital Bioterrorism Program include a program manager, who has experience in local Kansas hospitals, and a program assistant with expertise in chemical emergency management. Additionally a contract pharmacist, shared with the public health bioterrorism program will be hired this year as will a new medical director. Technical assistance is provided to the program through a contract with the Kansas Hospital Education and Research Foundation.

2. Regional Surge Capacity

In 2002 the six hospital regions prepared a regional hospital bioterrorism plan which included plans for the care of 500 additional acutely ill patients in the region. The plans included methods to acquire more space to care for patients, methods and resource lists for transportation of patients both within and outside the region. In 2003 the regions will continue the planning process and the revised plans will address protocols for triage of patients relative to available resources, including patients with infectious diseases and placement and transportation of patients with diseases requiring airborne isolation. Assessment of both intra- and interstate personnel credentialing problems will also be a part of the plan.

During 2003, grants of $25,000 are being provided to community hospitals to purchase personal protective equipment to be used during chemical, radiological and biological emergencies. Additionally facilities are using these funds to purchase systems for decontamination, medical supplies, education, training, and terrorism related exercises. Once facilities make these personal protective equipment purchases, employees in Kansas hospitals will be afforded the minimum level of protection in case of a chemical emergency.

3. Emergency Medical Services

This priority was not directly addressed in FFY 2002. In the current year, planning for EMS needs will be initiated. An assessment of the current capabilities of EMS agencies with regard to pediatric trauma and life support equipment and training will be undertaken. Priorities for purchase of equipment will be established and as available implementation funds targeted for FFY 2004. Each hospital planning region will establish a medical triage subcommittee as a part of its planning structure to address EMS and triage issues which could arise as a result of a large surge of patients. This subcommittee will be responsible for establishing triage, patient transfer, and admission guidelines for patients needing hospital services. These guidelines will be prepared in cooperation with the State Trauma Planning regions and local medical care providers.

4. Links to Public Health Departments

Development of a sentinel network of health care providers who would assist KDHE in collection of syndromic surveillance data is an integral part of the hospital linkage to local health departments. Establishment of a sentinel network composed of a variety of health care provider types including hospitals, health departments, and federally qualified health centers is a task currently underway. Hospital bioterrorism program staff are currently assisting the Bureau of Epidemiology and Disease Prevention in locating sentinel sites for monitoring of disease. Hospital infection control practitioners serve as a significant link to KDHE and the local health departments with regard to both disease reporting and disease investigation.

An increase of laboratory capacities for microbiology testing for Category A Agents and chemical terrorism in at least 10 hospital laboratories strategically placed throughout the state is being implemented. Funding of up to $10,000 per laboratory is being provided. This will increase the overall capacity and decrease the length of time for analysis of results based on geography and travel time.

5. Education and Preparedness Training

Several large scale terrorism preparedness educational programs will be undertaken during the coming year. Training for clinical providers and other appropriate volunteers to assist in caring for both those individuals who have been exposed to terrorist acts and those individuals who have behavioral manifestations of terrorism generated fear. This training will be useful in assisting the hospital regions in de-

veloping a cadre of trained workers who can assist in the assuring that mental health needs are met at a local level during terrorism related and other disasters. Training for non-clinical hospital workers in basic infection control procedures with special focus on CDC Category A Bioterrorist agents will be conducted using a variety of methods including the use of web-based media or "webinars" and CD–ROM materials. In addition to the on-site trainings, development of a manual of appropriate templates for mutual aid agreements, memorandum of understanding, memorandum of agreement, and contingency based contracts will also be prepared. These materials will be developed in cooperation with the Kansas Hospital Association using legal council and will be distributed to all community hospitals, local health departments and local emergency planning committees.

6. Terrorism Preparedness Exercises

During fiscal year 2003, KDHE is planning two regional hospital bioterrorism exercises. The first of these exercises, "Oktoberfest: An Exercise in Terror!" occurred in October 2003 the second is scheduled to occur in March 2004. The October full-day exercise was a functional tabletop exercise that occured at different times in each of the six hospital regions and tested each region's capabilities to respond to a biological event. The March 2004 full-day exercise is planned to be another functional tabletop exercise which will occur in each of the six regions. The purpose of this exercise will be to assess whether cross-regional coordination planning is sufficient to assure that any large scale event could be handled appropriately within the state. Both of these events include elements which will test the response systems plans and ability to care for children and the frail elderly as well as other types of special needs populations including those with limited English proficiency. Planned simulations include weather conditions, citizen/victim reports, massive pediatric and adult illness and trauma, deaths, the worried well, media interaction and movement and prioritization of resources.

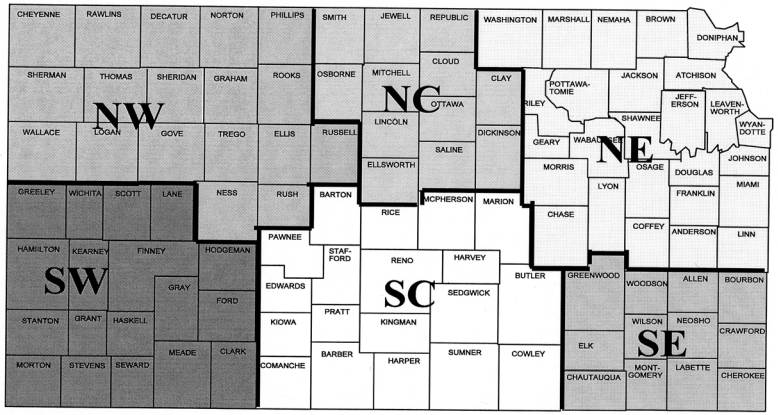
Attachment C

Bioterrorism Hospital Preparedness Regions
2003

Population: 101,005
Staffed Beds : 582
Hospitals : 18 Counties: 18

Population: 133.843
Staffed Beds : 581
Hospitals : 13 Counties: 12

Population: 1,299,832
Staffed Beds : 3,200
Hospitals : 34 Counties: 26



Population: 152,623
Staffed Beds : 556
Hospitals : 18 Counties: 18

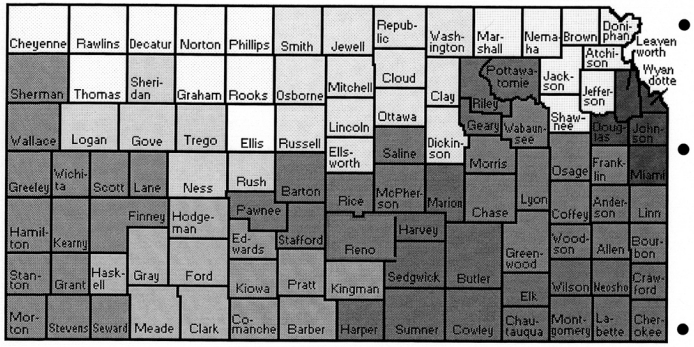
Population: 800,507
Staffed Beds : 2,503
Hospitals : 30 Counties: 19

Population: 196,108
Staffed Beds : 735
Hospitals : 15 Counties: 12

Prepared 1/13/2003

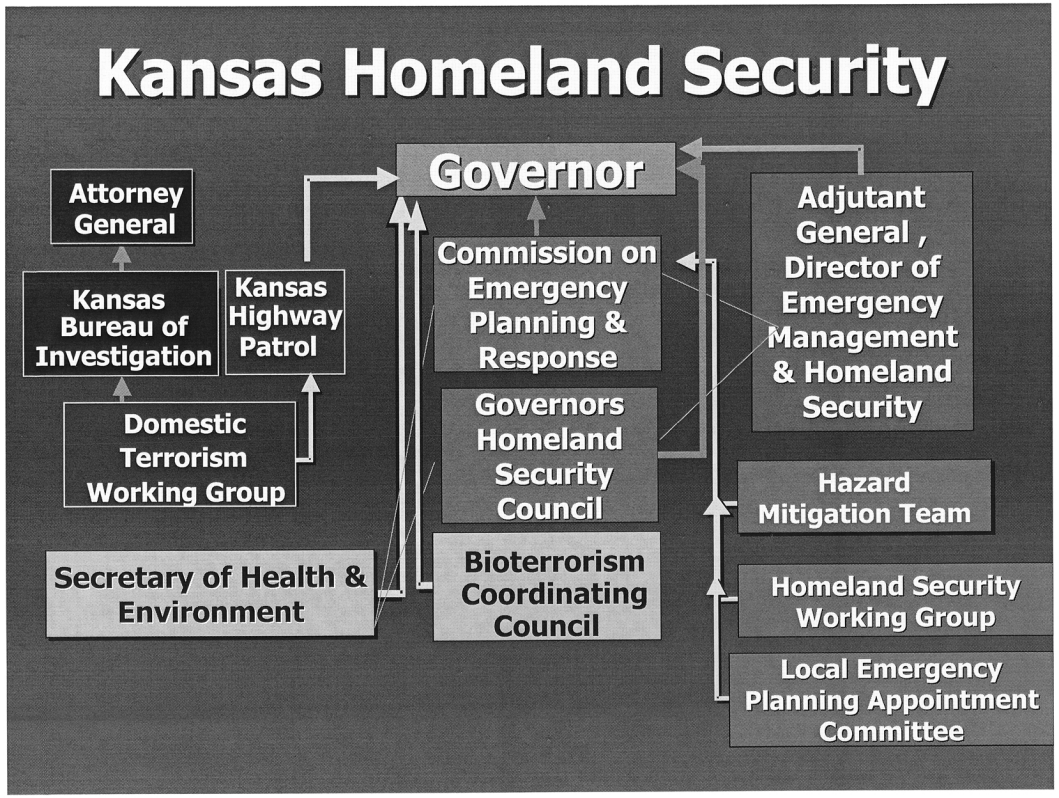
Building Local Public Health Capacity in Kansas

Regionalization Initiative



- 104 of 105 Counties Participating
- 11 of 15 Regional Groups Service Population >50,000
- Bottom- Up Approach
  - Voluntary
  - Contractual Arm of LHD

Attachment E



BIOGRAPHY FOR RICHARD J. MORRISSEY

2003–Present—Interim Director, Division of Health, Kansas Department of Health and Environment, Curtis State Office Building, 1000 SW Jackson, Suite 300, Topeka, KS 66612–1365

1992–2003—Director, Office of Local and Rural Health, Kansas Department of Health and Environment, Topeka, Kansas

1989–1992—Deputy Director, Division of Health, Kansas Department of Health and Environment, Topeka, Kansas

1983–1989—Director, Bureau of Adult and Child Care, Kansas Department of Health and Environment, Topeka, Kansas

1981–1983—Special Assistant to the Secretary, Kansas Department of Health and Environment, Topeka, Kansas

1979–1981—Director, Health Resources, Kansas Department of Health and Environment, Topeka, Kansas

1974–1979—Planning Consultant and Associate Director, Office of Health Planning, Kansas Department of Health and Environment, Topeka, Kansas

EDUCATION

Graduate of the University of Iowa (B.A.), 1971.

PERSONAL BACKGROUND

1. Attended elementary and high school in Davenport, Iowa
2. Served in the U.S. Army from 1965 to 1968 (First Lieutenant)
3. Married; two children
4. Presently living in Lawrence, Kansas.

Mr. NEUGEBAUER. Thank you, Mr. Morrissey.

Ms. Kay Kent, welcome.

STATEMENT OF W. KAY KENT, RN, MS, ADMINISTRATOR/HEALTH OFFICER, LAWRENCE-DOUGLAS COUNTY HEALTH DEPARTMENT, LAWRENCE, KANSAS

Ms. KENT. Good morning. My name is Kay Kent. I'm the Administrator/Health Officer of the Lawrence-Douglas County Health Department in Lawrence, Kansas. Thank you for the opportunity to address you today regarding state and local preparedness for a bioterrorism event.

Detection and response to bioterrorism generally happens first at the local level. The capacities needed to effectively respond to bioterrorism are also the capacities needed by local public health agencies to respond to all hazards. In Douglas County, we have worked to integrate bioterrorism detection and response with systems public health already uses to detect and respond to more common, naturally occurring disease outbreaks.

The Lawrence-Douglas County Health Department has had a leadership role in bringing together response partners to work on preparedness and response plans for public health emergencies.

Local preparedness efforts are ongoing. A critical step was to delegate and delineate our roles and responsibilities among response partners, both at the local level and state level. Participation in local and state exercises helps to identify critical gaps in our response readiness.

The most significant assistance from the Federal Government has been new dollars passed through the Kansas Department of Health and Environment to address preparedness for a bioterrorism attack and other public health emergencies.

The federal bioterrorism funding is used primarily to address staffing, training and infrastructure needs. In addition, we have recently received federal funding for the development of a Douglas County Medical Reserve Corps. These federal dollars focus on our significant need for developing surge capacity in the area of personnel. Resources from the Kansas Department of Health and Environment have included the template for writing a preparedness and response plan, exercises that allow local health departments to exercise their plans across county lines, and training on surveillance, risk communication and epidemiology.

In 2003, Douglas County and several surrounding counties were involved in an outbreak of Cryptosporidium. The first case was reported on July 24, 2003. The outbreak was considered over on October 24, 2003. I would like my written testimony to reflect that that's 2003, not 2004.

On August 22nd we made a request for assistance from the Centers for Disease Control and Prevention and on August 25th, three days, staff from CDC arrived and stayed on-site at our health department for five weeks. Kansas Department of Health and Environment epidemiology staff was also available on site during the first week of the CDC investigation and by telephone throughout the investigation.

Although this was not a disease perpetrated by terrorists, the size of the outbreak and the complexity of transmission constituted a public health emergency for our health department and our community. Our ability to meet our public health responsibilities in responding to this emergency was greatly enhanced by the preparedness work done over the previous 18 to 24 months. And these preparedness activities included enhanced relationships with key community response partners, key contact information and lists available in usable format for rapid dissemination of information, improved infrastructure including surge computer network capacity and surge capacity of agency staff.

Our experience with working with state and federal staff on an outbreak investigation was very positive. In an outbreak, strong leadership at the local, state and federal levels is critical. In addition to the staff that came on site, daily conference calls were held with Kansas Department of Health and Environment staff in Topeka and CDC staff in Atlanta to work on technical issues and strategies for the intervention.

In order to assist local health departments, state and federal agencies also need resources, particularly surge capacity for laboratory and epidemiology staff. We found lab support for the investigation at both the state and federal levels to be critical. It was vital to the investigation that we were able to have a large volume of tests run timely. The number of hours contributed by CDC and Kansas Department of Health and Environment staff was significant. Had there been another disease outbreak to deal with elsewhere in the State, the Kansas Department of Health and Environment staff would not have been able to provide the level of support needed in Douglas County.

Progress has been made related to preparedness and responses to public health emergencies. Federal funding has been an important part of that progress. Ongoing federal funding is essential to

sustain public health response readiness at the local level. The added responsibility placed on local public health agencies is great, but it is part of our mission and public health has a unique role to play.

Thank you for holding this hearing and for your support of public health and I'll be happy to respond to any questions.

[The prepared statement of Ms. Kent follows:]

PREPARED STATEMENT OF W. KAY KENT

Good morning. My name is Kay Kent. I am the Administrator/Health Officer of the Lawrence-Douglas County Health Department in Lawrence, Kansas. Thank you for the opportunity to address you today regarding State and local preparedness for a bioterrorism attack.

To put my comments in context, I will start with a brief description of Douglas County and the Lawrence-Douglas County Health Department. Douglas County, with a population of just over 100,000 residents, is located in northeast Kansas, 30 minutes from the Topeka state capital to the west and 30 minutes from the Kansas City metro area to the east. We are a city-county health department with governmental public health responsibilities. A five-member health board appointed by city and county commissioners is the policy making body for our agency. We currently have a staff of 42 and a total budget of $2.7 million. We provide a full range of public health services. Program offerings include disease control and prevention, clinic services for the maternal and child health population (ranging from child health assessments to family planning to nutrition services to child care licensing), case management services for the frail elderly, teen parents and at-risk families, community health activities, and environmental health.

The major points I will address are our health department's role in preparedness for a potential bioterrorism attack and how federal and state governments have facilitated those efforts. I will talk about my experience with an outbreak of cryptosporidiosis in Douglas County in 2003 and how preparedness efforts for bioterrorism helped us deal with this naturally occurring disease outbreak. Finally, I will discuss what State and Federal governments could do to improve their efforts to help us be better prepared for the next pubic health emergency.

Local role in preparedness

Detection and response to bioterrorism generally happens first at the local level. Local public health preparedness is a fundamental building block of our nation's overall readiness. The capacities needed to effectively respond to bioterrorism are also the capacities needed by local public health agencies to respond to all hazards. In Douglas County we have worked to integrate bioterrorism detection and response with systems public health already uses to detect and respond to more common, naturally occurring disease outbreaks.

The Lawrence-Douglas County Health Department began working in earnest on a bioterrorism preparedness and response plan in January 2002. Our agency has had a leadership role in bringing together local response partners to work on a preparedness and response plan for public health emergencies. This process involved forming new relationships, particularly with local law enforcement jurisdictions, fire and emergency medical services and emergency management. We also strengthened and enhanced our relationships with physicians, the hospital, university and urgent health clinics, and pharmacies.

Local preparedness efforts are ongoing; we continue today to update, expand and exercise our local public health emergencies plan. Our health department collaborates regionally with four other Kansas counties to provide staff training. A critical step during initial planning was to delineate roles and responsibilities among response partners, both at the local level and state level. Since then we have been working to further refine plans that would allow us to provide mass distribution of vaccines or prophylaxis through the deployment of the Strategic National Stockpile. Participation in local and state exercises helped to identify critical gaps in our response readiness. We continue to have a significant need for staff with specialized skills in risk communication.

State and federal role in assisting with our efforts

The most significant assistance from the Federal Government has been new dollars passed through the Kansas Department of Health and Environment (KDHE) to address new or expanded public health responsibilities related to preparedness for a bioterrorism attack and other public health emergencies. About half of the $11

million in federal funding that came to Kansas in FY 2003 was distributed to local health departments. Our health department received $111,000 in FY 2003 and $149,000 in FY 2004.

Bioterrorism funding is used primarily to address staffing, training and infrastructure needs. Staffing was increased by 1.75 FTE to address new responsibilities for local public health emergency preparedness and response activities and assure improvement in critical capacity areas. State-sponsored training on surveillance, epidemiology, risk communication, and the Incident Management System was made available to select health department staff. Because we must continue our day-to-day work while staff is being trained, grant funds pay for replacement staff during the trainings. We expanded our computer network to address surge capacity needs and put in place security enhancements. These activities required additional time for contracted IT assistance.

Other resources from Kansas Department of Health and Environment (KDHE) include a template for writing a preparedness and response plan that was made available to local health departments early in the planning process. KDHE also organized exercises that allow local health departments to exercise their plans across county lines.

We expect the state health agency to provide technical assistance on issues where capacity has not yet been developed at the local level or, in some cases, would not be effective or practical to implement at the local level. For example, the state should provide laboratory services and high level technical expertise in epidemiology that can be expanded if circumstances warrant.

Outbreak of Cryptosporidiosis

In 2003, Douglas County and several surrounding counties in northeast Kansas were involved in an outbreak of Cryptosporidium. Although this was not a disease perpetrated by terrorists, the size of the outbreak and complexity of transmission, constituted a public health emergency for our health department. Our ability to meet our pubic health responsibilities in responding to this emergency was greatly enhanced by the preparedness work done over the last 18 to 24 months.

Cryptosporidium is a diarrheal illness caused by a chlorine-resistant parasite. Individuals become infected by swallowing the parasite after coming in contact with fecal-contaminated surfaces or recreational water. The first case was reported on July 24, 2003; the outbreak was considered over on October 24, 2003. During this time period, there were 89 laboratory-confirmed cases among Douglas County residents plus seven cases among residents in neighboring counties linked to exposures in Douglas County. There were more than 600 probable cases. During the course of the disease investigation and implementation of prevention and control measures health department staff logged an additional 863 hours, distributed more than 9,000 fact sheets, made more than 5,000 telephone calls in search of probable cases, and issued 365 stool collection kits.

On Friday, August 22 we made a request, through the Kansas Department of Health and Environment (KDHE), for assistance from the Centers for Disease Control and Prevention (CDC). On Monday, August 25 an EIS officer arrived at our health department and stayed for five weeks. She was joined by a second EIS officer and four other CDC staff who rotated through. KDHE epidemiology staff was also available on-site during the first week of the CDC investigation and by telephone throughout the investigation.

Preparedness activities that assisted us in our response efforts included established relationships with key community response partners. These partners included local physicians, university health center, school district, and hospital infection control. Because these individuals or entities had been involved in planning with the health department for a bioterrorism incident, we already had built a level of trust and familiarity with public health work.

We also benefited from our current infrastructure. High-speed Internet capability was essential as was a functioning computer network and phone system. Transforming a conference room into an operations center capable of handling several computer and printer connections had been tested prior to the outbreak. Earlier preparations such as preprogrammed fax numbers for physicians and school nurses, mailing labels for child care facilities, and e-mail addresses for key contacts assisted with rapid communications.

The health department had begun to address the need for surge capacity in response to a bioterrorism event and this proved useful during the outbreak of Cryptosporidium. Individuals previously identified as potential workers were contacted and asked to assist. In addition, current staff, some of whom are part-time, worked flexible hours to meet the need. Nearly all current staff participated in re-

sponse efforts. Had the outbreak been much larger, additional surge capacity would have been necessary.

Future efforts from State and Federal Governments

Ongoing federal funding is essential to sustain public health response readiness at the local level. Ongoing preparedness efforts to respond to a bioterrorism incident (linkages made, training received, exercises held), improve skills that are also needed for responding to a naturally occurring disease. Local health departments do not have the luxury of hiring staff and creating systems exclusively for bioterrorism preparedness. Agency staff and systems are multi-purpose in providing essential public health services.

Since last year's outbreak, the health department has received federal funding for the development of a Douglas County Medical Reserve Corps. These federal dollars focus on our significant need for developing surge capacity to address public health emergencies.

Our experience with working with state and federal staff on an outbreak investigation was very positive. In an outbreak, strong leadership at the local, state and federal levels is critical. Those involved in the Douglas County outbreak had previous experience in partnering across the various levels of government which facilitated a good working relationship and an effective investigation. CDC was able to bring to us locally, expertise in epidemiology. We were able to provide expertise about our community. And together, we problem-solved about the source of the infection and what interventions to put in place to bring the outbreak under control.

By having access to local incidents as they unfold, CDC is able to improve understanding of new and emerging diseases and test better methods for disease identification. For example, one segment of research done in Douglas County was for the purpose of finding an alternative to stool samples as a means for disease testing.

In order to assist local health departments, state and federal agencies also need resources, particularly surge capacity for both laboratory and epidemiology staff. We found lab support for the investigation at both the state and federal levels to be critical. It was vital to the investigation that we be able to have a large volume of tests run timely. The number of hours contributed by CDC and Kansas Department of Health and Environment (KDHE) epidemiology staff to the Cryptosporidium outbreak was significant—during a public health emergency the work is really 24/7. Had there been another outbreak to deal with elsewhere in the state, KDHE would not have been available to provide the level of support needed in Douglas County.

In addition to the staff that came on-site, daily conference calls were held with KDHE staff in Topeka and CDC staff in Atlanta to work on technical issues and strategies for the investigation. Materials developed as part of the investigation were reviewed by CDC and KDHE epidemiology staff as well as significant contributions from the KDHE public information office. We worked to have consistent messages conveyed to the public across county lines because communicable disease does not know county boundaries.

Responding to bioterrorism or any other public health emergency is more than just learning the specifics of a new disease. There are new functions throughout the agency and local health department staff need strong analytical, communication and technology skills to be successful. Such staff development requires someone to do planning, assessment, leadership and monitoring.

Progress has been made related to preparedness and response to public health emergencies and federal funding has been an important part of that progress. The added responsibility placed on local public health agencies is great, but is part of our mission and public health has a unique role to play. Ongoing, adequate resources from the federal level are needed to address gaps identified through local planning and public health emergency exercises.

Thank you for holding this hearing and for your support of public health. I'll be happy to respond to any questions you may have.

BIOGRAPHY FOR W. KAY KENT

EDUCATION:

Master of Science in Community Health Nursing, Boston University, Boston, Massachusetts, January 1973.

Bachelor of Science in Nursing, University of Kansas, Kansas City, Kansas, June 1966.

Diploma, Trinity Lutheran Hospital School of Nursing, Kansas City, Missouri, August 1964.

PROFESSIONAL CREDENTIALS:

Licensed to practice as a Registered Nurse in Kansas.

PROFESSIONAL EXPERIENCE:

Administrator/Health Officer: Lawrence-Douglas County Health Department, Lawrence, Kansas, June 1973 to present. First non-physician Health Officer in Kansas.

Public Health Leadership Institute, Centers for Disease Control and Western Consortium for Public Health, 1992–1993 (Year 2 Scholar).

Instructor, Community Health Nursing: University of Kansas School of Nursing, Kansas City, Kansas, January 1973 to June 1973.

Instructor, Psychiatric Nursing: Faulkner Hospital School of Nursing, Boston, Massachusetts, September 1970 to September 1971.

Instructor: Mendota State Hospital, Madison, Wisconsin, January 1967 to August 1970.

Staff Nurse: New England Deaconess Hospital, Boston, Massachusetts, June 1966 to January 1967.

Staff Nurse (Part-time): Trinity Lutheran Hospital, Kansas City, Missouri, August 1964 to June 1966.

PROFESSIONAL ORGANIZATIONS:

Public Health Leadership Society.

American Public Health Association.

Kansas Public Health Association.

American Nurses Association.

Kansas Association of Local Health Departments.

Kansas Nurses Association.

District 17 of the Kansas Nurses Association.

CURRENT ACTIVITIES:

Board of Directors, Kansas Health Institute.

Kansas Public Health Systems Group.

Bioterrorism Preparedness Planning Committee for the Kansas Department Health and Environment and Kansas Association of Local Health Departments.

Douglas County Community Health Improvement Project Leadership Group.

Legislative Committee, Kansas Association of Local Health Departments.

PAST ACTIVITIES:

Chair, Board of Directors, Kansas Health Institute.

Lawrence Partnership for Children and Youth, Inc., Board of Directors.

Supreme Court Task Force on Permanency Planning and Children's Justice Act Task Force.

Governor's Public Health Improvement Commission Task Force on Effective Public Health Organizations.

Lawrence Memorial Hospital Board of Directors.

Kansas Master of Public Health Degree Program Advisory Committee.

Douglas County Health Care Access Board of Directors.

Kansas Department of Health and Environment Strategic Planning Committee.

Douglas County Area Health and Human Services Needs Assessment Steering Committee.

Kansas Public Health System Study Committee Co-Chair.

Douglas County Visiting Nurses Board of Directors.

Jayhawk Area Agency on Aging, Inc., Tri-County Advisory Council.

Douglas County AIDS Project Advisory Committee.

American Public Health Association/American Academy of Pediatrics Health and Safety Organization and Administrative Technical Panel of the Child Care Performance Standards Project.

Kansas Coalition on Medical Indigency.

Kansas Advisory Committee to the Coordinating Council on Early Childhood Development Services.

Emergency Planning Committee for Douglas County.

Kansas University School of Nursing Ad Hoc Nursing Curriculum Committee.

Kansas Long Term Care Advisory Committee.

Kansas Department of Health and Environment P.L. 99-457 (Handicapped Infant and Toddlers) Grant Review Committee.

Kansas Hospital Association Human Services Alternative for Rural Hospitals Grant Advisory Committee.

Douglas County Teen Pregnancy Task Force.

President, President-Elect, Secretary-Treasurer, District Representative, and Legislative Chair, Kansas Association of Local Health Departments.

Board of Directors and Secretary of Health Systems Agency Board, Health Systems Agency of Northeast Kansas.

Chairman, Project Review Committee of Northeast Kansas Health Systems Agency.

Chairman, Nominations Committee, Health Systems Agency of Northeast Kansas.

Board of Directors, Douglas County Planning Council On Services for the Aging.

Chairman, Health Committee, Douglas County Planning Council On Services for the Aging.

Kansas Public Health Association Legislative Committee.

Kansas Public Health Association Program Committee.

University of Kansas Biohazards Committee.

Douglas County Citizens Committee on Alcoholism.

Douglas County Heart Unit.

Douglas County March of Dimes.

Douglas County Emergency Medical Services Council.

Kansas State Board of Nursing Subcommittee on Communication between Nursing Service and Nursing Education.

Chairperson, Fourth Annual Governor's Conference on Aging Health Program.

HONORS AND AWARDS:

Kansas Health Foundation Leadership Fellow, 1999.

First Recipient of Kansas Health Foundation Community Health Leadership Award, 1994.

Kansas Public Health Association Special Services Award, October 1992.

Kansas Public Health Association Samuel J. Crumbine Medal for Outstanding Service in Public Health, May 1987.

Kansas State Public Health Association Certificate of Merit, October 1982.

District 17 of Kansas State Nurses Association Certificate of Merit, May 1982.

Sigma Theta Tau National Honor Society for Nursing, 1966.

Florence Nightingale Award, Trinity Lutheran School of Nursing, 1964.

PUBLICATIONS AND NATIONAL PRESENTATIONS:

"Mumps Outbreak in a Highly Vaccinated Population," Bradley S. Hersh, M.D., M.P.H., Paul E.M. Fine, V.M.D., Ph.D., W. Kay Kent, R.N., M.S., Stephen L. Cochi, M.D., Laura H. Kahn, R.N., B.S.N., Elizabeth R. Zell, M. Stat., Patrick L. Hays, Ph.D., and Cindy L. Wood., M.D., M.P.H., *The Journal of Pediatrics.* August 1991.

Co-presenter of *The Health of Children in Day Care, a Public Health Challenge,* American Public Health Association meeting, 1986.

"An Integrative Approach to Child Care Licensing by a City-County Health Department," co-authored with Peggy Scally, R.N., *Health of Children in Day Care, Public Health Profiles,* Kansas Department of Health and Environment, 1986.

"A Multi-Service County Health Department," *Dynamics of Aging,* Forrest J. Berghorn and Donna E. Schafer, and Associates, Boulder, Colorado: Westview Press, 1981.

Mr. NEUGEBAUER. Thank you, Ms. Kent.

Mr. Brad Mason.

STATEMENT OF BRADLEY C. MASON, DIVISION CHIEF OF SPECIAL OPERATIONS, JOHNSON COUNTY MED-ACT, JOHNSON COUNTY, KANSAS

Mr. MASON. Good morning, Mr. Chairman, Congressman Moore. Thank you for inviting me here today.

I am Brad Mason. I'm the Special Operations Chief for Johnson County Med-Act. Also I serve as the Chairman of the Mid America Regional Council Emergency Response Committee, commonly known in these parts as MARCER. MARCER is an emergency medical services committee serving the eight county MARC region. It covers both sides of the state line. I am also a member of the Regional Homeland Security Coordinating Committee and a number of its operational subcommittees.

I was asked to come here today to provide testimony on how current and future technology investments provide for coordinated communication among the public health, hospital and emergency response community within Johnson County and the Kansas City region.

MARCER has always been in the forefront of providing voice communications infrastructure to link EMS providers in the field to base hospital physicians in the emergency departments of all metro area emergency rooms. A recent upgrade to the MARCER system was completed in 2003. Presently, a wireless voice radio system links all providers in the area. Public Health agencies in the metro area have a minimal role in the MARCER radio system on a day-to-day basis. It is important to note that the radio system has the ability to expand to meet a need for public health radio communications, should such a need be demonstrated. At this time the need for day-to-day metro-wide access for our public health agencies is not required.

The use of internet-based communications is becoming more and more commonplace in metro Kansas City. One such application is called EMSystem®. MARCER led the deployment of EMSystem® throughout the region in 2001. While EMSystem® was initially implemented to facilitate disaster communications and hospital diversion information between hospitals and EMS providers, a side benefit was discovered in helping public health agencies communicate among EMS providers and emergency departments. Public health agencies have leveraged the rapid messaging ability of EMSystem® to provide yet another means of instant access to health alerts and other critical information pertaining to disease outbreaks, reporting, etc.

Based on the success in the Kansas City region with EMSystem®, the State of Missouri implemented EMSystem® statewide starting in 2002. This brought obvious benefits for the state health agencies in providing another communications conduit for the dissemination of public health alerts and advisories. Utilizing grant funding, the State of Missouri has covered all of the annual expenses for EMSystem® users statewide, including users from Kansas that serve the metro Kansas City region. EMSystem® combined with other public health information systems provides for an adequate means of information alerts to the response community. I also understand the State of Kansas is considering a statewide implementation of the EMSystem® as well.

As is widely reported, public health agencies need to have an early detection system in order to properly respond to potential infectious disease outbreaks. I understand that this is an area where quite a bit of improvement can be made, not only locally, but nationally. Johnson County presently uses the First Watch® program. Public Health grant funding from the CDC has helped fund the deployment of this program in Johnson County. First Watch® is an internet-based system at our Emergency Medical Systems dispatch center. The program looks for spikes in certain EMS call activity. Once a spike is recorded the system automatically notifies public health officials, who then in turn start an investigation into the matter. For instance, if there was an increase in respiratory distress calls that EMS ran in a given period of time, public health officials would be notified of that alert. The same First Watch® system is used in Kansas City, Missouri at the MAST ambulance system. Presently, there is no compilation of the two systems data to obtain a better "metro" picture of alerts.

While computer based programs have streamlined the sharing of information, much more can still be done to get a broader picture of the metro area when it comes to surveillance of the medical community. The shortcomings of only performing syndromic surveillance of CAD data are several. More detailed surveillance could occur by developing applications that mine the data of the EMS systems electronic medical record systems. Patient records are much more detailed in terms of reporting patient signs and symptoms compared to the very basic information found in CAD systems. The same could be said for the electronic patient records in hospitals and other health care settings in the metro area such as pharmacies. While the metro area has been making positive strides towards the information sharing and coordination needed for adequate early warning, more work still needs to be done.

Critically important to the progress being made on the aforementioned programs in place for the Johnson County and metro Kansas City area is federal funding. Funding from such programs as the Department of Homeland Security's State Homeland Security Grant Program and the Urban Area Security Initiative have started the ball rolling in the right direction with Johnson County and in our region. Continued funding at or above current levels will help move our region closer to the goal of a solid early warning network for public health emergencies.

As we progress into the future years, sustainment funding is also necessary for the new resources obtained through the grants. Often times, equipment is perishable and requires replacement in a matter of a few years. For example, Johnson County is considering stockpiling antibiotics to provide prophylaxes treatment of our first responders. However, we assume the risk that these medications will expire and we need funding to replace them in three to five years.

These are but a few of the representative issues we are dealing with locally and regionally. We are on the front lines and our community expects us to respond accordingly to their local emergency. I appreciate you taking the time to listen to your local first responders. I look forward to our continued dialogue on this matter.

[The prepared statement of Mr. Mason follows:]

PREPARED STATEMENT OF BRADLEY C. MASON

Mr. Chairman and Members of the Committee, I thank you for inviting me to testify today.

I am the Division Chief of Special Operations for Johnson County Med-Act, the county paramedic service here in Johnson County, Kansas. I also serve as the Chairman of the Mid America Regional Council Emergency Response Committee or MARCER. MARCER is a Metro Kansas City EMS committee serving the eight county MARC region. I am also a member of the MARC Regional Homeland Security Coordinating Committee.

I was asked to provide testimony on how current and future technology investments provide for coordinated communication among the public health, hospital and emergency response community within Johnson County and the Kansas City region.

MARCER has always been in the forefront of providing voice communications infrastructure to link EMS providers in the field to base hospital physicians in the emergency departments of all hospitals in metro Kansas City. A recent upgrade to the MARCER system was completed in 2003. Presently a wireless voice radio system links all providers in the area. Public Health agencies in the metro area have a minimal role in the MARCER radio system on a day-to-day basis. It is important to note that the radio system has the ability to expand to meet a need for public health radio communications, should such a need be demonstrated. At this time the need for day-to-day metro-wide radio access for our public health agencies is not required.

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As is widely reported, public health agencies need to have early detection systems in order to properly respond to potential infectious disease outbreaks. I understand that this is an area where quite a bit of improvement can be made, not only locally but also nationally. Johnson County presently uses the First Watch® program. Public Health grant funding from the CDC have helped fund the deployment of the program in Johnson County. First Watch® is an Internet based application that mines the data in the computer aided dispatch (CAD) system at the EMS dispatch center. The program looks for spikes in certain EMS call activity. Once a spike is recorded the system automatically notifies public health officials, who then in turn start and investigation into the matter. For instance if there was an increase is respiratory distress calls for EMS, beyond a predefined threshold, public health officials would be automatically notified by the First Watch® system. The spikes in calls at our 911 centers, urgent care center and emergency departments that are often the first real indicators of a potential biological incident. The same First Watch® system is in use in Kansas City, Missouri at the MAST ambulance system. Presently there is no compilation of the two systems data to obtain a more "metro" oriented perspective of the data.

While computer based programs have streamlined the sharing of information much more can still be done to get a broader picture of the metro area when in comes to surveillance in the medical community. The shortcomings of only performing syndromic surveillance of CAD data are several. More detailed surveillance could occur by developing applications that mine the data of the EMS systems electronic medical record systems. Patient records are much more detailed in terms of reporting patient signs and symptoms compared to the very basic data found in CAD systems. The same could be said for the electronic patient records in hospitals and other health care settings. While the metro area has been making positive

strides towards the information sharing and coordination needed for adequate early warning, more work needs to be done.

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As we progress into the future years, sustainment funding is also necessary for the new resources obtained through the grants. Often time's equipment is perishable and requires replacement in a matter of a few years. For example, Johnson County is considering stockpiling antibiotics to provide prophylaxes treatment to our first responders until Federal Response Plan resources are made available. Such medication has a two to five year shelf life and will eventually need replaced. If continued federal funding is not maintained, where will our local community find the needed dollars to maintain what we have?

These are but a few of the representative issues we are dealing with locally and regionally. We are on the front lines and our community expects us to respond accordingly to their local emergency. I appreciate you taking the time to listen to your local first responders. I look forward to our continued dialogue on this matter.

BIOGRAPHY FOR BRADLEY C. MASON

- Has worked for Johnson County EMS: Med-Act since 1984
- Division Chief of Special Operations since 1997
- Directs EMS Special Operations Teams which include:
  - Emergency Operations Team
  - Disaster Response Team
  - Hazardous Materials Medical Support Team
  - Tactical Medic Team
  - Bike Medic Team
- Responsible for EMS emergency planning for Med-Act and for Johnson County Government. Plans include Mass Casualty, Mass Fatality, Incident Management, Haz-Mat and Weapons of Mass Destruction (WMD)
- Presently the Chairman of the Mid America Regional Council Emergency Rescue (MARCER) Committee.
  - Through MARCER Brad has led:
    - A major overhaul to the radio communications system that links EMS providers in the field with hospital emergency departments in metro Kansas City
    - Revisions to the Regional Mass Casualty Incident (MCI) Response Plan
    - Revisions to the Regional Disaster Communications Plan
    - Development and implementation of the EMSystem® in Metropolitan Kansas City
    - Development of metro-wide hospital diversion protocols
- Member of the Regional Homeland Security Coordinating Committee and numerous related homeland security subcommittees.
- Recipient of the Mid America Regional Council's "2004 Regional Leadership Award"

Mr. NEUGEBAUER. Thank you, Mr. Mason.

Dr. Ron Kendall.

STATEMENT OF DR. RONALD J. KENDALL, PH.D., DIRECTOR, THE INSTITUTE OF ENVIRONMENTAL AND HUMAN HEALTH, TEXAS TECH UNIVERSITY

Dr. KENDALL. Chairman Neugebauer, Congressman Moore, thank you for the invitation to be here and to sit with these distin-

guished guests. I was presented a letter from the Science Committee to address some of the research underway in our Institute at Texas Tech University and I'm pleased to be here to represent the University and the District and your support, Congressman Neugebauer, and thank you very much for that support.

The activities that we have related to biological and chemical terrorism countermeasures date back to July 1998. We were, at that time, contacted by Admiral Elmo R. Zumwalt, Jr., previously Chief of Naval Operations in Vietnam. He had interactions with the National Security Council, identified our program as a place upon which we could interact in toxicological research and information leveraging related to biological and chemical terrorism. We worked closely with the Admiral to set up a briefing and subsequently an initiative by which we were funded in 2000 by the United States Congress to appropriate funding for Texas Tech University system, the University of Texas at Austin and the University of South Florida to support research and technology development, training and education for countermeasures to biological and chemical threats. This funding was critical to establishing the Zumwalt Program which is implemented through the Institute of Environment and Human Health at Texas Tech which I oversee and this Institute is the joint venture of our medical school, law school and university and I think reflects the multi-disciplinary cooperation that's critical.

In terms of purpose, we were to coordinate and facilitate multidisciplinary, basic and applied research and to provide education and training programs in cooperation with the Department of Defense to enhance various operational military capabilities to more effectively and efficiently identify, prevent, mitigate and eliminate biological and chemical threats and other weapons of mass destruction.

Our focus has been to integrate and expand the multi-disciplinary pool of expertise, technologies and collaborations necessary to remain a premiere internationally recognized leader in the scientific research and proliferation of information pertinent to military, and now civilian, countermeasures to biological and chemical weapon threats. This was not done irrelevant to other needs in the country, particularly as those identified previously by the National Research Council.

Our current research focus areas which are identified in great detail in my appended testimony today are to develop and test advanced modeling and simulation capabilities to predict and preclude the dispersion of biological and chemical agents inside buildings and in urban and rural environments within and including livestock and wild animal populations. Secondly, to study and identify and quantify as well as qualify emerging foreign animal disease and re-emerging zoonotic disease threats and their potential uses as biological terrorism weapons; develop and test advanced composite non-woven fabrics for use as personal protective equipment against ballistic, biological and chemical insult and as I speak, we have several patents emerging, already one in place and moving forward to others; to develop and test novel approaches to detect and remediate biological and chemical agent exposures through therapeutic and genetic approaches, and to test existing

and develop new generations of sensors to detect and identify biological and chemical weapon agents.

This work has involved extraordinary collaboration. It has involved many multi-disciplinary research projects at Texas Tech that have engaged more than 60 faculty scientists addressing modeling, textiles, chemical engineering, atmospheric science, electrical engineering, plant and soil sciences, pharmacology, physiology, microbiology and toxicology.

The Zumwalt Program has used and embraced this expertise in a multi-disciplinary format to bring this level of expertise to the focus of transferring the information to the scientific literature and to first responders. We have patented, published, as well as presented more than 60 professional scientific presentations not only in this country, but internationally. This research has been sponsored by the United States Army Research, Development and Engineering Command and continues to be sponsored through that process.

We have interacted with the first responders by developing scientific expertise and state-of-the-art technologies through our collaborations in the Zumwalt Program and leveraging that success to now the establishment of the Texas Emergency Analysis and Response Program, TEARP, operated through our program. This gives us an opportunity to integrate scientific and technical expertise with state-of-the-art computing, communications, information systems and visualization technologies to create an immediately responsive and highly accurate operational capability to save lives and protect property. This also employs the engagement and deployment of our mobile platforms known as the VIPER systems.

The federal funding that we have received has been predominantly through the Department of Defense. However, we encourage through the Department of Homeland Security and other entities becoming involved in the bioterrorism directive issued by President Bush to increase research focus on the development of more rapid biological pathogen recognition and identification capabilities for use in both active and passive surveillance systems, particularly in high population density areas such as this area; to create regionally focused research labs to assess and develop technologies to address the growing threat of emerging and resurging pathogens that may have also the potential for the use as biological terror agents; an increased focus on the establishment of training and education facilities to provide the most up-to-date information and technologies to emergency responders, their leadership, as well as elected officials, on the preventive and response procedures for biological weapon agents.

In July of 1998, as a toxicologist, and having the opportunity to visit with Admiral Zumwalt, this is an area we were concerned about. Now, it is an area that I think is a part of our reality. We must get ready. We must get ready as soon as possible. I think the threat is imminent.

Thank you.

[The prepared statement of Mr. Kendall follows:]

PREPARED STATEMENT OF RONALD J. KENDALL

Overview and History of The Institute of Environmental and Human Health:

In 1997, Texas Tech University and Texas Tech University Health Sciences Center established, as a joint venture, The Institute of Environmental and Human Health (TIEHH) to bridge their ability to assess the impacts of toxic chemicals on the environment and on human beings. This initiative employs a medical school and health sciences center interfaced with a comprehensive university, including the Texas Tech University School of Law, and represents an opportunity to address environmental and human health issues from a multi-disciplinary perspective. Research members have been recruited based on experience in the field of environmental toxicology, as well as the diversity of their research. Dr. Ronald J. Kendall, a prominent leader in the international toxicology community, was hired as the founding director of TIEHH to direct this team and recruit the best scientists and personnel in this field.

TIEHH research assesses human exposure to chemicals in the environment associated with symptomologies that can be determined to enhance and standardize the diagnostic process. TIEHH builds upon analytical methods of elements from human exposure to enhance quantitation of chemicals in association with environmental exposures. TIEHH also builds upon population-based epidemiological studies, including both humans and wildlife, to begin to better define the "Canary in the Coal Mine" concept from a more quantitative and rigorous scientific basis. TIEHH is developing new innovative approaches to assess human health consequences in the environment.

In a very short time, experts at TIEHH have created a one-of-a-kind program working to find answers to real-world issues. Incorporating a multi-disciplinary group of scientists, scholars, business leaders and government agencies, TIEHH personnel have assembled the best minds in the country to research environmental issues and provide solutions. Located in Lubbock, Texas, on the former Reese Air Force Base which is now Reese Technology Center, TIEHH occupies six buildings and more than 150,000 sq. ft. Over $15 million was invested through several state and federal agencies, as well as support from Texas Tech, for the building and laboratory renovation and capital improvements. This includes over $3 million for the renovation of facilities and purchase of a high performance computing system and virtual reality theater equipment that is housed in TIEHH.

As of Fiscal Year 2002–2003, TIEHH has facilitated approximately $50 million in grants and contracts awarded to Texas Tech University since TIEHH's establishment in 1997. Active grants facilitated by TIEHH core and research faculty and collaborators include the following sponsors: Strategic Environmental Research and Development Program, U.S. Army Soldier and Biological Chemical Command, Environmental Protection Agency, National Institute of Health, U.S. Department of Agriculture, National Institute of Environmental Health Sciences, National Science Foundation, and U.S. Army Corps of Engineers.

Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats

For almost five years The Institute of Environmental and Human Health at Texas Tech University has been the home of the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats (Zumwalt Program), which is a multi-disciplinary research, education, and service consortium composed of more than 60 research scientists. The Zumwalt Program was formally established in 1999 with the primary mission of defining, investigating, mitigating, and furthering the understanding and ability of operational military forces to prevent the threats associated with biological and chemical weapons. Inspired by the leadership of the late Admiral Elmo R. Zumwalt, Jr., the former Commander of Naval Operations during the Vietnam War, Dr. Ronald Kendall, Director of TIEHH, took the steps necessary to begin a countermeasures research program at Texas Tech University (TTU). He and others judiciously selected a team of multi-disciplinary intellectual and technological experts from the Texas Tech University System and charged them with developing effective countermeasure strategies that would improve the Nation's understanding of biological and chemical weapons. By late 1999, these efforts culminated in a large research consortium that submitted a white paper designed to meet the critical needs of the National Research Council. A short time later the U. S. Congress appropriated funding to the Texas Tech University System, the University of Texas at Austin, and the University of South Florida to support research and technology development, training and education for countermeasures to biological and chemical threats, the Zumwalt Program received

funding from the U.S. Army Soldier Biological and Chemical Command (SBCCOM) to establish and implement the research initiative (in October 2003 the SBCCOM was re-organized and renamed the U.S. Army Research, Development and Engineering Command (RDECOM)).

The administrative and support functions to facilitate all elements of the Zumwalt Program are headquartered at TIEHH. Once established and initiated, the Zumwalt Program used SBCCOM funding to expand and branch out to recruit scientists and conduct research in more than 12 different departments within the TTU System. Each research project is peer-reviewed to insure it complements the overall Zumwalt Program and SBCCOM/RDECOM mission, which is to develop, acquire, and sustain soldier support and nuclear, biological, and chemical defense technology, systems, and services. The start-up funding enabled individual scientists within the Zumwalt Program to bring their individual expertise and laboratory resources to bear on the threats of biological and chemical weapons and threat agents. The Zumwalt Program at Texas Tech is part of the National Consortium for Countermeasures to Biological and Chemical Threats (National Consortium), which represents efforts contributed from Arkansas State University, Florida Atlantic University, Kansas State University, Oklahoma State University, University of Central Florida, University of Kansas, University of South Florida, University of Texas System, and the Texas Tech University System.

Vision, Objectives, and Collaborations: Created by the best and brightest of the TTU System, the Zumwalt Program envisioned that its efforts would result in a long-term and much- needed biological and chemical weapon and threat agent research program. Initially envisioned as a means for creating professional jobs for West Texans, this program is now positioned to significantly contribute to improving national security. In an effort to minimize start-up costs and maximize research, the Zumwalt Program is permanently housed at TIEHH where an Administrative Support Team has been continually utilized to ensure solutions were provided to the problems associated with biological and chemical threat agents. The initial prime objective of the Zumwalt Program was to develop and lead collaborative efforts with other academic institutions involved in countermeasures research. This objective was achieved. In fact, after three years, intercollegiate collaborations continue to be developed with other academic institutions which now include the University of South Florida's Center for Biological Defense, the University of Texas, Oklahoma State University, the University of Kansas, Texas A&M University, and the Johns Hopkins Applied Physics Laboratory. Evidence of these successful collaborations was displayed when Texas Tech hosted the 2003 Consortium of Biological Defense Research Meeting (CBDR) where more than 80 scientists presented over 30 technical presentations concerning the detection, mitigation, and prevention of biological and chemical weapon and threat agents.

Specific Questions Addressed:

1. *What tools and systems is the Institute of Environmental and Human Health (TIEHH) working on to detect and respond to a bioterrorist attack? What organizations provide the funding to support this research and development? How are the resulting technologies transitioned to users?*

The Zumwalt Program continues its focus of coordinating and integrating all expert, multi-disciplinary intellectual and technological resources available to design, develop and field effective and efficient strategies, devices and therapeutics to combat biological and chemical weapons of terrorism or of mass destruction. The Zumwalt Program team at TTU is composed of more than 60 research scientists collaborating to meet our mission. The focus of our endeavors remains the leveraging of previous successes, advancement and continuity of our multi-disciplinary team to exploit all identified and novel opportunities to meet the Nation's biological and chemical threat countermeasures research and development needs as identified by the Institute of Medicine's National Research Council:

- Pre-incident communications and intelligence
- Personal protective equipment
- Detection and measurement of chemical and biological agents
- Recognizing covert exposure
- Mass-casualty decontamination and triage procedures
- Availability, safety, and efficacy of drugs, vaccines and other therapeutics
- Computer-related tools for training and operations

Specific ongoing research efforts being conducted by scientists under the auspices of the Zumwalt Program to protect against and respond to potential bioterrorism in-

cidents, are focused upon four areas, including: (1) The modeling, simulation and visualization of how biological threat agents may disperse through an environment following release. (2) Developing and refining technologies for agent detection, remediation and therapeutic intervention strategies. (3) Developing new and assessing existing technologies to create sensors and personal protective devices for biological and chemical threats. And (4), the design and development of technologies to protect buildings and the environment from biological and chemical weapons. During fiscal year 2003, the outstanding team of research scientists working as part of the Zumwalt Program successfully completed research in these four focus areas, as detailed below:

Focus Area I: Modeling, Simulation and Visualization

- *Modeling and Simulation of Scavenging Degradation and Deposition of Chemical and Biological Contaminants in the Urban Environment*—While most modeling and simulation projects have concentrated efforts upon determining and predicting the dispersive characteristics of chemical and biological agent plumes or clouds around buildings in an urban environment, this project seeks to understand the effects that vegetative canopy, scavenging contaminants, degradation of the chemical and biological agents as they interact with ambient radiation and urban pollutants or deposition and potential resuspension or re-evaporation of contaminants have on plume or cloud dispersion within the urban environment. Most currently-used models do not account for these post-release factors that are believed to profoundly affect the dispersion and concentration patterns, possibly leading to large errors in simulation accuracy. A primary focus of this program is to formulate and test boundary conditions that account for these post-release phenomena for codes that predict contaminant transport and dispersion. An understanding of the vegetative canopy flow is fundamental to improving the accuracy and ability to characterize urban dispersion patterns, including the street-level patterns. For this reason, investigators have gone to great lengths to study and understand data unique to vegetative canopies, including tree type, leaf size, and tree-stand arrangement. Models have been created that show particle movement and deflection around vegetative canopies and are proving to be very useful for estimating the risk that response teams may face when attempting to rescue casualties or entering and cleaning-up contaminated areas. Collaboration between TIEHH and the Atmospheric Sciences Group has lead to significant leveraging opportunities with the Governor of Texas Homeland Security Office and Division of Emergency Management of the Texas Department of Public Safety.
- *Modeling Airborne Transport of Hazards Using Advanced Atmospheric Monitoring Systems and Numerical Techniques*—The objective of this project is to evaluate the capabilities and limitations of mesoscale (10–100 km range) atmospheric models for chemical and biological agent airborne transport prediction. It is critically important to understand how biological and chemical agents are physically dispersed and transported in the atmosphere. Accurate simulation or near real-time assessments of chemical and biological threats depend upon accurate interpretations and forecasting of atmospheric conditions. Work conducted during 2002 has allowed investigators to develop and deploy portable field meteorological data sensor and recording platforms. Optimizing and enhancing the meteorological data handling of current DOD models will allow for accurate simulations of potential scenarios in advance of chemical/biological attacks, the determination of where and when specific populations or targets would be at risk given specific criteria, determination points of release and environmental conditions, and allow the tracing back of the trajectory of detected airborne agents in order to locate and neutralize its release point. These platforms were tested under severe weather events, included hurricane Lilli and tropical cyclones Fay and Isadore. The high-resolution atmospheric data gathered during these storm events can be used to better predict biological and chemical agent dispersion in the atmosphere. Additionally, significant leverage opportunities have resulted with the Texas Division of Emergency Management, as well as the testing of these capabilities during a training event held in the Houston Shipping Channel. Future leverage opportunities appear likely with atmospheric research groups in Oklahoma and New Mexico.
- *Determining Spread Pattern of Microbial Food Toxins in Agricultural Systems*—Agriculture-related terrorism is a real and present threat to our country's food supply and economic stability. The primary objective of this project is to determine and follow the spread pattern of ricin/ricinine from the point of contamination on the soil surface to its ultimate detoxification/ degradation. Investigators have identified and characterized a ricin-contaminated test-site within an existing field. This field has been used to grow castor beans for many years and investiga-

tors have detected a significant ricin gradient within the soil. Innovative techniques have been developed and implemented to qualify and quantify ricin levels in the soil. Abiotic factors including soil types, mineralogy, pH, salinity, moisture as well as biotic factors, fungi and bacteria, are primary factors in the capacity of the soil to sequester or mitigate the ricin/ricinine. From data resulting from studies of spread patterns during 2001, investigators are focusing on determining or developing new ways to mitigate the spread of this dangerous toxin. Recent discoveries of direct links between the al-Qaida network and the Iraqi military, and plans to utilize ricin on the battlefield, heighten the need to find means to mitigate the toxin.

Focus Area II: Agent Detection, Remediation and Therapeutic Intervention Strategies

- *Cellular Transduction Mechanisms Involved in Latent Neurodegeneration of Motor And Cognitive Central Nervous System Sites*—Chemical warfare agents, particularly organophosphate-based agents and biological toxins pose a significant threat to both military and civilian personnel and have the potential to both acutely and chronically impact the human nervous system. Long term consequences associated with intermittent or continued exposure to these toxicants appear to arise from excessive levels of glutamate and activation of AMPA-preferring glutamate receptors. There is some evidence to suggest that syndromes such as the Gulf War Syndrome experienced by Desert Storm veterans is the latent result of chemical exposure. Broadly, there needs to be a scientific basis for understanding and preventing acute and delayed neuronal cell death. Specifically this study was initiated to determine whether AMPA-receptor-induced dark cell degeneration (DCD) in Purkinje neurons is associated with the translocation of Bax, cytochrome C release from the mitochondria and activation of representative initiator and executor caspases that include caspase-9, caspase-3, and caspase-7. Investigators have concluded that stress-activated kinases are instrumental in mediating AMPA-induced DCD, and allow for the assumption that AMPA-induced toxicity is pharmacologically ameliorated with MAP antagonists. Developing therapies to control cell death in a programmed manner may prove beneficial in mitigating long-term effects of exposure to various chemical agents.
- *The Isolation and Characterization of Combinatorial Peptides for the Detection and Neutralization of Bioagents*—Isolation and characterization of high affinity peptide ligands is a useful and possibly a more economical means for detecting and neutralizing biological warfare agents. Using principles of combinatorial peptide chemistry along with affinity maturation of phage display peptides, this project will continue to investigate peptide ligands with high binding affinity for ricin, cholera, tetanus, and shiga toxins. During 2002, investigators identified peptide display phages with binding affinity for ricin and cholera toxin. These discoveries were critical in gaining the ability to detect ricin and cholera toxins in very low concentrations. Additionally, a capillary bio-panning apparatus was developed that can be used for automated bio-panning of phage display libraries.
- *Microsystems for Detecting Liquid and Gaseous Hazards*—Fluorescent Spectroscopy is used to identify and quantify trace contaminants by looking for their characteristic optical "fingerprint." This spectrophotometric sensing approach is a cornerstone of analytical chemistry and increasingly finds applications for monitoring biological and chemical agents. This project is focused on the development of enabling technologies needed for next generation sensors and integrating optic spectroscopic techniques into a compact biological and chemical agent warning device. Investigators have fabricated a hybrid mini-fluorescence/absorption spectroscopy system, the materials for a UV light emitting diode, microfluidics, and an analysis and deconvolution system. Liquid core waveguide technology has also been used successfully to improve this project. The hybrid-integrated mini-fluorescence/absorption system incorporates mostly small and discrete parts and is under computer control that uses a laptop for data output.
- *Combinative Toxicity of Biotoxin Mixtures*—Biotoxins are naturally occurring toxic agents produced by bacteria, cyanobacteria, fungi and some species of plants or marine fish and are etiological agents for a variety of animal and human toxicoses. Several biotoxins such as aflatoxin, T–2 toxin, anatoxin, botulinum toxin, microcystins, ricin, saxitoxin, staphylococcal enterotoxin, and tetrodotoxin are known to be potential biological weapons. Synergistic and potentiation effects of biotoxin mixtures may enhance casualties and cause long-term effects in affected human populations. The objective of this study is to investigate the mechanisms of combinative toxic effects on animals and humans to facilitate the development of protective strategies against potential use of these mixtures as biologi-

cal warfare threat agents or terrorist attack agents. Investigators tested the acute toxicity of four biotoxins, including aflatoxin B1, T–2 toxin, microcystin-LR and fumonisin, in rats and fish. The respective toxic index for these toxins was developed. Additionally, antibody-based immunoaffinity methods, enzyme-linked immunosorbent assays, and radioimmunoassay were established for measuring these biotoxins in the laboratory as well as for a small number of environmental samples. Investigators also optimized the experimental conditions, including parameters such as cell numbers, incubation times, substrate concentrations, and biotoxin solubilities. Significant leverage opportunities have already been demonstrated with cancer research centers in China. Future research collaborations include environmental research in Vietnam.

- *Counter-Terrorism Measures to Combat* Yersinia pestis *with Selenium Pharmaceuticals*—The primary objective of this research is to produce selenium-labeled peptides and phage (bacterial viruses) that can selectively bind to the surface of pathogenic bacteria and inactivate them through the generation of superoxide radicals on their surface. Initial results have demonstrated that selenium could be covalently bonded to organic molecules and would continue to retain its ability to kill bacteria. Additionally, investigators identified specific peptide sequences for high specificity and affinity for *Yersinia pestis.* Some of these sequences have been synthesized and labeled with selenium display phages. Most importantly, investigators have demonstrated that using the selenium-labeled phage, bacteria can now be killed in 30 minutes, as opposed to 36 hours. Plans have been initiated with members of the DOD to test the in vivo efficacy of these phage on *Y. pestis.*

Focus Area III: Sensors and Personal Protective Devices

- *Development of Lightweight Nonwoven Protective Clothing for Chemical and Biological Warfare Protection*—Non-woven substrates are a novel and promising approach for use in the development of protective clothing substrates because they are lightweight, breathable, and comfortable. The purpose of this project is to use state-of-the-art non-woven technology to produce fabrics capable of providing chemical protection. Researchers have produced non-woven substrates with high tensile strength and have incorporated an activated carbon layer that is thought to provide a significant amount of chemical absorbency. Additionally, the research team was able to use thermal bonding technology to incorporate chemical sensor prototypes into wall coverings. This project has generated substantial scientific, industry and media attention and has been featured in local and regional coverage. Results from this project has led to the filing of two patents and has significantly increased public and industry awareness for TIEHH, TTU, and TTU's Office of Technology Transfer and Intellectual Property.
- *Development of a Fluid-Based Fluorescent Bioaerosol Detector*—The primary objective of this research is to meet the immediate need for an inexpensive, low power, robust trigger to alert inhabitants of an increase in biological aerosol activity, thereby allowing the triggering of more sophisticated systems to determine the identity and source of the pathogen. During 2002 this project resulted in the development and testing of a novel and inexpensive sensor device capable of detecting airborne biological agents. The first three months of the project were dedicated to defining the parameters for sample media such as liquids, aerosols, and solid surfaces. A considerable amount of time was spent in the design and testing phase, as well. The prototype instrument utilizes a recently developed and proven aflatoxin biosensor which utilizes a flashlamp and photomultiplier tube, coupled with miniaturized fluidics to repeatedly sense small amounts of fluorescence in a two-minute cycle and a high-flow, aerosol concentrator into a single integrated unit. Although there was some experimentation involved in the construction of the detection device, the final test results of the prototype bio-aerosol detector revealed the relationship between the bacterial agents and the intensity of the fluorescence emissions. This prototype device will be improved and refined in 2003 and tests in full-scale building models will be completed.
- *Development of Near Real-Time Sensors for Chemical Warfare Agents in Indoor Environments*—The potential use of chemical weapon agents represents a growing global threat and has brought to focus the need for instrumentation that can rapidly detect these compounds at very low levels. The objective of this project is to develop an inexpensive, concealable sensor for monitoring the release of the chemical warfare agents Sarin and Soman in indoor and outdoor environments. Using liquid core waveguide technology and a molecular imprinted polymer designed specifically for recognition of chemical agents, investigators have built a chemical sensor capable of detecting chemical warfare simulants in near real-time. The proof of concept was successful and efforts in 2003 will seek to improve on limiters

of detection and timing. Significant leveraging opportunities for this project exist, including the possibility for future collaborations with ITT Industries and the United States Air Force.

Focus Area IV: Building Protection Strategies

- *Modeling and Simulation of Chemical and Biological Fluid Dispersion within a Building Envelope*—The Modeling and Simulation (M&S) project has developed an integrated computer model and simulation of the release of chemical and biological agents in urban terrain, including releases within an office building. Along with the ability to predict chemical and biological particle dispersion, these models provide predictions of the relative toxic effects on military and civilian personnel. These simulations should prove useful to the military for training operations designed to test response time for an offensive or terrorist use of chemical and biological weapons. Additional future leverage opportunities exist with both tactical and operational war-gaming and virtual battlefield technologies.

Each of these research projects was very successful in meeting its planned objectives and milestones, as well as generating significant information and novel findings to enhance the knowledge base and approaches to countering biological and chemical weapons and threats. Measures of the successes of these research efforts by the Zumwalt Program include the issuance of one patent and two are pending with the U.S. Patent Office, more than 35 peer-reviewed publications are either in print or in press, and 60 professional scientific presentations have been presented in 13 states and five foreign countries as a direct result of this research program to date.

Specific areas of research to be addressed by the Zumwalt Program researchers at Texas Tech during fiscal year 2004 will include:

Focus Area I: Modeling, Simulation and Visualization

- *Modeling the Transport of Aerosols in the Urban Environment: Real-time Updating of Dispersion Predictions Using Sensor Data*—Near-real time dispersion codes based on Gaussian Puff and Plume models are essential to the direction of responses to chemical, radiological and biological releases. Aerosol dispersion predictions are currently based on Second Order Integrated Puff (SCIPUFF) algorithms. One of the major sources of uncertainty in the predictions provided by such codes lies in source characterization. In many cases, it will be difficult or even impossible to directly assess the exact characteristics of a source during the critical early stages of a release, and further uncertainty results from the effects of source location (elevation, position relative to obstacles) on downstream transport. It is sought to develop techniques to integrate sensor data to improve dispersion predictions in real time during the evolution of a release event. It is anticipated that future generations of sensors will provide a spatial concentration field during the evolution of a release event. The proposed research will develop techniques to use this data to develop refined estimates of source characteristics and updated dispersion predictions. The reverse-diffusion problem is inherently ill-posed, eliminating the possibility of direct analytical solution. To address this problem, a neural net algorithm is to be developed to characterize the source from the evolving concentration field. The algorithm will then be applied to evaluate the effect of sensor deployment strategies on the accuracy of, and time taken to achieve, source characterization. The proposed research will be closely integrated with the development of the Texas Emergency Analysis and Response Program (TEARP) operations center. The dispersion modeling tools used in center operations will provide scenarios for use in the evaluation of sensor deployment strategies. The operations center will benefit by using scenario development for both the training of center personnel and the cooperative development of operational strategies with TIPC. The evaluation of sensor deployment strategies provides another opportunity for cooperation with the TEARP center and TIPC, both with regard to strategies for use in emergencies and in the design of permanent sensor arrays to protect key elements of the infrastructure of the State of Texas. As source characterization algorithms are developed, methodologies will be developed to implement the algorithms in conjunction with the Gaussian modeling codes used by TEARP. The algorithms may be tested in an operating environment, and, once successfully validated, implemented for use in emergency operations. Research currently funded enhances understanding of aerosol transport in the urban environment by characterizing the interaction between aerosols and vegetative canopies. While the vast majority of the research effort will be devoted to the research described above, an effort is to be made to pursue elements of the current investigation into the interaction between aerosol species and vegetative canopies

to completion. A methodology is to be developed to introduce the local effects associated with vegetation into larger scale Gaussian dispersion models. Further investigation is needed to determine the residence of time of the entering streams within the canopy and the rate at which aerosols entering the canopy can be expected to deposit out on the surfaces of the canopy. These elements may then be combined with previously obtained results to formulate a sink/source term representing vegetation in Gaussian Puff models. An investigation into the effect of wind velocity on the aerodynamic drag force exerted on trees is also to be undertaken in order to establish a framework for adjusting canopy parameters in response to varying wind velocities.

- *Use of Prognostic Wind Fields and GIS-based Software for Surface-Layer Atmospheric Diffusion Computation*—This project is a follow-up to the past three years of our work, which has focused on combining meteorological field platform development, mesoscale meteorological models and diffusion modeling technologies to investigate, develop, evaluate the accuracy and effectiveness of, and improve codes simulating the airborne dispersion of chemical/biological agents or other hazardous substances. Past results have indicated that nudging the meteorological models with surface-based data alone appears to have only a limited impact on mesoscale weather and dispersion forecasts: it appears that data from vertical profiles and probes of the atmosphere may be needed for true improvement of model prognostications through data assimilation. A model providing the best tools for evaluation of a dispersing airborne chemical/biological event must provide a balance between complexity, timeliness, and accuracy, and should be able to display results overlain with urban topography in a Geographic Information Systems (GIS) setting. The proposed project will strive to implement these needs, and will represent a partnership with Army Research Laboratory (ARL) scientists. The ARL has been tasked to develop a real-time operational system for short-term weather forecasting for chemical/biological-emergency response applications, and has sought out the expertise of this project's Principal Investigators to assist them towards this goal. This project will include the development of interactive software between the MM5 meteorological model and the CATS–JACE GIS-based software, including the HPAC dispersion model, in order to display airborne dispersion calculations in a GIS environment. A microscale wind model will be developed or acquired, and will be interfaced with the aforementioned dispersion model to provide a fast but sufficiently accurate and detailed wind flow prediction in the event of an attack or accidental release. This project utilizes the field facilities of Texas Tech's Wind Science and Engineering Research Center and West Texas Mesonet, leveraged with other ongoing experiments supported by other agencies, to acquire high-resolution surface and upper air wind flow measurements. The MM5 meteorological model will then be "nudged" with these data to determine whether vertical (above-surface) meteorological information improves short-term local forecasting and dispersion calculations and provides a more accurate prediction of the consequences of a chemical/biological release. Finally, a new-generation mesoscale model will begin to be tested to determine whether it can replicate MM5's ability to provide inputs to the HPAC dispersion model. This project will represent an improvement to models of weather and airborne dispersion, supporting the Army's need to rapidly and accurately adjust high-resolution meteorological and dispersion model forecasts to actual observations at a meso (10 to 100 km) scale, as related to the Integrated Meteorological Support System concept. The results of the proposed research will improve the ability not only of the armed forces but also civilian authorities and first responders to use locally-collected weather data to gain a tactical advantage, whether it be on the battlefield or in a civilian emergency.

Focus Area II: Agent Detection, Remediation and Therapeutic Intervention Strategies

- *Mechanistic Studies of Combinative Toxicity of Biotoxin Mixtures*—The long-term goal of this research project is to investigate mechanisms of combinative toxic effects of biotoxin mixture(s) on animal and humans and develop prevention strategies against potential use of these mixture(s) as biological warfare threats (BWT) or terrorist attacks. Biotoxins are naturally-occurring toxic agents produced by bacterial, cyanobacteria, fungi, and some species of plants and marine fish, which have caused the tremendous economic loss worldwide and are etiological agents of a variety of animal and human toxicoses. Many biotoxins, such as aflatoxin, T–2 toxin, anatoxin, botulinum toxins, microcystins, ricin, saxitoxin, staphylococcal enterotoxins, and tetrodotoxins, are known to be weaponized or to be available for use as terrorist attack(s). For many years, our research efforts have been only fo-

cused on study of single toxin, and a great deal of data regarding individual toxins are well documented. However, little attention has been paid in study of combinative toxic effects of biotoxin mixture(s), which may be more potent and cause more damage to human and animal health. The great challenge currently faced in the field of anti-BWT is how to deal with the attack(s) of toxic biotoxin mixture(s). It is logical to raise the concern because a large quantity of single biotoxin is ready, available for use and our knowledge about the combinative toxicity of toxin mixture(s) is very limited. Therefore, there is an urgent need for understanding the mechanism of combinative toxicity of biotoxin mixture(s), developing rapid and sensitive methods to detect multiple biotoxins in the field and body fluids of animal and humans, and as a long-term shot, developing prevention strategies against possible use of these toxin mixtures. The general hypothesis for this FY04 research proposal is that the combinative toxic effects found in our studies with biotoxin mixtures may be molecularly controlled by the critical gene or gene products for metabolism and detoxification and modulate the process will, to a certain degree, reduce the damage and mortality caused by these toxin mixture(s). The specific aims in this project include: 1) to study molecular mechanisms of combinative acute toxic effects of biotoxin mixtures in rat and fish models. 2) To study molecular mechanisms of combinative cytotoxicity induced by biotoxin mixture in targeted human liver and lung cells. 3) To continue development and validation of rapid and sensitive monoclonal antibodies based method(s) for detecting multiple biotoxins exposures in animals and humans, and 4) To continue screening safe and nontoxic chemicals for detoxifying or antagonizing the combinative acute toxic or cytotoxic effects caused by these toxin mixtures. Biotoxins and their mixtures selected in the project represent most toxins of interest both in the field of anti-BWT and in the scientific community of public health. Through the completion of the proposed study, the mechanisms of combinative acute toxicity and cytotoxicity of selected mixture of biotoxins will be thoroughly explored. The rapid and sensitive method(s) for detecting multiple biotoxins in field and body fluids of animals and humans will be developed and validated. A series of chemicals possessing antagonistic effects against acute toxicity of biotoxin mixture(s) will be identified and studied. This proposal seeks the continuing support from RDECOM for FY 2004. The research project titled "Combinative toxicity of biotoxin mixtures" was funded by SBCCOM in FY 2001 (DAAD13–00–C–0056), in FY 2002 (DAAD13–01–C–0053), and in FY 2003 (DAAD13–02–C–0070). The proposed studies for the first two years have been completed and the annual report for each year has been delivered. The delivery arrangement for the FY 2003 will be fully met by the end of this funding year. A large database regarding toxicity and cytotoxicity of individual toxin, combination of two toxin mixtures, and combinations of three toxin mixtures in F344 rats, mosquitofish, human HepG2 and BEAS–2B cells has been set up based on our previous studies. Research proposed will be follow-on from previous research findings with the new specific aims and new methods.

- *Proteomics and Latent Neurodegeneration Triggered by Warfare Agents: Development of a Novel System for Comprehensive Assessment of Candidate Protein Mediators Using an Array Chip*—The objective of this proposal is to utilize a protein array chip to develop a novel model system that permits a comprehensive and efficient qualitative assessment of candidate proteins involved in latent neurodegeneration triggered by radiological, biological and chemical warfare agents. The ultimate objective is to identify molecular substrates, define prominent transduction pathways and describe relevant cellular pathophysiology mediating latent neurodegeneration to be able to rationally develop therapeutic interventions that prevent catastrophic life-long neurological problems following exposure to non-lethal amounts of warfare agents by targeting proteins identified as major contributors to neuronal programmed cell death in selected brain regions. Retrospective epidemiological studies document higher incidences of neurodegenerative and other diseases in personnel from the Viet Nam conflict and Gulf War however potential causes and mechanisms are entirely unknown. Chronic neurodegenerative diseases have been mechanistically linked to excitotoxicity, a process that occurs when glutamate abusively activates various glutamate receptors including the AMPA and NMDA subtypes leading to a plethora of intracellular events that are capable of triggering multiple constitutive programmed cell death enzymatic cascades that remain poorly characterized. Moreover, particular cell death mechanisms are likely dependent on many concomitant factors including the physiologic context of the cell and the regional location in the brain. This year we propose to develop a model system using a protein array chip that directly identifies proteins that mediate the pathology of cellular neural degeneration. Protein array technology is a successor to gene micro-array tech-

nology and represents an innovative and new, "state-of-the-art" approach that targets many relevant proteins at once and excludes irrelevant proteins by casting a wide net, allowing identification of potential players at the exclusion of others. Proteins are the molecular machinery (work horses) of the cell responsible for all physiologic and pathologic processes. Identification of relevant proteins by traditional methods is particularly problematic since the number of these proteins and enzymatic cascades associated with cell death is rapidly expanding making it impractical to singularly probe each candidate protein. Protein array methodology has the advantage over DNA genomic technology because it directly identifies complexes of proteins that work in molecular ensembles to carry out the pathophysiologic events. Furthermore, this technology translates to more efficient discovery of cellular processes, fostering rapid progression and development of rational therapeutic interventions for field applications. Our major goals/milestones for year 4 continue to be to define potential novel therapeutic approaches that target destructive enzymatic cascades to prevent radiological, chemical or biological warfare agent-induced excitatory neurodegeneration in exposed individuals. The overall intent of our research is to develop a model system to expedite discovery of various proteins that contribute to signal transduction pathways that are common final process responsible for neurotoxicity and neurodegeneration regardless of the nature or type of initiating insult. These studies will identify universal intracellular mediators of neurodegeneration and thereby identify relevant target proteins/enzymes on which to focus development of prophylactic and therapeutic treatments to prevent latent neuropathology in individuals at risk from non-lethal exposures to neurotoxic warfare agents.

- *Fluorescence based detection of single spores*—The goal of this project is to combine recent advances in ultraviolet light sources and results of experiments with gated fluorescence detection to prepare a microsystem capable of detection of a single spore. Under past funding from SBCCOM we have developed deep ultraviolet light emitting diodes operating at 280 nm that are an enabling component of new fluorescence-based spore detection systems. We have also developed the microfluidic components using sophisticated electronics needed to realize a practical detection system. The current implementation uses a chelation reaction of terbium with dipicolinic acid (DPA), a unique chemical component of spores, to provide an efficient and long-lived fluorescence signature specific to DPA. This detection method greatly reduces the problem of false positives. The fluorescence efficiency of Tb(DPA)3 is 10,000 times higher than that of native Tb(III). Our current system, based on gated photomultiplier detection, has a sensitivity limit equivalent to 10 spores. This already exceeds the best published results by more than a factor of 70. Higher power LED sources and improvements in the photodetection electronics will reduce the limit of detection to a single spore. The construction and testing of the new system requires an interdisciplinary team of scientists with expertise in Electrical Engineering, Chemistry, and Physics. Such a team, consisting of Profs. H. Temkin (Electrical Engineering), S. Dasgupta (Chemistry), S. Nikishin (Electrical Engineering), and M. Holtz (Physics), has been assembled and proven under the past SBCCOM funding. A simple, compact, and reliable spore detection system would be of great interest to a number of our partners in the Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats.
- *Development of Combinatorial Peptides for use in the Detection of and Countermeasures against BWAs*—Many bioassays and biosensors depend upon antibodies as recognition reagents. While antibodies frequently have the desired sensitivity and selectivity, there can be problems with antibody reagents. In some cases, antibodies may be unobtainable due to the non-antigenic nature of the analyte or the target of interest and need to be analyzed in a sample matrix not compatible with antibody function. This later limitation can be especially important in environmental testing applications, where compounds must be extracted from soil or groundwater with organic solvents. Antibodies are also relatively expensive to produce in large quantities, are susceptible to a variety of environmental agents and conditions, have a relatively short shelf life and require refrigeration or freezing for storage and transport. Recent technology, however, can address these limitations and includes the use of peptides as reagents for sensors. Single -chain peptides are much more robust and have much longer shelf-lives than do more complex proteins such as antibodies. They do not require refrigeration for storage or transport, can be produced in very large quantities inexpensively and are more amenable to a variety of diagnostic and therapeutic formats than are antibodies. For these reasons high affinity, target-specific peptides offer an obvious advantage over the use of antibodies in the detection and/or neutralization of biowarfare

agents (BWAs). A program is proposed to develop Phage-Display technology for the isolation and characterization of high affinity peptide ligands which can be used for the identification, simulation, and as countermeasures against of BWAs. For this study, and on the advice of RDECOM, we will target *Y. pestis, vaccinia* virus, *B. anthracis* spores botulinum toxin (BoNT) for identification and simulation and cholera toxin (CT) for countermeasure studies.

- *Counter Terrorism Measures to Combat* Yersinia pestis *and Cholera Toxin with Selenium Pharmaceuticals*—Objective: During the last year a selenium-peptide was designed and synthesized that can kill over three log units of bacteria (99.9 percent) in 15 minutes and kill all of the bacteria in two hours. This seleno-peptide is specific for only bacteria that express the *Yersinia pestis* F1 antigen on their surface. Thus, the peptide has no effect on other bacteria. This represents the first of a new type of antibiotic that kills by a mechanism for which bacteria cannot develop resistance and that is specific for a single bacterial type. The objective for the next year is to complete the design of this new antibiotic by testing its half-life in vivo. The seleno-peptide will then be modified to extend its half-life and test it on the bacteria in living animals. In addition, we will extend this technology to develop a drug that will inactivate cholera toxin. This will utilize a peptide that was developed by Dr. Joe Fralick on a different SBCCOM project which targets and binds quite well to cholera toxin. Methods: 1. To determine and improve the half-lives of newly selected seleno-peptides and seleno-peptidomimetics in vivo. The peptides will be labeled with tritium and then injected into mice. Half-lives for the existence of the peptide in the blood will then be measured. The same peptides will also be synthesized with attached polyethylene glycol residues to improve their half-life in vivo. 2. To continue to synthesize peptides and peptidomimetic selenium containing compounds that were selected for increased binding to *Yersinia pestis* and increased stability in vivo. While testing for the half-life in vivo, additional seleno-peptides will be synthesized based upon molecular modeling studies for binding to the F1 protein. These peptides will then be tested by BiaCore binding studies for the ones, which bind best to the F1 protein. 3. To test for the ability of the seleno-peptide or seleno-phage to kill *Y. pestis* in vivo. The best candidates from the half-life studies will be tested for their ability to kill the *Y. pestis* bacteria in vivo. 4. A seleno-peptide that binds to cholera toxin will be synthesized and tested for its ability inactivate the cholera toxin. Significance: This research represents the design and synthesis of a new type of antibiotic that can target a specific bacterial species, and then kill that bacteria by a mechanism for which the bacteria cannot develop a resistance. In addition this same technology, which works extremely well on bacteria, will be extended to the design of a drug that can inactivate a toxin. Both of these new drugs have significance as medical countermeasures for the protection of combat personnel.

Focus Area III: Sensors and Personal Protective Devices

- *Liquid Crystal Technology Based Diagnostic Sensor for Detecting Nerve Agents*—Threats of use of Chemical and Biological agents during peace time and warfare have drawn considerable attention. For purposes of countering such threats, it is necessary to detect a variety of synthetic organic chemicals at low concentration levels. Highly sensitive laboratory-based methods of detection (like Gas Chromatography and Liquid Chromatography) for specific chemical compounds do exist. However, these methods are not suited for measurement of personal exposure due to their size, weight and power requirements. Further, many of these techniques require demanding user input for obtaining reliable analytical results. Hence, it becomes imperative that we find an inexpensive, easily-constructed, low weight alternative that requires minimal user input for detecting presence of chemical warfare agents for the protection of personnel in danger of being exposed. To meet this challenge, several approaches have been designed. In the first approach, a pre-treated solid surface presents an array of immobilized chemical receptors that weakly bind LC molecules to orient it in a well-defined direction. Upon exposure, the receptors will selectively bind targeted analytes (driven by competitive H-binding ability) more strongly than they bind the molecules forming the LC. This will release the LC molecules. Since the surface will be pre-treated to define a nanometer-scale topography, the freed LC molecules will be forced to assume a predictable and visually distinct orientation in the absence of receptor-mediated-anchoring of the mesogen at the surface. In the second approach novel liquid crystalline molecules will be designed and synthesized that form LC phase through weakly bonding with each other. These molecules will be placed in an electric/magnetic field which orients the molecules in a well-defined direction. The target

molecules, due to their competitive H-bonding ability, will release the LC molecules from each other. This will induce a visually-distinct phase in the liquid crystalline material. This release will also trigger a change in the applied electric field which in turn will be amplified and used for detection. In this approach, the LC molecules will double up as receptors for target analyte molecules. This approach will also allow the flexibility to tuning/designing target specific liquid crystalline molecules. The above will lead to the construction of a detection system that will be sufficiently simple to be easily incorporated into a sensor for personal monitoring. Such a sensor, with low power requirements and production cost will be of diagnostic utility for detecting nerve agents such as Tabun (GA) Sarin (GB) Soman (GD) or VX or their hydrolytic products.

- *Development of Highly Efficient Nonwoven Chemical Countermeasures Substrates*—The overall goal of the project is develop nonwoven based chemical countermeasures protective substrates that are multi-functional and highly efficient. Immediate objectives are: 1) to develop "next-to-skin" friendly adsorbent chemical decontamination wipes and liners for chemical protective suits and 2) to develop highly efficient and multi-functional destructive adsorbent nanofiber webs. The proposed project will utilize the "state-of-the-art" H1 needle-punching non-woven technology to develop a multi-layer adsorbent substrate. In addition, a through-air thermal bonding technology will be effectively utilized to develop base substrates with enhanced strength and smoothness. The combined use of the needle-punching and the thermal bonding technologies will result in non-woven base substrates that have improved mechanical and surface properties. The project will also focus on a new and unexplored territory to develop destructive adsorbent nanofiber webs. These specialized nanowebs will have catalytic degradation action against certain chemical warfare agents and also adsorbency. This multi-functional web will significantly enhance the overall protection and filtration efficiencies of chemical protective substrates. The RDECOM funded chemical protective non-wovens research at TTU has been extremely successful in delivering products on time. A three-layered non-woven chemical protective substrate has been developed. The chemical protective non-woven composite substrates were evaluated for their protection and adsorption characteristics at the U.S. Army Natick Soldier Center. Results have been very successful and have shown that the non-woven composites are good enough to serve as lining materials for JS–LIST chemical protective suits. Overall, the project has tremendous pay-back potential to the U.S. DOD and the society by developing new technologies that enhance the protection efficiencies of currently available chemical countermeasures substrates. The continued support of the RDECOM will help to sustain graduate students to continue their research activities resulting in their intellectual growth and development.
- *Development of a Field-Deployable, Remotely-Monitored, Area-Wide, Biological Pathogen Detection System*—Zoonoses, or diseases of wild and domestic animals that can cross over into humans, have shaped history and influenced mankind's social and cultural behaviors. Many of these naturally-occurring zoonotic pathogens are known to have been weaponized and are classified as potential biological terrorism threat agents. Diseases such as hantavirus, plague *(Yersinia pestis)* and tularemia *(Francisella tularensis)* exist and are maintained in wild rodent and arthropod hosts throughout most of the western United States. These enzootic foci of disease are most often unknown until a human case of disease occurs and field surveillance operations are conducted. Current technologies to identify the reservoirs or vectors of these disease agents involve capture of wild rodents, collection of blood or tissue specimens from the animals, and serological assay, culture growth or polymerase chain reaction methods. These processes and techniques are extremely labor-intensive, expensive and require from days to weeks for definitive results to be obtained. The primary objective of this project is to develop a remotely monitored, near-real time, highly accurate biological agent detection system that can be easily deployed into any environment to detect and report the presence of disease pathogens and infection in a suspect rodent population. The initial step to acquiring our objective will be to develop a molecularly imprinted polymer (MIP) or liquid crystal (LC) absorbence sensor that is sensitive to *Yersinia pseudotuberculosis* (a pathogenic species in rodents very similar to *Y. pestis).* The MIP/LC sensing element will then be integrated into a rodent bait matrix and offered to a rodent known to harbor *Y. pseudotuberculosis.* The fluorescence response signal of the MIP or absorbency response of the LC will be monitored, measured and transmitted to a remote event recorder. Successful development and follow-on enhancement of this biological pathogen detection system will

significantly improve public health, preventive medicine and Homeland security response capabilities in the civilian and military environments.

Focus Area IV: Environmental Protection Strategies

- *Generation and analysis of dust particles potentially containing plant toxins and bacterial spores*—The objective of this proposal is to identify the relationships between soil materials and the generation of dust particles that contain plant toxins and bacterial spores. Inoculation of soil with a toxic agent would be a simple mechanism to contaminate large military reservations through the dust raised by wind action. The plant-toxin, ricin, and peanut lectin, a non-toxic surrogate for ricin, will be evaluated. The spores of the bacteria *Bacillus cereus,* a surrogate for *Bacillus anthracis,* will initially be evaluated. Characterization of ricin sorption to and desorption from natural and anthropogenic materials has been achieved by our team. Also, the sorption of both ricin and *Bacillus cereus* spores on raw fruits and vegetables has been examined. The potential detachment of dusts containing these toxins or spores has not been evaluated. A local USDA–ARS research facility that examines wind erosion has developed a laboratory apparatus to generate dust particles from soil samples. This technology will be utilized in this research project. A series of experiments to quantify the amount and fraction of dust particles that contain toxins and bacterial spores is to be conducted. Soils are unique materials that are heterogeneous and vary both spatially and temporally. Soils with the same soil texture can exhibit radical differences in dust loss depending on whether the soil is wet or dry. Temperature might also have an effect on dust production. This will be the first year of a multi-year proposal. The relationship between soil properties, dust generation, and wind transport of toxins and spores is complex and cannot be easily or rapidly evaluated.

Leveraging of Successes

Specific examples of ongoing efforts to leverage the successes and expand the momentum of the Zumwalt Program into additional research areas to address highly vulnerable human health protection and economic stability include: (1) Coordinating the development and establishment of a multi-disciplinary project with the Director of Homeland Security for Texas to provide near real-time surveillance, monitoring and predictive modeling of disasters or biological and chemical incidents. (2) Developing and coordinating a multi-disciplinary project to provide near real-time surveillance of livestock and field crops for disease indicators to combat agricultural terrorism. (3) Exploiting the successful completion of research and development of a near real-time biological aerosol detector device. (4) Conducted preliminary studies and analysis for the development of multi-discipline, multi-agency projects to quantify and characterize zoonotic diseases classified as potential biological weapon agents occurring in Texas. New research initiatives being pursued as a result of the capabilities, expertise and successes of the Zumwalt Program team include:

- Enhanced sensitivity and specificity of biological and chemical agent sensors.
- Emergency operations support through total visibility and modeling of biological and chemical threats in the environment.
- Active surveillance and monitoring of pre- and post-harvest agricultural production systems.
- Non-woven fabrics technology for protection against and detection of biological and chemical threat agents.
- Adaptation of biological and chemical agent sensor technologies to more directly support homeland security needs.
- Development of integrated medical system/health care surge capacity models to assess biological and chemical terrorism incident response capabilities.
- Expansion of non-wovens materials technology research to improve health and safety of military forces, as well as emergency first responders in diverse environments.
- Design and development of novel approaches to military medical force protection.
- Development of biological and chemical environmental threat recognition, prediction and mitigation technologies.
- Dynamics of zoonotic pathogens and their potential use as biological terror agents.

2. How does TIEHH work with first responders and State and local government organizations to understand their needs for the technologies being developed at TIEHH? How do you work with them on education, training, and outreach?

Through the scientific expertise and state-of-the-art technologies available through the collaborations among the Zumwalt Program team members and through leveraging of our successes, an operational capability to augment and supplement emergency response assets in the State of Texas was created. This capability, the Texas Emergency Analysis and Response Program (TEARP), integrates scientific and technical expertise with state-of-the-art computing, communications, information systems, and visualization technologies to create an immediately responsive and highly accurate operational capability to save the lives and protect the property of Texans during accidental or intentional incidents involving biological, chemical and radiological threat agents.

The TEARP at Texas Tech University is composed of four primary components: (1) A continuous Operations Center which coordinates the gathering and initial assessments of "raw" information, disseminates analyzed information, and maintains communications with supported agencies and services. (2) The Center for Dispersive Processes which utilizes data received from numerous sources to develop predictive plume/cloud/threat dispersion models. (3) Wind Science and Engineering, which utilizes meteorological and other weather information resources to evaluate and predict atmospheric influences at an incident site. (4) Biological and Chemical Threat Assessment, which collects and analyzes epidemiological, epizoological and toxicological data to develop predictive models of biological pathogen threats, chemical hazards and their dispersion. This operational platform will provide Texas law enforcement and emergency response leadership, as well as on-site personnel, the information technologies and capabilities needed to dramatically improve their abilities to safely, effectively and efficiently respond to emergency situations. We are a multi-disciplinary team combining scientific and technical expertise, as well as operational experts with an understanding of emergency incident response and support operations. This operational understanding coupled with highly accurate weather and hazardous dispersion prediction technologies will provide on-site emergency responders with what is needed to help save lives and property.

The TEARP will provide a wide variety of technical and relevant information and consultation to on-site authorities and the Governor's emergency response team through the development and interpretation of predictive models of hazard (plume/cloud) movement in the environment for 1, 2, 3, 6, 12, 24, 48 and 72 hours in the future, thereby ensuring highly accurate, near-real time situational awareness for the Texas SOC and on-site first responders. TEARP utilizes all available U.S. National Weather Service observations, near-real time satellite imagery, and forecast information combined with sophisticated high speed computing capabilities (SGI Super Computer) to provide weather forecasts covering Texas at resolutions ranging from 1–15 km. Additionally, the TEARP can deploy mobile platforms called Vehicular Instrumentation Platform for Emergency Response (VIPER) systems outfitted with biological, chemical, meteorological, and radiological sensors into hazardous areas and environments, to relay near-real time data to decision-makers. The TEARP will maintain a full remote computational backup and satellite distribution network for its products and results to ensure uninterrupted service. Finally, the superior technologies and operational and scientific expertise brought together by the TEARP will make available unprecedented resources to provide training to emergency responders, as well as local and state elected officials, in all aspects of biological, chemical and radiological incident response activities.

Operational Capabilities:

- Deliver rapid, accurate data and predictions to government officials, emergency responders, and emergency/incident site commanders; information to make insightful and knowledgeable decisions.
- Provide real-time dissemination of analysis results through secure communications to prepare for and mitigate an emergent event.
- Continuously deliver accurate, high-resolution, timely weather predictions covering the entire state of Texas.
- Provide state-of-the-art dispersion predictions of pollutants, biological and chemical agents as a result of adverse atmospheric conditions, industrial and transportation accidents, and terrorism-related incidents.
- Provide mobile platforms called Vehicular Instrumentation Platform for Emergency Response (VIPER) systems for deploying biological, chemical, me-

teorological, and radiological sensors into hazardous areas and environments, to relay near-real time data to decision-makers.

- Ensure dispersion and weather predictions are visualized using leading edge technologies.
- Provide support for local and state emergency response training exercises.
- Provide technical support on the latest in meteorological and particle dispersion modeling and simulation capabilities. Modeling results (complemented with insights and analysis from subject matter experts in biological, chemical, and radiological materials and their relationship to environmental toxicology and epidemiology) will be utilized before, during and after all operational events. These highly accurate assessments will be communicated in user-friendly language to enable use by all facets of governmental infrastructure.
- Maintain a full remote computational backup and satellite distribution network for its products and results to ensure uninterrupted service.

3. How can the Federal Government, particularly the Department of Homeland Security, improve its efforts to help communities be better prepared for a bioterrorist attack? Are there specific areas that demand increased attention?

The following areas require increased attention from the Department of Homeland Security to ensure the American people are protected from the threat of bioterrorism:

1. An increased research focus on the development of more rapid biological pathogen recognition and identification capabilities for use in both active and passive surveillance systems, particularly in areas of high population density.
2. The creation of regionally-focused research laboratories to assess and develop technologies to address the growing threat of emerging and resurging pathogens that may also have the potential for use as biological terror agents, particularly those pathogens specific to or enzootic in geographic regions.
3. An increased focus on the establishment of training and education facilities to provide the most up-to-date information and technologies to emergency responders, their leadership, as well as elected officials, on the preventive and response procedures for biological weapon agents.

BIOGRAPHY FOR RONALD J. KENDALL

- Founder and Director of The Institute of Environmental and Human Health (TIEHH) at Texas Tech University (1997–Present); Founding Chair and Professor, Department of Environmental Toxicology, Texas Tech University (Institute Faculty, Adjunct Faculty, Staff, Graduate Students—130; 150,000 square feet Physical Plant and multi-million dollar annual budget)
- Founder and Director of The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University (1989–1997)
- Founding Department Head (1989–1995) and Professor (1989–1997) in the Department of Environmental Toxicology at Clemson University
- Founding Director, Institute of Wildlife Toxicology, and Professor of Environmental Toxicology, Huxley College of Environmental Studies, Western Washington University (1980–1989)
- Past-President of the Society of Environmental Toxicology and Chemistry (SETAC), and has served on its Board of Directors and Executive Committee, as well as being Vice President, on the SETAC Foundation for Environmental Education Board of Directors, and was the Annual Review Editor and currently Terrestrial Toxicology Editor of the journal, *Environmental Toxicology and Chemistry*
- Authored more than one hundred refereed journal and technical articles, and published or edited several books including, *Toxic Substances in the Environment, Wildlife Toxicology, Wildlife Toxicology and Population Modeling: Integrated Studies of Agroecosystems and Principles and Processes for Evaluating Endocrine Disruption in Wildlife*
- Made more than 170 public and scientific presentations in the field of wildlife and environmental toxicology
- As Principal Investigator have received 136 research grants totaling more than 42 million dollars

- Graduated thirty students at the graduate level, including M.S. and Ph.D. degrees
- Authored ten courses in environmental toxicology and wildlife toxicology
- "Award of Appreciation" from United States Environmental Protection Agency for service related to Chairmanship of the EPA Scientific Advisory Panel for implementation of the Federal Insecticide, Fungicide and Rodenticide Act and the Food Quality Protection Act of 1996, January 2004.
- Received an Outstanding Researcher Award, College of Arts & Sciences, Texas Tech University, 2003.
- Received the 1996 Alumni Research Award for outstanding faculty research at Clemson University
- Received the 1987 Paul J. and Ruth Olscamp Research Award, from Western Washington State University
- In 1996, addressed the United Nations Committee on Sustainable Development, United Nations, New York
- Awarded a Fulbright Fellowship in 1991
- Served as an environmental advisor to the United States Justice Department, Environmental Enforcement Section
- National Board/Committee Appointments (representative past and present)
- National Research Council Committee on Superfund Site Assessment and Remediation in the Coeur d'Alene River Basin (November 2003 to present)
- United States Environmental Protection Agency's, Science Advisory Panel (Member, 1995–December 2002; Chair January, 1999–December 2002)
- United States Environmental Protection Agency's, Joint SAB/SAP Review on "Data from Testing of Human Subjects" served as Chairman (1998–2000)
- United States Environmental Protection Agency's, Science Advisory Board, Mercury Review Subcommittee (1997)
- The National Academy of Sciences', Ecological Risk Assessment Subcommittee, Committee on Risk Assessment Methodologies (1990–1991)
- The Endocrine Disruptors Screening and Testing Advisory Committee (EDSTAC) of the USEPA (1996–1998)
- Board of Research Directors of the Canadian Network of Toxicology Centers for the Canadian Government (1993–1999)
- Consulted with many foreign countries on environmental issues (e.g., Russia, Costa Rica, Canada, the Netherlands, France, United Kingdom, Portugal, Switzerland)
- Graduated with honors from the University of South Carolina, received M.S. degree in Wildlife Ecology from Clemson University, Ph.D. in Fisheries and Wildlife Sciences/Toxicology from Virginia Polytechnic Institute and State University, and received a United States Environmental Protection Agency post-doctoral traineeship at the Massachusetts Institute of Technology

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April 28, 2004

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to Dr. Ronald J. Kendall, Director of The Institute of Environmental and Human Health (TIEHH) at Texas Tech University, to testify before the U.S. House of Representative Committee on Science on May 3rd for the hearing entitled *Bioterrorism Preparedness: People, Tools, and Systems for Detecting and Responding to a Bioterrorist Attack*. In accordance with the Rules Governing Testimony, this letter serves as formal notice of the federal funding that TIEHH, through Texas Tech University, of which Dr. Ronald J. Kendall is an employee, currently receives and has received in support of Bioterrorism research.

Amount	Grant Number	Federal Agency Source Title	Federal Funding Agency	FY Year Received
$313,868	DAAD13-01-C-0066	Modeling and Simulation of Scavenging, Degradation and Deposition of Chemical and Biological Contaminants in the Urban Environment	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$188,917	DAAD13-01-C-0054	Determination of Spread Pattern of Microbial Food Toxins in Agricultural Systems and Contamination and Restoration	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$434,960	DAAD13-01-C-0053	Combinative Toxicity of Biotoxin Mixtures	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$259,428	DAAD13-01-C-0066	Modeling Airborne Transport of Hazards Using Advanced Atmospheric Monitoring Systems and Numerical Techniques	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$190,882	DAAD13-01-C-0066	Isolation and Characterization of Combinatorial Peptides for the Detection of Ricin and Cholera Toxins	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$281,302	DAAD13-01-C-0050	Cellular Transduction Mechanism Involved in Delayed Latent Neurodegeneration of Motor and Cognitive CNS Sites	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$250,388	DAAD13-01-C-0066	Counter Terrorism Measures to Combat Yersinia pestis with Selenium Pharmaceuticals	Department of Defense - Army - Soldier and Biological Chemical Command	2002

$552,832	DAAD13-01-C-0066	Implementation and Administrative Coordination of the "Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$135,364	DAAD13-01-C-0070	Modeling and Simulation of Chemical and Biological Fluid Dispersion Within a Building Envelope	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$260,961	DAAD13-01-C-0066	Development of CW Protective Composite Substrates	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$328,991	DAAD13-01-C-0052	Microsystems for Detecting Liquid and Gaseous Hazards	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$353,387	DAAD13-01-C-0069	Development of a Near Time Sensor for Chemical Warfare	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$288,365	DAAD13-01-C-0071	Development of a Fluid-Based, Fluorescent Bioaerosol Trigger	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$60,565	DAAD13-01-C-0052	Microsystems for Detecting Liquid and Gaseous Hazards	Department of Defense - Army - Soldier and Biological Chemical Command	2002
$194,790	DAAD13-02-C-0067	Determination of Spread Pattern of Microbial Food Toxins in Agricultural Systems and Contamination and Restoration	Department of Defense - Army - Research, Development and Engineering Command	2003
$131,752	DAAD13-02-C-0066	Modeling and Simulation of Chemical and Biological Fluid Dispersion Within a Building Envelope	Department of Defense - Army - Research, Development and Engineering Command	2003
$587,126	DAAD13-02-C-0058	Implementation and Administrative Coordination of the "Admiral Elmo R. Zumwalt, Jr. National Program for Countermeasures to Biological and Chemical Threats	Department of Defense - Army - Research, Development and Engineering Command	2003
$330,324	DAAD13-02-C-0076	Bio Aerosol Detector II (BAD II): Design, Fabricate and Test	Department of Defense - Army - Research, Development and Engineering Command	2003
$646,862	DAAD13-02-C-0070	Combinative Toxicity of Biotoxin Mixtures	Department of Defense - Army - Research, Development and Engineering Command	2003
$160,333	DAAD13-02-C-0068	Modeling Airborne Transport of Hazards Using Advanced Atmospheric Monitoring Systems and Numerical Techniques	Department of Defense - Army - Research, Development and Engineering Command	2003

$355,279	DAAD13-02-C-0075	Development of CW Protective Composite Substrates	Department of Defense - Army - Research, Development and Engineering Command	2003
$522,624	DAAD13-02-C-0074	Development of a Near Time Sensor for Chemical Warfare	Department of Defense - Army - Research, Development and Engineering Command	2003
$359,551	DAAD13-02-C-0071	Microsystems for Detecting Liquid and Gaseous Hazards	Department of Defense - Army - Research, Development and Engineering Command	2003
$383,616	DAAD13-02-C-0072	Cellular Transduction Mechanism Involved in Delayed Latent Neurodegeneration of Motor and Cognitive CNS Sites	Department of Defense - Army - Research, Development and Engineering Command	2003
$267,226	DAAD13-02-C-0073	Isolation and Characterization of Combinatorial Peptides for the Detection of Ricin and Cholera Toxins	Department of Defense - Army - Research, Development and Engineering Command	2003
$288,655	DAAD13-02-C-0069	Counter Terrorism Measures to Combat Yersinia pestis with Selenium Pharmaceuticals	Department of Defense - Army - Research, Development and Engineering Command	2003
$169,099	DAAD13-02-C-0065	Modeling and Simulation of Scavenging, Degradation and Deposition of Chemical and Biological Contaminants in the Urban Environment	Department of Defense - Army - Research, Development and Engineering Command	2003
$25,000	DAAD13-02-C-0071	Microsystems for Detecting Liquid and Gaseous Hazards	Department of Defense - Army - Research, Development and Engineering Command	2003
$79,585	DAAD13-02-C-0080	Development and Testing of Composite, Non-woven Protective Clothing Fabric for Bioterrorism Response	Department of Defense - Pass Through - University of South Florida	2003
$69,750	DAAD13-03-C-0065	Development of Enhanced Novel Personal Protective Clothing for Biochemical Warfare Defense and Emergency Responders	Department of Defense - Pass Through - University of South Florida	2004

Should you have any questions or need additional information, please do not hesitate to contact our office.

Sincerely,

Robert M Sweazy

Robert M. Sweazy, Ph.D., P.E.
Vice President for Research, Technology Transfer, and Economic Development,
Texas Tech University

DISCUSSION

Mr. NEUGEBAUER. Thank you, Dr. Kendall, and I'm going to yield to my friend from Kansas, Mr. Moore, for the first questions.

Mr. MOORE. I'd like to direct my first questions to Mr. Schable and also to Sam Turner, Mr. Turner. And the question is that the President has set a goal of assuming, I'm sorry, assuring that most Americans have electronic health records within the next 10 years. This would seem to impact detection and monitoring, analysis and interpretation, as well as knowledge management.

My question to you is what do we need to do to meet the President's goal of assuring that—and is this something that we should do, that most Americans have electronic health records in the next 10 years? What do we need to do to make that happen?

Mr. Schable, first, if you would, please?

Mr. SCHABLE. Electronic medical reporting and medical records would be a useful tool in monitoring events, get knowledge of something that might be happening on a local level, but to also see over a long period of time what the baselines are for particular events. That is like we track influenza over long periods of time. We know when a peak occurs, something has occurred, when the peaks for influenza should be or they shouldn't be. How exactly to handle that is a little out of my expertise. I would defer to the person from—Mr. Turner, from the hospital system to answer that a little more at the local level.

Mr. MOORE. Very good.

Mr. TURNER. We're currently in the process of implementing electronic medical records here at the hospital and we think we'll have it done within the next 14 months, the first phase of it, which will go a long ways toward being able to really take care of our patients adequately and it certainly will increase the medication, reduction of medication errors, safety of patients in the hospital. I think that any time you can have that much information readily available to parties that need the information, it will certainly increase, not only our ability in-house, but as well as community-wide and nationwide to get demographics out, disease categories information that needs to be done to really address some of the issues that we're talking about today.

The problem is that it's millions of dollars for each hospital to implement it. And you don't get reimbursed for that. So the ability for all hospitals to be able to implement this mandate is problematic. It really is, and I think that 10 years, certainly for some hospitals is realistic, but for most hospitals without funding, it's impossible.

Mr. MOORE. Thank you, Mr. Turner. I guess I'd ask the same question to Mr. Morrissey with the Kansas Department of Health and also Ms. Kent, if you have comments on that, and any other witness, frankly, if you have comments on that, let me hear from you.

Mr. MORRISSEY. Congressman Moore, I think Mr. Turner's focus on the potential benefits with patient safety and drug interaction, whole range of things, have been an issue that the whole industry has focused on for some time and clearly would benefit from that. We've talked and you've heard several of us talk about early detec-

tion systems and the potential for new technology and common patient medical records to enhance those and I think there's no question that going that direction makes sense from the technological standpoint.

Probably the concern I would raise is that Kansas is also a rural state with many very small hospitals. We have a large number, in fact, the largest in the country of critical access hospitals and I'm not sure that the priorities statewide are going to be as focused on that kind of technological change as they are on for us walking before we run and having on the ground communication and basic surveillance capability to respond.

So I think it's both. We have an urban situation and capacity to deal with. We also have a very rural situation and it's going to require addressing both, both directions.

Mr. MOORE. Ms. Kent, do you have any comments?

Ms. KENT. During our disease outbreak, when CDC came and we were trying to get a handle quickly on what the extent of the outbreak was, we wanted to look at physician records, electronic records and so we called all of our physician groups in the community and were truly handicapped by the fact that I think we only had two medical practices that had electronic records. And so we were not able to get a handle on that as quickly as we could have, had we had electronic records to be able to access. So I think that it has tremendous potential in terms of when you have disease outbreaks, but I do think in a state as rural as Kansas, it's going to be very difficult to achieve.

Mr. MOORE. Mr. Mason or Dr. Kendall, any comments?

Mr. MASON. Well, as I mentioned in my testimony, we use an electronic medical record system. We basically implemented it about a year ago and spent probably about a half a million dollars of our funds of capital improvements to implement the project. So yes, it's costly. I can only imagine what it would be like to implement it in a hospital.

I think an important part is we're looking to the future to have electronic medical records to surveil, but let's don't forget those that we already have in place. As an example, the MAST system of Kansas City is implementing an electronic medical record system. And if you combined our EMSystem® and MAST EMSystem®, you're looking at probably about three-fourths of the metro area's emergency medical response system through hospital. You could data mine an awful lot of this medical surveillance from that. While we need to look at future implementation, let's look at leveraging what we have in place right now as well.

Dr. KENDALL. I'd like to make a comment, Congressman Moore.

Mr. MOORE. Yes.

Dr. KENDALL. In Lubbock, Texas, we're blessed with multiple hospitals and a medical school at Texas Tech. Just this past year, the flu epidemic alone saturated our beds to the point where if we had had an additional problem like a biological attack, we would have been at capacity already. Therefore, the concept of the best medical records possible as applied to individual patient care could do much more for us to identify how serious a level of potential an individual patient may be of succumbing to a disease threat and so on.

And also, I want to comment that once we have people entering the hospital, we are way down the road on a biological or chemical event. In other words, can we do a better job at providing the platforms necessary to provide real time information to assist our first responders in reducing exposures or getting people out of toxic or hazardous zones. I think that's going to be one of the great challenges because already, this minute, the fine people that are running our hospitals are already in near capacity, in order to make their budgets work as well as provide the kind of comprehensive care necessary in today's health care needs.

Thank you.

Mr. MOORE. Thank you, Dr. Kendall.

Mr. Morrissey, about a third—and I'll direct this really to anybody on the panel who thinks they have something to contribute here, because a lot of these transcend your individual testimony, I think, and apply to Kansas and Missouri.

A third of the population of Kansas lives near Missouri in this northeast section of Kansas and I guess my question to you is how are we coming along in coordinating efforts to protect the population of Kansas and Missouri with the State of Missouri?

Is there coordination efforts going on there, Mr. Morrissey?

Mr. MORRISSEY. Congressman, there is ongoing communication between the two state programs and the two state health departments and in fact, in this federal region, the four bioterrorism programs have a meeting scheduled, really, the first one to get all of the staffs together and to begin that discussion.

Mr. MOORE. When does that happen? Do you recall?

Mr. MORRISSEY. It's in June. I'll have to get you that exact date. I think that's an area where we recognize there's significant need. The metropolitan area really has been the focus of the metropolitan medical response system with first a program that was funded through Kansas City, Missouri and covered the Kansas side and now one as well in the Wyandotte County area. And so a good deal of that coordination has occurred locally through those mechanisms and through the focus of MARC and their regional partnership.

Mr. MOORE. Anybody else want to comment on this?

Ms. KENT. I would just say that I think we're beginning, counties that are a little further removed from the metropolitan area, but would be impacted such as Douglas County, beginning to have closer relationships with the Kansas counties that are part of the metropolitan area, but I think there's still a lot of work that needs to be done in that area.

Mr. MOORE. Mr. Schable, and this is not intended as a criticism of anybody, this is simply an acknowledgement, I think, that we had a horrible event here in September 2001 and we've got a huge challenge to try to prepare our nation to respond to something in the future similar to make sure something like that doesn't happen to the extent that we can.

My question, I guess, is if you can answer this or any other panel member can answer this, with regard to the Department of Homeland Security, how are efforts to coordinate among the 50 States and I just—I think this is the first time I've heard about this regional meeting that's coming up in June, maybe. And I'm glad to hear that because my concern is I don't know what's really being

done by the Department of Homeland Security to coordinate efforts with the 50 States and my feeling is, and maybe this is correct, maybe it's not, that the Department of Homeland Security and the federal agencies would have a lot more background and experience in dealing with bioterrorism than some of the states would.

Is there an effort to try to coordinate the information that they could use, the 50 States, to protect themselves and our citizens or is each state kind of just left on its own to develop their protection as best they can?

Mr. SCHABLE. Well, the Department of Homeland Security, of course, is a new federal department that is still organizing itself, but I assure you, Congressman, that the Department of Health and Human Services is actively working with the Department of Homeland Security on these bioterrorism efforts. Many of the people that I know that are now in the Department of Homeland Security are long-time public health people that I personally know and have a lot of experience with and then we do try to coordinate what we are doing.

The Department of Homeland Security has some very specific mission for the Nation's defense against terrorism and CDC knows what it needs to do and we do try to coordinate.

Could we coordinate better? Certainly, sir. And we are making every effort to try to do that. As I said, I know almost everyone in DHS that deals with terrorism and we constantly are trying to make sure that the right hand and the left do know what they're doing. Do they always know what they're doing? No, sir, but we're trying very hard to make sure they do know what they're doing.

I am firmly convinced that if an event occurs, it will be at the local level and those people are the ones that are going to have to respond first. When something happens, they're not going to call me first. These people are going to be responding and we are going to be right behind them helping them respond.

Mr. MOORE. Thank you, Mr. Schable. I do want to again state this is not intended as a criticism of anybody. We're kind of all struggling through this together and I appreciate the efforts that are being made on the national level and I just want to make sure that the states, each of the states has the same opportunity and experience and information level that the Federal Government has.

Does anybody else have a comment on that?

Mr. Chairman, I've got some other questions, but I certainly would like to yield back to you.

Mr. NEUGEBAUER. Sure, we'll bounce back and forth here.

Dr. Kendall, one of the things that is certainly an important part of our efforts on biological attack is detection. And then once we've detected, determining how broad that threat is and to disseminate that information, obviously, to our first responders and our health officials.

Could you kind of go into a little bit of detail of the TEARP and the VIPER program that you all have developed at the Institute and how that fits into the detection scenario?

Dr. KENDALL. Yes, sir, I will. Through the Governor's office there is a strategic plan to deal with homeland security in the State of Texas, including biological and chemical terrorism countermeasures. Included in that are operational centers that are located

throughout the state that employ largely our Department of Public Safety, but in our case, there are discussions to engage research and knowledge-base information that can be transferred to our first responders.

What I mean there, as I mentioned earlier, the Department of Defense has funded us for a number of years to develop information for military readiness, yet it was highly transferrable to domestic security. And in that concept, we developed the TEARP, the Texas Emergency and Analysis Response Program which involves our high performance computing systems, virtual reality center and multi-disciplinary expertise to engage questions of how would one look at a hazardous waste—I mean a hazardous substance or toxic cloud or release into our water systems, etc., and work through that question through virtual reality simulation as we could then assist in identifying the threat level and the dispersion zone and at what point and what level of protection would be needed to enter those zones. That's going to require a lot of expertise and quick response. Not hours, minutes. Okay?

In addition to that, one of the areas that we have worked with and I wanted to emphasize cooperation is the key. Multi-disciplinary cooperation among our federal agencies, our states and then down to our regions and communities.

One of the areas that we've worked with with our wind engineering research team, a world-renown group at Texas Tech, is the VIPER platform, is the Vehicular Instrumentation Platform for Emergency Response. Basically, this is a system that we can deploy either with human operated capability or in the future robotics that can engage toxic zones to provide us with critical weather information, wind information, humidity, barometric pressure as well as deploy our sensors to determine what substances at what concentrations and the dispersion zone.

This information can be transferred immediately in real time via wireless internet as well as cell phone technology back to the operations center so the high performance computer can model the event and determine dispersion characteristics and how widespread the toxic zone will be. Those are some of the things we are doing within the State of Texas and this will be provided—this kind of data will be provided immediately to our first responders. We provide demonstrations to leaders in our community and the state level, including the Office of Homeland Security leadership in the state. And I think it's a model that could have applications in other regions, including this region.

Mr. NEUGEBAUER. I think I can speak for Dr. Kendall, I think he would invite you to come and see the capability that they have developed there for helping our first responders in other agencies to begin to model a particular event and I think it's important that we share the information that we're gleaning from the research money that we're spending because there's not an endless supply of that money available and so I think—Mr. Schable there is nodding his head, yes. And so I think it's important that we do that. So I would encourage you to do that.

One of the things we talked about and we focused this morning a little bit is about the attack on our direct—attack on our citizens in an event of something like that, but what we really haven't

talked about in some of the opening testimony was attacks on our food supply which could be as catastrophic as attack directly on our population.

I'd like to kind of just hear from some of you as you're incorporating into your plans and detection and monitoring, what you're doing in that respect also. Mr. Schable.

Mr. SCHABLE. Yes sir. We are working diligently with the Food and Drug Administration, the U.S. Department of Agriculture, the Food Safety Inspection Service, FSIS. Indeed, their Acting Director is coming next week to discuss this because food safety, it really is extremely important, yet many people don't realize how hard that is to do. There are tremendous numbers of processing plants. CDC historically keeps an eye on outbreaks associated with food processing plants, but in this day and age, we want to make sure that those terrorism type of events don't occur. We don't want to have to go investigate. We would prefer to investigate nothing. But we are working with those groups to try to make food safety much better. Indeed, in Georgia, at the U.S. Department of Agriculture associated with one of the universities, they just opened a new research laboratory to detect outbreaks or threats to the food safety very quickly. And again, that is something we need to do a good deal more work on. We've as you said, sir, been working more on people, but now we're going to start backing that up with work on not only food supply, but the animal industry itself.

Mr. NEUGEBAUER. Any others?

Mr. MORRISSEY. Mr. Chairman, recently, the state has allocated funding from its grant funds from the Office of Domestic Preparedness to conduct a statewide assessment of food security in the state and I would echo Mr. Schable's concern that this is a difficult problem to get your arms around. The farm to fork idea here in terms of agriculture and the whole food chain is a huge task when you think of it from a security perspective and changing. From a public health perspective, our basic response has still got to be dealing with food borne disease and the systems that we already have in place to detect and respond to food-borne illness.

Mr. NEUGEBAUER. Dr. Kendall.

Dr. KENDALL. Congressman Neugebauer, a good example of a model for a biological terrorist attack would be West Nile Virus, as an example, moving from the northeast to the southeast and across the country. We in Lubbock, Texas, get about 16 inches of rain a year. You wouldn't think there would be many mosquitos there, but last year we had the largest per capita outbreak in the country with children dying and older individuals dying.

What does this mean is that the animals were telling us something, birds, horses, etc. Therefore, although I was asked to focus predominantly on human health today, we cannot separate them. The animals were already telling us the virus was moving in. Our institute had the data and was showing these mosquitoes were infected, birds were dying, etc. I think we've got to learn to have good surveillance epidemiology to look for signals before humans start dying.

In addition, I think it gives us tools to better apply early warning systems that will help us better save lives.

Mr. NEUGEBAUER. Thank you. Anybody else want to—I think particularly, this is going to be an issue for Texans and Kansans alike because when you look at the contribution that these two states, for example, make to the food supply in our country, particularly I think about the cattle industry, it's a major issue.

This is a question to all of you, but disease surveillance we've been talking about is an important facet of public health, especially in early detection of seasonal diseases and outbreaks. Have you or your office detected seasonal diseases earlier, more rapidly through the use of disease surveillance and I guess has the CDC been an integral part of that surveillance in the past and presently?

Mr. SCHABLE. Well, since he asked, the Chairman asked about have we been of any help, I hope that the state would say yes.

(Laughter.)

Mr. MORRISSEY. Kay just did actually, in her earlier comment talking about the Cryptosporiosis outbreak that Douglas County suffered through last summer and the significant help from CDC and from the state and the partnership that worked on that. But to the question about early detection systems, I don't think that I can say that we've had the experience of having detected disease using those electronic systems. And my understanding is that's not occurred nationally. We really haven't gotten to the point yet of having a system that's worked to the extent that we can say yes, we identified this disease early because of that and I think in my testimony, I made the point that we're looking at developing more basic systems across the state and assuring that we can function doing more rudimentary, I guess, surveillance.

It's not that we don't recognize the very potential advantages of the technology interventions with surveillance, but we're looking to others to make the investments to develop that and frankly, we're looking to take advantage once those systems are better tested and in place.

Mr. TURNER. I think there are, with the HealthSentry software package I mentioned in my testimony, there are beginnings of having viable software packages and tools to help us with early detection. And CDC has always been an important part of helping hospitals out, but we are very vulnerable as was evidenced by the influenza outbreak this past winter when a lot of us ran out of the vaccinations. It's just some things we just have to get—we're going to have to get better and better. That's something that really caught a lot of us by surprise. The full scope of it. But there are software packages that are being implemented that are being discovered that will help us in the future.

Mr. NEUGEBAUER. I think an important aspect of this question is and it's somewhat what Dr. Kendall mentioned was like for West Nile Virus, it's important that information transfer begin very quickly, particularly West Nile because early treatment of that disease is very important and I think as we look at some of these other threats, identifying them very quickly and making sure that we help, and particularly, I think the question was brought up about or a statement was made that in Kansas and in West Texas, we're urban and we're rural.

And in some of those early detections, we always assume that those are going to begin in a metropolitan area, but you know that

may not necessarily be the case. So we've got to build a network where our detection and identification is done on a relatively quick basis.

Mr. MOORE. Mr. Chairman, may I follow-up on one of your questions?

Mr. NEUGEBAUER. I yield back to you.

Mr. MOORE. Thank you, sir. Thank you. I thought the Chairman asked a really good question and I wanted to follow up a little bit and that deals with the food supply and the infection of a food supply. And we saw in the last several months disastrous results when one animal in Canada apparently came to this country infected and we—it has a tremendous adverse effect on our economy. Kansas, Texas and I think there are a few cattle in Texas, right, Mr. Chairman?

Mr. NEUGEBAUER. One or two.

Mr. MOORE. And really, I'm very serious here, this could be a tremendous economic, just devastation for many places that are cattle producers around this country.

What, if anything, can we, should we do to protect the food supply, namely cattle, but expand from there and I'm asking Mr. Schable, Dr. Kendall, anybody who wants to comment on that, Mr. Morrissey?

Mr. SCHABLE. It's actually a very good question, Congressman.

What can we do to protect the food supply? I think we have worked with our colleagues in the U.S. Department of Agriculture as they are the ones that have the legal responsibility for the food supply, along with the Food and Drug Administration and HHS. We have to look at what vaccines are available, what systems are available, how can we make sure something doesn't move into this country from other parts of the Nation, other parts of the world. The borders between us and Canada and us and Mexico, I don't know how easily herds move back and forth, but I don't think they worry—they worry a little bit about that, but they're starting to pay more attention to that type of thing.

I think that's what we need to do, is to start putting as much effort into animal and plant safety in many of these cases as much as we are for human safety because you're right, sir, is that the economic impact of this would be tremendous if say there was a significant cattle problem and look what happened in the U.K. That was a lot of people who suffered a lot from that particular event.

Mr. MOORE. Others? Dr. Kendall.

Dr. KENDALL. Congressman Moore, thank you for the opportunity to comment on this, but to a large degree how we've concentrated our agriculture, say corn production, cotton production, beef cattle, concentration, chickens, other poultry, makes them vulnerable and easily attacked. Therefore, the need for surveillance capability, I think is critically important now.

I continue to emphasize we cannot separate ourselves from our food supply. The need for fiber and food is critical to our survival as well as our monetary health and for that reason I think increased cooperation between multiple federal agencies, as well as our states and regions will be critical as we continue to work through these problems and how to detect them early.

Mr. MOORE. And let me just ask one additional question which may elicit further comment from any of the people who have already talked, but to Mr. Morrissey as well. How are we, right now, in terms of readiness, preparedness to deal with this? Are our people protected? What do we need to do to get us there? My uneasy feeling is we're not really close yet. Maybe I'm wrong, I hope I'm wrong.

Mr. MORRISSEY. Congressman, if I can touch on the question about foreign animal disease first, that's not our principal focus in the Department of Health and Environment. It is a shared responsibility across a number of agencies and the Department of Animal Health, Commissioner Teagarten has that responsibility. They're working toward enacting—they have in place an active statewide planning process. They're working toward an animal identification tracking system and they're now I think looking forward to participating in a national effort to better be able to electronically track animals for things like BSE and the whole range of concerns.

I think that's in the early stages and like the public health system and the health care system, they have the same kinds of problems with surge capacity. And in fact, we have some plans, but our ability to implement those in a very short time frame is I think very limited and those are issues they're going to continue to struggle with.

Mr. MOORE. I guess that's the uneasiness I feel about this and I think it's just an acknowledgement that we still have a ways to go, we need to get through. That's one of the reasons for the hearing today, Mr. Chairman. As you know, sir, I really appreciate your coming in for this, but there are a lot of areas where I think our country and our people are still vulnerable. We need to number one identify those and find a way to coordinate giving information to all the different, the 50 states and homeland security. I know this is a huge, huge challenge. So I'm not pointing a finger to anybody. I'm saying we're all in this together. We've got to work together and I think we're doing the best job we can right now, but boy, we've got a ways to go to make sure that our nation is protected in the future. Because what we saw as a result of September 11 was not just the horrible fact of 3,000 plus people died there, but there were tremendous economic implications for the rest of the Nation after that as well. So it's a question of lives and our commerce, the airline industry was hurt very, very badly as a result of September 11.

Mr. Chairman, do you yield back?

Mr. NEUGEBAUER. I think the President's directive, I think they're calling that Project Bioshield and I think that's—when we talk about multi-disciplinary, I think we've got to put the food supply into that initiative because it's equally important.

One of the things I'd like to hear from some of the first responders because you have other folks in the room that probably need to hear this, but what are some of the information—we heard a lot of you talk about the need for vaccination and equipment and stuff like that, but from an informational standpoint where do you feel like the information void is that you need today to be on the front line, particularly the first responders diagnoses, symptoms, remediation?

Mr. Mason, I'll start with you.

Mr. MASON. For us, the—as the responders you said the word response, basically react. We don't spend a lot of time in the detection and surveillance piece in and of ourselves, we just respond to the 911 calls and start tracking those trends—hm, something has consistently been going on here—and then we pull in our friends in public health in the process.

Through the exercises we participate in in the county and the state, as an example, I think one of the frustrations for the response community isn't the lack of information from our public health community, it's the speed at which it comes. And that's just a matter of science. It has little to do with problems in communicating on the human side. It's laboratories are few and far between. Their ability to do high end analytical work in the State of Kansas, I think, is limited to one lab that's been recently upgraded. So that slows the process down in terms of identifying what it is that we're dealing with. Once the identification has occurred, the treatment plans and what we can do to respond to that are I think pretty well known and very easily disseminated from top to bottom, so really, it's probably more of a time delay in determining what it is we've dealt with. In terms of my personal frustration in exercises, thankfully, nothing in the real world has hit us yet. But in the exercises, it's certainly been that delay in what is this thing? We've got to narrow it down to five possibilities and we can start some things, but it certainly is that delay.

Mr. NEUGEBAUER. And that concerns me, quite honestly. If you're called to a building, for example, this afternoon and people are either sick or you find people that have died in that building, as you go into that building, do you have detection equipment that would help you begin to identify the environmental conditions of that building?

Mr. MASON. We do. When we're talking about detection equipment, it's a broad spectrum from like the chemical detection through the biological detection. The biological detection clearly is the one that takes some time to get a true analysis of what goes on and we can certainly defer to the experts on exactly what I'm referring to here, but we can go in today with monitors that tell us if there's an oxygen deficient atmosphere, if there are certain chemical agents, VX, saran and so on and so forth that are part of those environments. We can walk in today with those things off of the fire trucks which traditionally don't carry items like that on our first response ambulance, but my hazmat medics carry those kinds of detection equipment so we can look at the signs and symptoms of patients and do they fit a certain profile for a chemical agent. Those kind of are the things, walks like duck, quacks like a duck, it's a duck. Very simple things up front in the chemical environment.

It's the more incipient biological thing that we're not going to know about. It's going to be we're all of a sudden seeing a spike in calls and maybe it's an evocative thing and maybe it's a more rapid food-borne illness that we're seeing a grouping of people come in, but today, I think, going back to just universal precautions. The books from the CDC tell you to wash your hands and wear your gloves. Our paramedics do that every day. So going into a building

today with the detection equipment we have, I feel safe that our people are going to go in there. They're not going to get themselves hurt. They're going to identify the problem and they're going to treat the injuries and give them transport to the hospital.

It's again that long-term identification of what is this biological piece that we're dealing with. We can through the grant money, the Homeland Security grant money, they bought a nice fancy piece of equipment that can tell us today off one of our hazmat trucks is it coffee creamer or is it anthrax? They can do a little bit of that stuff in the field now which is nice. So we're making some of these technological advances to give to that rapid assessment of what the problem may be, so we're getting there in terms of biological, but I think there's still a lot more needs to be done and I'm very intrigued with this VIPER system that I'm hearing about.

Mr. NEUGEBAUER. I was going to say so, Dr. Kendall, if Mr. Mason calls you and has a reading on this device and he's got a five story building or a warehouse or something like that, what kinds of information could you give him back to help his first responders?

Dr. KENDALL. First of all, there would need to be structure in a way that we would need the relevant data on atmospheric conditions or humidity, etc., so we can get a better feel, if it's in a building, outside of a building, how materials may move or flow.

Once you get into the biological area, that gets into—we can do quick analyses on chemicals. A lot of the real time chemical problems, the equipment right in our building we can do it. It's the biologicals as Mr. Mason mentioned, that require a little bit more screening. Although we can get it down to certain, at least certain potential areas.

I think one of the—I was just sitting here thinking, Congressman, but one of the areas that I think we're underestimating is we're talking about whether anthrax or botulism and so on, we know a good bit about them, relatively speaking. It's the techniques and current technologies of molecular biology, we're going to probably be seeing in the future genetically engineered organisms that we don't necessarily have the technology yet to deal with and I think our techniques in the future are going to have to be robust, they're going to have to be encompassing and at least get them information: is this an acute toxin or a chronic toxin or whatever else? And so that's a challenging area. We don't have as quick a response capability as I would like to see, but this is what I'm saying. We need to develop further techniques to at least get the first responders the information on just how hazardous is this. Subsequently, of course, we can be seeing the human health effects if they aren't adequately prepared.

Mr. NEUGEBAUER. Ms. Kent?

Ms. KENT. Yes, I just wanted to say on the biological agents and referring back to my testimony, this is where having lab surge capacity that we can really get quick results and that is where epidemiology is critical, where we really are getting on it right away and following up and who has had contact with whom, but laboratory surge capacity will be critical in these biological events.

Mr. NEUGEBAUER. I yield back.

Mr. MOORE. Thank you, Mr. Chairman. A couple of questions and I'll throw them out to anybody who feels they have something they want to contribute, I'd like to hear from you.

One, I guess is, with response, and the Chairman asked this earlier, kind of as a collateral question here about the VIPER system or somebody mentioned the VIPER system, I guess, Mr. Mason did. So it sounded like a great system.

Are there efforts to find out where a state has come upon something that really may benefit the other 49 states to distribute that information to make sure that not just Texas has it? That's one question I have.

Another question and this is an uneasy feeling again and I hope you can say well, that shouldn't be a concern, you don't have to worry about that. I have walked past on sidewalks in Washington, D.C. and the same thing here, huge buildings where several hundred or a thousand people work and I've seen not far from the sidewalk this huge air intake and I just wonder what would happen if somebody were to put a biological agent in there that would be distributed through the air ventilation system throughout the building.

Are we dealing with anything like that? Is that just science fiction or is that something that really could be damaging to people?

Mr. Turner.

Mr. TURNER. I don't know that we are dealing with that and some of these opportunities that terrorists would have are so scary that you don't even want to mention them on record because there are so many opportunities.

Mr. MOORE. I guarantee you, if we thought about it, they have too.

Mr. TURNER. I know. As I mentioned in my testimony, one of our concerns that we have, even at this facility is if our inability to isolate air duct systems, those systems that would just spread it throughout the hospital, so we could be really good at what we're doing even in the emergency department, but it then infiltrates the whole hospital. So I don't see from a public facility standpoint that we are doing anything to address that and it is something to be concerned about.

Mr. MORRISSEY. Congressman, we have done statewide threat assessments, now in the second version we're into, in looking at that and I think it's as indicated, safe to say that we have a lot of buildings that are vulnerable in a variety of ways and the process of reengineering those is probably overwhelming in a number of cases, not just from the situation you describe, but even from protecting them from explosive attack. I think it's a big problem and I sure don't have an answer.

Mr. MOORE. I'm sure, Mr. Schable has an answer.

Mr. SCHABLE. Well, we have, obviously, that is something, sir, that we have looked at. Since Mr. Turner is sitting next to me, we'll use his hospital as an example. I mean the air intakes usually do not blow directly into the hospital without some type of filtration system embedded in them. They're not HEPA filters which would filter all organisms, but there are things in there that would substantially reduce the amount of particles that do make it through.

But as Mr. Morrissey said, to re-engineer these types of buildings so that air intakes would truly get rid of all biological agents as they go through it would be an astronomical cost. We have thought about that and there's no clear answer for that, sir.

Dr. KENDALL. As far as I'm concerned, it was just a few years ago when Admiral Zumwalt approached us with this question and concern. And look at us today. It's every day. It's meetings, it's on the evening news. We need to be ready and no, we aren't ready. We're getting ready. And those air ventilation systems are vulnerable and it depends on what substance you're using, how you're applying it.

So at this point, with all this great nation has done, putting a man on the moon, all our great technology, this is one that we need to drop back, evaluate exactly what we need to get ready and I think with first responders, they're critical to us, but they need technology and information. And so we've got to figure out how to make that transfer across lines very easily. And so it may be under a biological attack, it may be Texas or it may be California that gets the answer for Kansas to address it. That's the kind of technology and information sharing we're going to have to implement.

But I wanted to say, Congressman Neugebauer did invite people to come to our University. I want to formally say we support our Congressman greatly. He is a great friend of our District and our University. And I welcome everybody to come and see how we would walk through this challenge. And you give us the challenge. You give us the weapon. You give us the scenario. We've done it for our leaders in the state. You come and we will talk to you and perhaps Kansas, working with Texas, and Oklahoma and so on, we start building regional expertise and information-sharing.

And I fundamentally believe we can't expect to deal with this necessarily from Washington, D.C. We're going to have to be dealing with it right in our regions and our states and in our communities ultimately.

Mr. MOORE. And I'm not saying that. The Federal Government certainly does not have all the answers, certainly not. And if Texas has developed a model program, I just want to share in that information and not just stay down in Texas and I don't know yet if that's happening and I'm not sure that it's your responsibility to make sure that information gets out to 49 other states, but I'd sure like to see somewhere in the Federal Government, the Federal Government identifying model programs that work well and distribute that information, coordinate that information with other states. That was my comment.

Mr. NEUGEBAUER. I think that's a great point and certainly if we're going to put research dollars into it, we talked about that limited supply, information sharing.

And I'm glad the gentleman moved into the building environment. I think we've got detection and you've got containment and mediation. I think this is the next piece of the puzzle. Building design, I mean, we—I know we have in West Texas and in Kansas we've got places where people can go for tornados and we've got designated areas in buildings for people to go for those events.

Mr. MOORE. We have basements.

Mr. NEUGEBAUER. We have those too. I think the next part of that, our state and our federal officials have to start thinking about is where is the best place in a building to go. Instead of smoke detectors now, do we have environmental detectors and what kind of mediation could we provide people early in and also in containment? I just would open up for the panel, your thoughts and things that you see going on and what—or is there anything going on?

Mr. MASON. Mr. Chairman, we presently on the local level, usually we have in place already to a certain degree until new technologies push us in another direction, and that's following existing shelter in place programs that have been in place for a number of years developed around communities where significant hazardous materials risk is involved. If there was a release at chemical plant X, that community had plans in place to shelter. Create a safe haven within your home or work place that kind of shuts yourself off from the outside air, so on and so forth.

So that's a program that we still profess on a very regular basis in Johnson County. There can be, again, much more—utilizing some of the things Dr. Kendall has mentioned, many more advances made in terms of detection and providing—you read my mind, is there going to be a chemical detector and bio detector to sit next to our smoke detector in the house?

Mr. NEUGEBAUER. Exactly.

Mr. MASON. Some day, I guess that's going to be here. I think a thing that we face again as an emergency response community is the grant money came out and so did all the snake oil salesmen. And everybody but Ronco has come forth with the biodetector kit and we need people like Dr. Kendall and his institution of higher learning to tell us and establish the best practices, to run these things through the paces and tell us that no, this thing here is best used as a paperweight. This item here is a good piece of detection equipment for first responders. We need facilities like his to do that work for us.

Mr. MORRISSEY. Mr. Chairman, I think from a state perspective, as indicated, we're following now the federal recommendations that are not new, that are basic about shelter in place and do other things. I think that's not an area that we focused on.

I think one of the big concerns about bio detection systems, generally, is and it's very important again, I think for the smaller, more rural states is what do you do when the alarm goes off? And in fact, do we have the resources to allocate and do we know what resources it takes? We've touched on the difficulties here with screening. How do you handle the number of false positives that get generated out of some of those systems?

I don't think we have answers for that, but I think those are very real concerns from a national perspective before we get to making significant commitments to particular systems.

Mr. SCHABLE. Mr. Chairman, it's interesting what we've been talking about here because historically CDC, health departments in the state and the counties work on human beings and all of a sudden now we're being tasked more and more with environmental microbiology, that is, we at CDC don't do much of that. We are certainly embarking on a lot more of that in these detection systems, that is, how can we help the first responders. As he has said, many

of the tools out there, you might as well just flip a coin whether or not the answer is correct or not. We are working on—the National Institutes of Health has put significant research funds out the door to many different groups who wish to apply for these types of grants to work on environmental microbiology.

We can detect almost anything in a human being very quickly, but trying to detect whether or not there might be anthrax in a dust bunny sitting over there—it may sound simple, but it's not so simple, sir.

Mr. MOORE. Thank you, Mr. Chairman. That kind of was my uneasy feeling and has been since September 11, actually. The Federal Government will probably do a pretty decent job of protecting our nation from the nuclear strike, probably. And that chemical contamination is going to be fairly readily discernible and we can probably deal with that, but where we're really behind the eight ball and behind the curve is on bioterrorism and really trying to recognize when it's happened and it may take sometimes hours or days before we really know, and then preventing it. And we've talked about a couple of areas already.

I want to ask Dr. Kendall a question, if I can, please. In your written testimony, Dr. Kendall, there were indications that the University of Kansas and Kansas State are participants in the national consortia for countermeasures to biological and chemical threats and that the University of Kansas is a collaborator with the Zumwalt Program which you mention in your testimony, Dr. Kendall.

What are the Kansas universities' roles in these programs? Are there other ways that you think institutions in Kansas or around the country could be working together?

Dr. KENDALL. I appreciate you mentioning that point. As I earlier testified, the national consortium was developed originally with the University of Texas at Austin, University of South Florida and our program, called the National Consortium for Countermeasures to Biological and Chemical Threats. And we received our first funding from Congress in the year 2000 after discussions in 1999. That entity has been operational since the first funding was received in 2000.

In just this past year, the expansion and to other universities, and in fact, 17 universities are a part of the consortium now. We had last May, our meeting in Texas, I hosted it at Texas Tech and Kansas representatives were there. Unfortunately, we didn't have an expansion in research funding at that time. However, there are discussions as to collaborative projects and other places in which we could share resources. And in fact, in just two weeks, we will be meeting in Florida. They're hosting this event this year and we—and so we will have consortium members from most of the universities including our program. And we intend to with the new presidential directive and the great expansion of interest in bioterrorism, to forge out some new proposals and ideas to leverage this knowledge into operational platforms that can help people save lives and protect property.

So they are in the dialogue and they are welcome and we intend to reach out and embrace them for collaborative research and also education.

Mr. MOORE. Thank you. Mr. Chairman?

Mr. NEUGEBAUER. What I was going to say and I know that I have a few more questions and the gentleman does also. I don't know what your time schedules are for airplanes and stuff. So if a Panel Member feels that they need to go take care of a little thing like airplane reservation or has one, feel free to excuse yourself, but in fact, we have you all together here and I think this is an excellent opportunity for dialogue and we'll continue a little longer here, but I do want to be sensitive to anybody that has any.

One of the things that is—I've heard the comment made in communications and in planning at the regional and local level and statewide level and the—obviously the states are disseminating a lot of the money from homeland security for many of these initiatives, but do you feel like everybody is being included and everybody is at the table that we need at a planning level or are there some people being left out? What's your sense of that, Mr. Turner?

Mr. TURNER. I think regionally since 9/11 the people that need to be at the table are at the table. If you ask me does every one of a particular discipline, do they feel they're at the table? Probably not, but I think that discipline has been represented at the table.

We still have this—there's still a certain amount of independence with all of our entities and a concern of mine is that while we're at the table and realize what we need to do, we know we need better information systems and everybody has their idea about which information system is the best for their hospital or organization, I think it's important that the government not get into mandating what information system is out there, but that whatever systems are out there, they need to be able to speak to each other.

We're going to go with Cerner. Someone else is going to go with McKessen. We need to make sure that on top of everything, they're able to speak, but I do believe that regionally the players are at the table.

Mr. MOORE. I think you make a good point there and I think it's working with CDC, making sure multiple platforms, making sure when the information gets to the CDC, it's in a readable form. It's kind of like exporting a spreadsheet. You may have a different spreadsheet program that you may need to make sure that whatever spreadsheet you send, the person on the other end is able to open that spreadsheet. And so I think as we disseminate that information, do you feel like in the private sector, in the companies that are helping provide that technology are they at the table right now with us and are they in the loop? Are they listening to the needs and some of the challenges?

Mr. TURNER. Some other folks might be able to speak to this more factually than me. I don't see a lot of emphasis when we get with the private sector on bioterrorism. I do see it getting a lot of information that helps us with taking care of our patients, disseminating that information, but I don't see a lot of talk about doing it for the purpose of addressing bioterrorism, but others might know better than me.

Mr. MORRISSEY. Mr. Chairman, I think that may be because the focus has perhaps been at the state and federal level and with universities and research in terms of the development process and certainly there's been significant private sector involvement in devel-

oping the products that facilitate planning, communications, a whole range of areas.

I touched on in my testimony, the Governor's concern about the initial question that you raised and she literally upon taking office started asking questions about how homeland security efforts were being coordinated and was everyone at the table and how is that done. And as a result of that discussion, formed a new body whose focus was to give an overarching view to the various elements of both the bioterrorism program and for us at the state level, integrating that homeland security effort into the ongoing emergency response, and existing emergency response capability that was there.

The Kansas Division of Emergency Management has primary responsibility for emergency response under state law. We've always had a close relationship with them related to disaster response. It got significantly greater with the advent of the bioterrorism funding and development of those programs and so I think yes, we have those folks at the table, but as you said, is there someone out there who feels differently, I'm sure there are.

One of the problems has been just getting to it all and we talked about food security, a number of issues that we agree are a high priority. We don't have as much work done on them yet at this point.

Mr. NEUGEBAUER. And I think that brings up a point that I want to make and the way I feel and I want to encourage all of us to, as we move forward in this, in Congress and the Administration and the people out in the field and in the research and in the private sector is we don't have a lot of time to work on just one thing at a time. We really have got to be working on this issue in a multi-disciplined way. We need to bring the private sector in. We need to start talking about designing buildings and ventilation systems for future buildings.

We know the retrofit cost would be phenomenal, but the problem is if we wait two, three, four or five more years before we really determine what's the best way to do that, we've got three, four, five years of buildings that don't have the capability. The problem with not addressing feed lot contamination or animal contamination, if we wait, two, three, four or five years, we've got that many more years of opportunity there, so I think what we have to begin to do is identify where, who's doing what and begin to develop some niches and some specialties and have different groups working on that rather than all of us trying to work on one particular issue at a time. I think in order to commercialize that, which is the ultimate goal here is that with research and any of those kind of things that we're learning is quickly getting them commercialized and in a format that everybody understands so that we can share that information and make sure that our information systems are talking to each other. So I think as we move forward and we want to talk to people, certainly encourage the Administration that we've got to really do this on a broad basis.

Mr. MOORE. Can I just add something?

Mr. NEUGEBAUER. Sure.

Mr. MOORE. I think the Chairman has made an excellent point. We need to multi-task here and you know, we live in a free society

and an open society and we think this is the greatest country in the whole world and it is. We value and love the freedom and openness of our society. But it's those very things that make us vulnerable, make our nation vulnerable.

And we need to find ways, I guess, to work together and this should not be—it's not partisan at all. It's not about Republicans and Democrats, it's about Americans and working together to protect our nation and our people. And we've talked about the food supply. We've talked about biological agents that can get into the food supply or air. We've talked about—we haven't talked about huge containers that come into the ports around our country that could have a dirty bomb. And we make an effort to inspect some of those containers, but boy, I'll guarantee you, there's just thousands of them that really don't get inspected is my understanding.

And we haven't even mentioned here, and this wasn't the point of this, but as a nation, it's part of the threat of terrorism against our country. We used to get up every morning before September 11 and turn on the television and drink a cup of coffee and watch TV and read about or see on television a report of some horrible suicide bombing in the Middle East or some terrorist incident in Europe and we thought well, that never happens here at least, but we found out on September 11, we're part of the real world and we do have to be prepared for that because the Chairman and I were talking before we started here and we can take all the steps that we can imagine which would cost millions and billions of dollars and yet still not be able to protect everybody because somebody tried to assassinate and shot President Reagan several years ago with the best security protection in the country. If somebody is willing to give up their life, there's a good chance that they're going to be able to hurt some people and I'm just amazed that we haven't seen the suicide bombings that we see in the Middle East happen here because there are demented people there and there are some demented people in this country as well. And it would just be tragically easy for something like that to happen.

And I'm not trying to spread any ideas to anybody, but as we said before if we've thought about it, I guarantee you people around this world have thought about it as well and I'm really glad, Mr. Chairman, that you were willing to come here today because we need—I guess the one other area I want to identify and ask a question about and just throw this out.

We've talked about coordination of information and ways to protect our country. And I still have this uneasy feeling, again, it's not critical of anybody because it's such a huge task. It's just going to take time for us to develop the ways to do this, but coordination of information and spreading information like this VIPER program. I'm sure there are other great programs in other states and I just question or wonder if this information is getting around to the other states so they can look at implementing similar programs in their states.

What I don't want to happen is just one or two states develop great programs and the rest of the country not hear about it and I think that would be a good responsibility of the Department of Homeland Security, for example, to disseminate that information

around and make sure everybody has access to it, so if they want to develop a similar program, they have that opportunity.

Mr. NEUGEBAUER. And I think that as I read the President's press release, I think that is part of the initiative here is to make sure that there is coordination because as Mr. Moore and I have observed first hand sometimes we're appropriating money in different areas and sometimes for the same cause without—not a lot of coordination going on. And we're at a time in our country, one, that's not the right public policy, but secondly, we're at a time in our country where we're watching what we're spending and we need to spend it wisely and so we do need that coordination to go on.

Mr. Moore, I always like to ask the panel—because they're the experts and you and I are here to listen—when are they going to ask this question and we never asked that question and we leave here not really hearing some information that we needed to hear and certainly we have your testimony and opening statement.

But was there in this dialogue, did it spur a question that we should have asked that you would like to bring up or a point that——

Mr. MORRISSEY. Mr. Chairman, it's not a point. It's one that's been raised a couple of times, but I think it's worth noting. In the issue of information exchange and technology transfer, an appropriate federal role and that is one that I think CDC has taken a lead in and that is standard setting.

It's been raised, noted a couple of times. The issue is not you should pick up the system we're using or translate it, but that we can all develop systems that can communicate based upon federal standards that are defined and achievable in the public health information network that Mr. Schable mentioned is down the road in attempting to organize public health information systems, to be able to do that. I know there are other standards around and it seems to me from a federal perspective in the area we're talking about, that has to be a critical basic function. How do we assure that all of these systems are going to be able to link up?

Mr. NEUGEBAUER. I think it's a good point. Any——

Ms. KENT. I would have to say I concur with that because at the local level we're looking at spending money. We want to be sure that we spend it on something that's going to be compatible with neighboring counties and neighboring states and I think the Federal Government does have a role in being sure to help with those standards so that the money we're spending is very well spent and that we can all be talking to each other and understanding what is going on. And I think that's true in terms of communication technology also in terms of radios and all of that type of thing.

Mr. NEUGEBAUER. Mr. Schable, could you enlighten us, maybe what's going on at the federal level to address that?

Mr. SCHABLE. Well, as I mentioned, what's called PHIN, Public Health Information Network, is a large program trying to bring some order to all of these surveillance systems, if you will. I mean CDC, historically, asks the state and local health departments for data to come in. I mean many, I don't know, I'm not exactly sure how many data streams the State of Kansas has and the State of Texas has to CDC, but I'm sure it's a lot. It would be nice if all

of those data streams all from a computer networking capability were all able to talk to each other and if the State of Kansas wanted to share a piece of information with the State of Texas, someone could just hit a submit button instead of when sometimes the data shows up at the other state, it's completely garbled because somebody didn't use the same DL7 code or—I'm not a computer expert, but I mean that's one of the things we're trying to do is make some kind of sense and order out of these hundreds and hundreds of data streams that are coming in and it almost sounds easy, but that's another major task is to try to get these things so that all of the extant data streams which might not work which are very important and have to be changed over so that they do work.

We don't want to tell the State of Texas or the State of Kansas in half of your data systems you're going to have to go out and hire 10 more people just to reprogram everything you've got, then that would be disaster.

What we need to do at the federal level is to come up with something that can take a data stream that's not perfect and mold it over into a thin compliant system so that we have something that people can look at data quickly, can share data very quickly.

Mr. TURNER. I agree with everything that's been said about the information. I also would like for us not to forget the basics and that is that we provide funding for CDC or whomever to make sure that we're able to quickly produce the antibiotics, the vaccinations that we need locally to take care of at least a 72-hour period of need.

Mr. MOORE. May I ask a question, Mr. Chairman? My question, and I don't know who to ask this to, I suspect it may be here and Dr. Kendall or Mr. Morrissey, but are all the players at the table, all the interested stakeholders, the parties, for example, pharmaceutical companies and you just mentioned vaccines, if they can be manufactured, developed quickly enough. Is there a stockpile large enough to handle those? When people are sick and go into a drugstore, is there a way to monitor what's happening there in terms of what kind of medications they may be getting to treat certain symptoms and which may—they may not even go to a—I suppose they're going to go to a doctor, but maybe they don't even know what they have.

What are we doing to, what are we doing to determine if people are, go to a doctor and then they're prescribed a medication, they end up at the drug store and they buy a prescription and maybe they've been correctly diagnosed, maybe not, but is there a way that we can look at patterns there? I've heard about some software and I think Cerner's, I've been out to Cerner once or twice and they've talked about a software program they have to try to monitor that.

Mr. Turner or Mr. Schable or anybody, Mr. Morrissey, can you comment on that and what we're doing there?

Mr. SCHABLE. Several of the departments, Health and Human Services, Homeland Security, there are what are called requirements committees in which what we do, along with the NIH, they're there, we look at what is, what do we think is required in the future for the level of do you need this vaccine or that vaccine

or this antibiotic or that antibiotic? What does the Nation need in the strategic national stockpile that CDC runs?

And so there are groups of high experts that try to sit down and think what is important, what needs to be done? Do we have enough of this drug or that drug? A pharmaceutical company isn't going to make a drug that no one is ever going to use, so we have to tell them this is something that's important. We think it needs to be in the stockpile. And that information then is given to the pharmaceutical companies. So we are working at that level.

But what you just mentioned, sir, is that the issue of would it be nice to know, because a lot of people when they get sick don't even go to the doctor. Unfortunately, there are a lot of marginalized individuals who cannot afford health care, barely can afford to go buy some aspirin at a discount super store. And so is there a way to monitor the amounts of the drugs sold? And CDC is embarking on a biosurveillance initiative, we call our bio intelligence center in which we are trying to put that data together, not only pharmaceutical data, laboratory data, data on emergency room admissions. This is just the start. We're just getting ready to do this because, obviously, in the same issue would be of data monitoring. All of these people are using different types of data sets, plus when, can you imagine the amount of drugs that are sold on a daily basis in the United States, when that came to the CDC, you would have a huge database. Someone has to write computer software that says when something happens, a red flag goes off so someone—no one person could monitor all of that. It would have to be the computers. But the computer program has to say you better look in Kansas City, because all of a sudden everybody is starting to buy some type of antibacterial drug or some type of something to monitor upper respiratory infections. That could be a key. And so we are just now embarking on doing that and we're moving down that path.

Mr. NEUGEBAUER. Dr. Kendall.

Dr. KENDALL. I think at it though with the drug companies, they are probably going to need to be encouraged because it takes so much money to develop a new product and bring it to the market these days. And I think this is going to be an area that's going to be very important to us and perhaps that may be something the Science Committee could consider, how to encourage new drug research, that may not be immediately needed, but would set the platform to be able to deal with these kind of ultimately potentially terrorist threats.

But Mr. Chairman, I was just thinking here, if I could have one more minute just to speak. I was just thinking about your comment about many years ago and the nuclear threat to the country. And I can think about when I was a child the Cuban Missile Crisis and how that challenged this country and its backbone. And I look at what we did as a nation and then in my lifetime we have seen the Cold War diminish to a great degree. We've seen the Berlin Wall fall. We've seen an enormous increase and our presence relative to challenging and being able to take on the nuclear threat.

At this point we have a new challenge, biological terrorism. It's more difficult to target it. It's more difficult to follow it and it's more difficult to even tell where it is at any given time. So I think

both of you are to be complimented for holding this meeting and hopefully many other meetings in the future because we as a nation are getting ready and we're not ready. We're beginning to get ready. And technologies are emerging and we have a wonderful opportunity to transfer information and to work together, but this reminds me of back in the '60s and beginning to think about the nuclear threat.

Indeed, gentlemen, this country will respond, I'm convinced. And it's going to take leadership from leaders like you to bring us together, challenge us as did Admiral Zumwalt did me years ago. And then I think the technology, the capabilities, the universities, the health responders will work together and we will make this nation stronger and safer.

Mr. NEUGEBAUER. I want to thank this panel. I think we've had a great discussion here today, good questions. I encourage you if you have any follow-up information that you want to provide to the Committee to do so and we will put that in as part of the record.

You can't have a hearing like that without the help of a lot of folks and certainly, Mr. Turner, we want to thank you and your staff for providing this facility for us. I want to thank Jimmy Hague and Elizabeth Grossman, and Sarah Matz from my office and I know Marsha Shasteen and then Jana Denning. Jana, thank you for your help and then Jill deVries. Jill, thank you for your help in making this possible.

In closing, I would just like to say that this is a very important issue in our country and it's going to be more and more important every day as we fight this front and this is a front that we're not just fighting in Iraq and Afghanistan and other parts around the world. This is unfortunately—the battleground is, has been brought and could be brought to our homeland. So we want to continue to work with you. We're relying on you to challenge us and to keep us moving in a direction that protects our citizens. As I've said, I was very fortunate the first 54 years of my life. I didn't have to live a fearful life in my own country. And I don't intend for my children or your children or grandchildren and my grandchildren have to live a fearful life in their own country.

It's going to be a challenge, but you know that's the great thing about America is when we're challenged, that seems to be when we do our very best work. And so I'm going to thank all of you for being here and thank you for your attendance and your participation today.

Mr. MOORE. May I make a quick closing statement as well? I really appreciate the statement that the Chairman just made here because he's talking about what a challenge we have in the future, but that we as a nation do rise to the challenge and I appreciate the comments by Dr. Kendall and all of you for being here today because I think we've had a good discussion about some of the challenges.

I had to smile because he said, Dr. Kendall said, when he was a boy we would have these air raid drills or nuclear drills or something where you would put your head down on your desk and put your hand over the back of your neck as if that's going to protect from a bomb, you know? And now we're sort of talking about little

masks and duct tape and that's probably not going to protect us from some of the things we need protected against as well.

We are at the front of the challenge here, but I'm absolutely confident as the Chairman indicated, as Dr. Kendall and you all have indicated, that we can meet this challenge as a nation and protect our people in the future and we just have a lot to learn here. And I think we, in the last two and a half years, have begun to scratch the surface about how much we have to learn, but I'm absolutely confident that we can do it. So thank all of you, and Mr. Chairman, thank you especially for convening this hearing.

Mr. NEUGEBAUER. Thank you. We're adjourned.

[Whereupon, at 11:30 a.m., the hearing was concluded.]

Appendix:

Additional Material for the Record

PREPARED STATEMENT OF SCOTT C. VOSS

An Overview of Current Local Public Health Initiatives in Johnson County Kansas and the Kansas City Metropolitan Area

3 MAY 2004

SCOTT C. VOSS, MPH
PUBLIC HEALTH EMERGENCY COORDINATOR, JOHNSON COUNTY HEALTH DEPARTMENT
CO-CHAIRMAN OF THE PUBLIC HEALTH EMERGENCY SUBCOMMITTEE
OF THE REGIONAL HOMELAND SECURITY COORDINATING COMMITTEE,
AND CHAIRMAN OF THE EPIDEMIOLOGY SECTION OF THE KANSAS PUBLIC HEALTH ASSOCIATION

Introduction

Thank you, Chairman Neugebauer and Representative Moore, for providing me the opportunity to testify on Bioterrorism Preparedness efforts in the Kansas City Metropolitan Area. My name is Scott Voss and I serve as the Public Health Emergency Coordinator for the Johnson County, Kansas Health Department. Johnson County, Kansas is situated on the border between Kansas and Missouri. With an estimated 2004 population of 495,788, Johnson County represents more than 25 percent of the total population of the Kansas City Metropolitan Statistical Area.

Additionally, I serve as the Co-Chair of the Public Health Emergency Subcommittee of the Kansas City Regional Homeland Security Coordinating Committee. This objective of the Public Health Emergency Subcommittee is to regionalize all public health emergency activities, within the Kansas City Metropolitan Area. I also serve as the Chairman of the Epidemiology Section of the Kansas Public Health Association.

You have had a chance to hear from my colleague from the Lawrence-Douglas County Health Department, Ms. Kay Kent, regarding the interaction of local public health with State and federal agencies during a response to a public health crisis. Her testimony was appropriate and true. However, Douglas County is not part of the Kansas City Metropolitan Statistical Area. Therefore, Ms. Kent could not provide you with a perspective on the efforts that local public health has undertaken within the Kansas City Metropolitan Area and specifically within Johnson County Kansas. My testimony will provide you with that information.

Issues Confronting a Bi-State Multi-Jurisdictional Region

Local public health agencies in the Kansas City metropolitan area are faced with a relatively unique challenge. As with many other local public health agencies, we must coordinate our plans and responses with other local public health agencies from neighboring jurisdictions. This can be a relatively easy task, when both agencies are receiving guidance from the same state health department. However, here we are confronted with a situation where we must work with health departments that receive their guidance from a different state health department. While the overall goal of the local health departments is the same, the specific guidance and timelines we have been given differ.

To address this issue, the local public health agencies have formed the Public Health Emergency Subcommittee. This committee, which was formed under the Kansas City Metropolitan's Regional Homeland Security Coordinating Committee, was created to provide a forum from which local public health agencies could meet and work through these bi-state challenges. The subcommittee has developed working groups to address the following; Quarantine and Isolation, Epidemiology and Surveillance, the Strategic National Stockpile, Training and Exercises, and Planning. Together, this subcommittee has fostered a spirit of cooperation between all of the participating agencies and has resulted in many regionalized public health decisions.

Early Detection Systems

Here is Johnson County we are currently implementing three syndromic surveillance systems for the early detection of bioterrorism or public health emergencies. These systems respectively look at school absenteeism, emergency department data, and 9–1–1 emergency call data.

The first system was designed to monitor the rate of absenteeism in our public schools. Over the past several years, our department has worked closely with the school nurses responsible for the 153 public schools in Johnson County. Together, we have implemented a system, which collected information on the number of children absent each day and the type of illness they were experiencing. Through careful analysis of this system and review of scientific literature on school based absenteeism surveillance, it was determined that this system was of little benefit. As of this year, we have altered this system to only collect information from the schools when total school absenteeism reaches 15 percent. We have included a notification when the absenteeism increases by five percent of the total student population in one day. We are currently testing this system to determine its functionality.

The second system relies on information collected at emergency departments. We have identified two hospitals, within Johnson County, to be sentinel syndromic surveillance sites. Working with the infection control nurses at each of these hospitals, we identified the specific indicators of a possible bioterrorism event, as they would be recorded in the hospitals. Each day we receive a report from the infection control nurses with the data from the previous day. Currently there is no mechanism for the collection and dissemination of this data on the weekends, so the data from the weekend is transmitted to us on Monday morning. This is a very simple form of hospital based syndromic surveillance. We are currently investigating other methods of real time hospital data surveillance.

This system utilizes a product called FirstWatch®, developed by Stout Solutions, to monitor 9–1–1 emergency medical service calls. We worked with Med-Act (the Johnson County EMS), Johnson County Emergency Communications, the Health Departments in Kansas City, Missouri and Sedgewick County, Kansas and Stout Solutions determine the specific call types to monitor. Once this was established the system began the silent monitoring of call activity within our county. When it detects a significant increase in call volume, an alert is sent to the e-mail and pagers of a select group of responders. We are currently working to launch regional component of this system that would allow for a regional view of this data.

The FirstWatch® system is a relatively new component to our disease surveillance arsenal. We are continually working with the company to identify areas for enhancement of our system and to tune our current system capabilities. Although this system has not yet provided early warning for a disease event in our county, it has done so in other jurisdictions. In 2003, this same system installed in Tulsa, Oklahoma and Richmond, Virginia provided an early warning to public health of the arrival of influenza in their communities. With proper calibration of this system and vigilance, this system has much promise in providing similar results here.

Mass Prophylaxis Management systems

During a bioterrorism event, it is likely that the public will require medications in order to prevent contracting the disease. The Strategic National Stockpile provides the medications for the mass prophylaxis of the public. To perform the mass prophylaxis on the local level, we will establish clinics throughout our county, often in sites not normally used for health care services. These clinics must be operational in a just a few hours and provide treatment for, potentially, thousands of victims over a few days.

The primary staff at the clinics will be volunteers, although key members of the public health departments and government agencies will provide direction and oversight. A number of initiatives are under way in the Kansas City area to improve the availability of trained health care professionals. In fact, the Mid-America Medical Reserve Corps has identified the SNS deployment as one of the primary volunteer needs in our area and will begin active recruitment later this month. However, many health care professionals that volunteer may be required to provide for the normal care and treatment of patients in hospitals, physician offices and other health care settings. The competition for health care professionals will likely reduce the availability of qualified personnel at the clinics.

The operating efficiency of a clinic will be largely determined by the availability of key health care professionals to perform critical knowledge-based decisions, including health assessments and medication dispensing. If there are not sufficient personnel to make the decisions, the clinic efficiency and effectiveness will be reduced. This problem has been recognized at exercises held here in the Kansas City area and at other locations throughout the Nation. Even with a corps of trained volunteers, a large magnitude event will likely overwhelm the available trained resources. The key to increasing the efficiency of the clinic lies within the ability to utilize less skilled personnel to complete the paperwork and to remove, to the greatest extent possible, the decision making process from these less skilled people.

The Johnson County Health Department is currently investigating a product from NexGenisys, a Kansas City based company, called Metropolitan Emergency Dispensing System (MEDS). The product provides critical support for mass prophylaxis clinics by providing patient tracking, labeling, inventory reporting and clinical decision support. This program is designed to improve the efficiency of the prophylaxis clinics by using an evidence-based clinical decision support system that will assess risk factors and determine appropriate treatment for the victims. This will allow for the better utilization of health care professionals, at a time when this resource will likely be scarce. It is our hope that utilizing a system, such as MEDS, will allow us to provide this vitally important medication to our population in a much more timely manner.

Everyday Benefits of Bioterrorism Preparedness

The tragedy of September 11, 2001 and the ensuing bioterrorism events of that fall were a terrible moment in U.S. history. While it was impossible to imagine at the time, good has come from those horrible events. We have become stronger as a nation, focused clearly on what are weaknesses are, and worked to strengthen those weaknesses. Public health is one discipline that has benefited from this focus and work.

An act of bioterrorism is similar to a naturally occurring disease outbreak, only on a different scale. Therefore, all of our preparedness activities that we are undertaking are providing an increased capability to detect and respond to any disease outbreak.

Additionally, the addition of the risk communicator and information specialist positions and the development of a risk communication plan have added an extra level of expertise and capability to our department public information officer. These new resources have been utilized many times to develop and refine messages our department sends to the media.

Finally, our efforts in bioterrorism preparedness have made us more recognizable to outside organizations. In the past, it has been difficult for the Health Department to make contact with certain groups or organizations. Now, the Public Health Emergency Preparedness and Response Program regularly meets with representatives from these organizations. Many of these groups and organizations actively seek out our program for assistance or guidance. These new relationships have provided the opening to work on non-bioterrorism related projects.