

**PREPARING FOR AN ERA OF WEAPONS OF MASS DESTRUCTION (WMD) – ARE WE THERE YET!
WHY WE SHOULD ALL BE CONCERNED, PART II**

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Preparing for an Era of Weapons of Mass Destruction (WMD)— Are We There Yet? Why We Should All Be Concerned. Part II

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ABSTRACT. September 11, 2001 demonstrated dramatic voids in national preparedness, and catalyzed massive efforts to identify and remedy vulnerabilities. Since Part I of this series appeared in August 2002, significant improvements have been achieved especially in bioterrorism and chemical terrorism for first responders and emergency medicine, law enforcement, and public health (surveillance). Such efforts manifested benefits during the SARS outbreaks and monkeypox cases of 2003. Nevertheless, emerging infectious diseases will continue to pose a threat if we do not remain vigilant and continue to invest in training, surveillance, and treatments. As expected, many poison centers and toxicologists have taken leadership roles nationwide. In regions where such leadership existed, preparedness levels are strong and collaborations resulted in the development of valuable response plans and training, including the Advanced Hazardous Life Support (AHLS) and Basic Disaster Life Support (BDLS) courses. Early success notwithstanding, experts suggest that current national preparedness has improved slightly from “1” (9/11) to “3” out of “10”. Increasingly it has become evident that the nuclear threat, including radiation terrorism, is significant, against which the US remains inadequately prepared. Arguably the nuclear threat—whether accidental or planned—remains our highest consequence vulnerability, and we must rapidly improve our readiness across disciplines. Special populations including the elderly and children remain marginalized in preparedness protocols. Local vulnerabilities including chemical manufacturing and transportation – not just a risk for terrorism but industrial accidents – continue unabated. Our early success is not an endpoint; much work remains and time is fleeting. This report examines vulnerabilities that must be addressed to enhance preparedness.

“Those who ignore history are condemned to repeat it” – *George Santayana* (1)

Echoing the sentiments of Santayana, Florida Governor Jeb Bush drove home the point when he stated Floridians are over “hurricane amnesia.” If Hurricanes Charlie, Frances, Ivan and Jeanne have taught us anything, it is to learn from the past and be aggressive in preparedness efforts. In a world of competing demands this is sometimes difficult as limited resources force us to address shifting priorities. The absence of terrorist activity in the US may dangerously lull us into complacency toward Weapons of Mass Destruction (WMD) preparedness at a time when interest and concern are starting to wane on the one hand, and global terrorist networks regroup on the other. The controversy over whether or not Iraq possessed WMD has had an impact on our resolve. If an event occurred today, would the response be insufficient, an example of crisis management, or successful as a result of consistently practiced plans?

It has been several years since the terrorist release of sarin nerve agent in the Tokyo subway or the anthrax events of 2001. Even the Madrid railroad bombing is a fading memory. Yet we remain highly vulnerable to the toxic chemicals transported on railways and transportation centers are ideal places to harm large numbers of people. This period of domestic calm should not be interpreted that we are safe. Instead we should use this time to examine and address the vulnerabilities that remain. While the list of vulnerabilities is long and includes further training, facility enhancement and financial support across responder disciplines from law enforcement to private medicine, one threat looms large and ominously – the nuclear threat. In a nuclear world, this should be a preparedness priority.

THE NUCLEAR AND RADIATION THREAT

“The chilling reality is that nuclear materials and technologies are more accessible now than at any other time in history”: *Director of Central Intelligence John Deutch*

Of all the WMD agent categories – chemical, biological, radiologic, nuclear and explosive—nuclear and radiologic agents represent the ultimate lethal mass casualty threat, yet remain the most underemphasized and least prepared for among potential terrorist weapons (2, 3). Almost half of hospitals lack a plan for nuclear terrorism (4). A recent Medline literature review of WMD articles revealed most publications address biological and chemical events with a glaring absence of guidance on radiation by comparison. Historically, preparedness protocols emphasized specific radiation receiving hospitals, based upon closely held beliefs that there were limited therapeutic options and the likelihood of nuclear events were low. Yet the rise of Al Qaeda and the fall of the Soviet Union set in motion events that raise the likelihood of a radiation event. Al Qaeda has repeatedly expressed interest in and efforts towards obtaining nuclear weapons. Russia has admitted it cannot account for numerous suitcase size thermonuclear devices as well as other radiological materials. Graham Allison, author of *Nuclear Terrorism*, states that North Korea will sell missiles to anyone with cash and possesses an advanced weapons program that most likely includes spent fuel rods and fissile materials. Charles Pritchard of the Brookings Institute suggests North Korea has enough enriched plutonium to create several thermonuclear

devices. In addition, it is estimated that thousands of tons of radioactive waste will be transported largely in unmarked and relatively lightly protected vans throughout the US to the Yucca Mountain, Nevada, waste depot. Numerous instruments containing cesium, americium and other radionuclides (medical and industrial) have been stolen or misplaced throughout the nation and remain unaccounted for. This widespread availability of radioactive materials should make the prospect of nuclear terrorism or radiation accidents a more pressing concern nationwide.

Highly respected policymakers, such as Senator Lugar of Indiana and Congressman Edward Markey of Massachusetts, are trying to raise awareness about the nuclear threat. As of September 2004 the media increasingly are concerned about radiation threats; several television specials, including an HBO documentary about the vulnerability of nuclear reactors such as Indian Point Reactor and CNN Presents: Nuclear Terrorism, have been aired.

Whether thought of as first responders or last preemptors, law enforcement officers, fire-rescue and healthcare workers need to be able to identify a possible radiologic event, control the panic such an event will generate, and simultaneously protecting themselves with appropriate personal protection equipment while rescuing and protecting victims as well as rescuers and resources (2, 3). These responsibilities hinge not only upon the tempo and delivery of reactive efforts, but on a required shift in training and preparedness which is proactive, predictive and preventative. Education among and between these communities must become routine to perform effectively during either a critical event or a scare.

Radiation threats go beyond nuclear holocaust imagery. Dirty bombs such as radiation dispersal devices are likely given the availability of medical waste and industrial sources of cesium. The Chechnyans have already expressed a willingness to place cesium in public places in Moscow (2-5).

To decrease our vulnerability, the medical community should have a better understanding of radiation hazards, newer treatments such as Prussian blue, colony stimulating factors or Zn-DTPA, and be prepared to collaborate with non-health care agencies, including law enforcement, intelligence and resources such as REAC-TS from Oakridge, TN (1-11). While greater detail in terms of radiation sickness, management and preparedness strategies are beyond the scope of this report, readers are encouraged to become involved in promoting increasing nuclear preparedness efforts. Management of radiation or nuclear events is directed toward rapid recognition, prevention of secondary contamination, intervention, referral and follow up. The toxicology community can play a leadership role by providing expertise, especially for multidisciplinary coordination and planning, training and antidote management.

HAZMAT AND OTHER LOCAL VULNERABILITIES

It is disturbing that schools remain highly vulnerable to terrorism—domestically and world wide—as recent events in Russia demonstrate. Several pilot projects have been developed to enhance bioterrorism training for school nurses. Unfortunately health care professionals are not available in all schools; shortages of staff and limited access to training continue to

plague public education. There remains a disconnect in terms of community preparedness: Schools may not receive training or additional resources nor be included in WMD planning except as designated facilities to commandeer in emergencies. There are US schools with hazardous materials pipes adjacent to them. A school in the Southeast has an anhydrous ammonia pipeline on the property; it has already been breached. Fortunately, this was perpetrated by drug dealers trying to obtain materials for their laboratories, and not by terrorists. Nevertheless, if one wishes to strike a blow to any nation – attack its children. If we cannot or are unwilling to protect our children from accidental exposures to hazardous materials, it is unrealistic to expect they are safe from malefactors intent upon causing deliberate harm. Poison Control Centers (PCC) enjoy a well earned reputation for local knowledge and near universal trust among the people they serve. The opportunity to positively impact such local threats is critically important.

Virtually every community has dangerous chemicals transported within or nearby. Yet how many local agencies know which toxicants are being transported and have the opportunity to stock appropriate antidotes or develop plans specific to those threats? 9/11 demonstrated the resolve and creativity of terrorists to employ resource adaptation and to take readily available dangerous materials and use them for deadly purposes. Whether we are protecting against an industrial accident like Bhopal or an intentional release, hazardous materials need to be secured and health care facilities should enhance training. Courses such as AHLS and closer linkages among transportation companies, fire rescue and PCC should be encouraged (7, 8).

HOSPITAL PREPAREDNESS

Hospitals are symbolic of public preparedness, health care leadership and safety within a community. How are they doing nationwide in terms of WMD preparedness? Research continues to demonstrate that many health care facilities lack even the most basic and necessary antidotes suggested by the toxicology community (1, 12-15). If the most commonly used antidotes are inadequately stocked, what can be said about the supply of treatments against WMD? Most experts agree local and regional stockpiles will have to suffice until the National Pharmaceutical Stockpile (NPS) arrives. The toxicology community must be more proactive not only in antidote and other resource research but in translating that research into remedy. How many Health Care Facilities (HCF) could manage the domestic equivalent of the Tokyo sarin subway attack with literally hundreds of patients arriving within hours and requiring intervention? This concern is especially true for the nuclear threat. While there have been several PCC based antidote protocols and recommendations for non-WMD exposures, consensus guidance on radiological antidotes, including minimum stocking levels, would go far in enhancing local hospital preparedness (2, 3, 10, 12).

Infection control is a persistent problem plaguing certain HCF. SARS, anthrax and other threats illustrate the importance of maintaining a high index of suspicion, vigilance, availability and proper use in personal protective equipment, practice and ongoing training. Recall it was an astute private practice infectious disease specialist and an alert laboratorian who had attended bioweapon training identified the first intentional

case of anthrax in 2001; their efforts resulted in the prevention of many deaths.

Hospitals remain vulnerable to external forces such as terrorism or accidents and from internal forces, such as finance and manpower and facility limitations. It is incredulous in a post 9/11 world to imagine a hospital with toxic materials stored near or transported through or by the facility. Yet many hospitals continue threatened by adjacent propane tanks or railroad tracks carrying hazardous materials on trains. The white powder incidents of 2001 changed the way hospitals and other organizations handle mail. Unfortunately, some hospitals are reverting to unsafe mail handling. Imagine discovering a white powder envelope in the hospital laboratory? Hospitals are an easy source of radioactive materials; hospital security is significantly easier to breach than government or military facilities. If I were a terrorist, one of my first domestic targets would be a hospital. Should we persist in allowing hospitals to remain easy targets?

Fortunately, some hospitals have readily embraced their responsibility in WMD preparedness, utilizing the significant funds that HRSA and other agencies have dispersed to enhance homeland preparedness by hiring expert trainers, upgrade facilities and purchase much needed equipment. Other hospitals have chosen to use in-house resources to provide basic awareness training obtained from unreliable Internet resources instead of utilizing the funds to procure true expertise. It is not uncommon to hear hospital association (HA) leaders admonish state health officials to just turn over the money and leave the strategies (ie how to spend it) to its members. Recently the vice president of large southern HA was heard telling a state emergency preparedness official "just give us the money for preparedness and we can best decide what to do with it. We don't need your priority list to prepare our facilities." In a recent unpublished study hospital preparedness, most hospital WMD trainers were part of the security or staff education departments originally tasked with teaching violence prevention, workplace safety, ACLS and nursing skills respectively. In addition, the study revealed most of the training is basic awareness and not advanced operational. Moreover, few departments provide significant dedicated practice time. It is unlikely anyone will argue that the intent of the HRSA money was to encourage hospitals to upgrade their capacity to manage mass casualty events. While it is well known that surge capacity at hospitals is virtually non-existent in most municipalities, and resources are scarce, the infusion of WMD dollars was not intended to enhance other facilities or support unrelated personnel who would otherwise be laid off due to funding cut-backs (1). This practice is not unique to hospitals. Several public health departments facing funding cuts and resulting loss of important, but not WMD personnel, utilize preparedness dollars to retain these workers, adding to their job description bioterrorism coordinator instead of using the funds to acquire true experts. WMD is a complex issue requiring true expertise across disciplines to provide ongoing training and facilitate skill enhancing activities. While many of these non-expert trainers told by their administrators to learn WMD and then train it have done a reasonable job teaching awareness level courses, few would argue that this is the best way to enhance the skills level of hospital or public health personnel. Greater accountability for how WMD funds are spent is one solution. Improved guidance, and the development, dissemination and evaluation

of evidence and competency based training are critical. Fortunately courses such as AHLS and BDLS provide additional opportunities to learn. Multidisciplinary collaborations and curricula from such organizations as the American College of Emergency Physicians, the American Board of Medical Toxicology, and others should be adopted and shared with or adapted to other performance cultures.

THE ROLE OF POISON CONTROL CENTERS AND TOXICOLOGISTS

Poison Control Centers serve as a central component for surveillance, information dissemination, and response to a terrorism event (16). Syndromic surveillance is able to detect environmental exposures (such as carbon monoxide) with near real time analysis, and is currently being performed on a national basis (17, 18). Furthermore, PCC should be incorporated in first responder protocols to co-ordinate pre-hospital care and triage along with dissemination of treatment guidelines during such an event (19). Direction of antidote stockage is also a vital function of PCC. Medical toxicologists serve as a clinical conduit for individual patient care during and after a terrorist event. Working with public health and regulatory agencies is also an essential function (20).

MULTIDISCIPLINARY COLLABORATIONS

When it hits the fan that's not the time to exchange business cards. Unfamiliarity with outside agencies tasked with specific threat responsibilities can undermine the potential for success. If response is predicated upon collaboration, then information sharing, and authentic drills should occur. Too often drills are referred to as "Broadway shows"; everyone knows their role, the event is scripted and the outcomes predictable. Organizational cultural constraints dictate that peers are not embarrassed and thus hotwashes which follow seldom are honestly critical of decision making and/or response gaps. How can these unmask weaknesses in the system? Drills must be no blame zones where problem solving is the objective across the ranks.

LAW ENFORCEMENT IN WMD PREPAREDNESS— A ROLE IN HEALTHCARE?

In this post 9/11 era, preparedness efforts cross professional boundaries. The intelligence, law enforcement and military communities are struggling to develop partnerships which cut across organizational and jurisdictional boundaries while staying cleanly between the lines established by law and through policy. Unraveling the traditions of unilateral action is the greatest delimiter to effective collaboration. Health care and first responders have been tasked with the much of the response to a WMD event and are now asked to play a greater role in preparedness efforts.

Law enforcement is ideally suited to provide key indications and warning of potential issues before they scale, and when finally supplied with credible and timely intelligence, are able to help disrupt the criminal behaviors or methods utilized for an event. While law enforcement increasingly tries to protect against WMD, health care professionals are increasingly being asked to provide enhanced surveillance as well as to recognize that a terrorist event is also a crime scene. Neither

performance culture is accustomed to working with, nor is operationally familiar with, the mission of the other. Yet preparedness hinges upon such familiarity, trust and cooperation. Now is the time to foster greater collaboration.

EMERGING INFECTIOUS DISEASES

In early 2004 avian influenza virus swept across East Asia and as of September 2004 has re-emerged in Thailand, Vietnam, China and Malaysia. Worrisome is the high case fatality rate and potential for interaction with human virus which could lead to a pandemic (21). Would we be able to respond rapidly and effectively? What if this virus was genetically manipulated to become a bioweapon? Until a cluster of children died from influenza last winter, public interest in influenza vaccine was equivocal.

Airports and other transportation centers are ideal portals for intentional dissemination of infectious diseases. While most airport security focuses on weapons, few would argue our vulnerability to contagious illnesses. Unfortunately drill scenarios are not designed to address this threat.

SPECIAL POPULATIONS

Planning for the medical response to WMD has largely emphasized the overall population. Yet vulnerable groups remain under-addressed in preparedness protocols. These include the elderly, children, women who are pregnant, immunocompromised persons and those living with disabilities (22, 23). Most of these will be at increased risk from the direct effects of WMD as well as disadvantaged for escape and interventions. Much of our knowledge about WMD is based upon military males. Adapting dosing and deployment devices such as autoinjectors for use in small or frail victims should be considered.

Many physiologic and behavioral characteristics unique to children may make them vulnerable to toxic exposures (22). Small mass, increased minute volume, smaller airway diameter and lower fluid reserves, as well as limited cardiovascular response options, seizure thresholds, ability to follow commands or preparedness plans and several antidotes that were developed for adults, makes planning for pediatric victims a challenge (22, 23). The psychological impact of terrorism, and the manner children and adolescents process worrisome information, should raise awareness for substance abuse, behavioral changes and somatic manifestations and need to be considered in preparedness planning (26).

Fortunately, PCC enjoy close relationships with the pediatric community. This can be expanded upon to deliver guidance, reassurance and assist in safe preparedness plans. In a recent study conducted by the Bioterrorism and Emergency Preparedness Training in Aging (BTEPA) project funded by HRSA, of 314,000 references on bioterrorism, very few focused on the elderly—in spite of the fact those over 70 y of age are among the most rapidly growing populations. This study also revealed that most clinicians who specialize in geriatric care have not received formal WMD training and when they did, geriatric specific content was only present as < 10% of the programming. The elderly often have multiple morbidities or take medications that may confound early di-

agnosis by limiting or masking symptoms that might be hallmark clues for adults, but not for children or older patients (24-26).

In addition to preparedness protocols for people, non-human victims must also be considered. Animal companions are vitally important to their human counterparts as are service animals. Yet most shelters, evacuation, decontamination and treatment strategies do not include animals. Albeit an Israeli veterinarian developed a gas mask for pets for the 1991 Gulf War, service animals are highly trained and warrant consideration. One must also consider animals as vectors for human illness, as seen with prairie dogs and monkey pox in 2003.

CONCLUSIONS

So what does national preparedness mean? It suggests the ability to respond to a wide variety of threats, prevent unnecessary loss of life or injury and provide for the common good. This requires translating national policy into local program implementation. It is a daunting task to so prepare a nation, especially in an open society within a large and complex industrial country. It is a significant challenge to prepare for an unknown event against undisclosed threats without knowing who to protect and from whom. Remedying years of underinvestment in healthcare—ie, public and private, inexperience with long forgotten infectious diseases, a largely borderless world which allows free exchange of friend and foe, the sick and healthy, the lack of familiarity with non-health care professionals such as law enforcement, and then promoting cooperative endeavors among agencies unaccustomed to collaborating—it would appear a Herculean task! Yet these are what we must do, and more!

Enhanced preparedness not only provides for a terrorist threat, but enables us to better protect our community against a wide range of industrial accidents, natural disasters and emerging infectious diseases. In spite of the numerous nuclear reactors and widespread proliferation of radioactive waste, the US has been fortunate to thus far escape the fate of Russia. Significant attention to nuclear threat is critical and preparedness efforts need to be dramatically improved upon. The toxicology community is in a unique position to help guide the process. Historically toxicologists have served as resources for wide arrays of professions, including law enforcement (forensics), public health (environmental), hospitals and other clinical applications (PCC, occupational medicine), government (FDA, military, regulatory, policy, WMD and pharmaceutical safety), intelligence (WMD, threat assessment, preparedness), and fire rescue (HAZMAT).

Most of all, we cannot afford to leave anyone behind. Law enforcement relies upon the community for information and support. So should we in WMD preparedness! The citizenry are ideally suited to serve as an early warning system of potential problems—a factor that is one of the cornerstones of community policing. The "Blue Line" is not an insignificant factor in protecting our nation. We are all stakeholders – from the most disadvantaged neighborhood to the White House – and with that is the opportunity to identify and attempt to remedy vulnerabilities. Think global, but act local. Together we can enhance national preparedness!!

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