Traumatology, Vol. 11, No. 2 (June, 2005)

The Sarin Gas Attacks on the Tokyo Subway – 10 years later/Lessons Learned

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This paper considers "lessons learned" from the March 20, 1995 covert terrorist attack on the Tokyo, Japan subway system employing a neurotoxic agent. The following lessons from this disaster are reviewed in light of prevailing practice and policy in the U.S. in 2005: timely communication of vital information; operational logistics including triage, surge capacity and decontamination; secondary contamination of emergency responders and hospital personnel; assessment and treatment of the "worried well"; secondary traumatization of rescue workers; and behavioral health preparedness measures and treatment for disaster victims. In some respects little progress has been made, for instance, in developing new, evidence-based therapies for disaster victims with posttraumatic stress disorder. On the other hand, some recently developed and implemented initiatives such as the Strategic National Stockpile (SNS), represent enhancements to U.S. preparedness compared to that which existed during the 1995 terrorist attacks on the Tokyo, Japan subway system.

Key Words: Mass casualty event; Neurotoxic agent; "Worried well"; Psychological First Aid; Posttraumatic Stress Disorder

This paper focuses on some of the lessons learned from the sarin gas attack on the Tokyo, Japan subway a decade ago. In that attack, on the morning of March 20, 1995, members of a "doomsday" cult released sarin gas, a neurotoxic agent, in the Tokyo subway system, killing twelve people and causing more than five thousand people to seek medical care. The companion articles in this special issue by Dr. Taneda and by Dr. Kawana and her colleagues highlight the many immediate, short-term and downstream psychosocial issues raised by a covert terrorist mass casualty disaster employing an initially unidentified neurotoxic agent (Taneda, 2005; Kawana, Ishimatsu, Matsui, Tamaki, & Kanda, 2005). The aim of this paper is to revisit the many lessons of the sarin gas attacks on the Tokyo subway system (especially the "psychosocial lessons") and to compare and contrast present-day preparedness for a similar disaster and the ensuing psychosocial sequelae in the United States – 10 years later. Lessons learned from the

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[4] Acknowledgements: This article was made possible by grant number 1 TO1HPO1412-01-00 from the Health Resources and Service Administration, DHHS, Public Health Training Center Program and was also supported, in part, by a cooperative agreement from the Center for Disease Control and Prevention (CDC) through the Association of Schools of Public Health (ASPH), Grant Number U36/CCU300430-21. The contents of this article are solely the responsibility of the author and do not necessarily represent the official views of CDC or ASPH.

Tokyo subway sarin gas attacks were based not only on the companion articles by Taneda (2005) and Kawana, et al (2005) but also on a review of the published works of Okumura et al (1998a; 1998b, 1998c), Matsui, Ohbu & Yamashina (1996) and Ohbu et al (1997) among others.

Communication of Vital Information

Although more than six years had elapsed since the sarin gas attacks on the Tokyo subway system, pre-hospital communication at the Pentagon terrorist disaster site on 9/11/2001 was suboptimal. According to the Arlington County after-action report prepared by Titan Systems "Almost all aspects of communications continue to be problematic, from initial notification to tactical operation: In the first few hours following the attack on the Pentagon, foot messengers at times proved to be the most reliable means of communication." This report also noted that "communications and coordination were deficient between Emergency Medical System (EMS) control at the incident site and area hospitals receiving injured victims" (Department of Justice, 2002)

Since 9/11 there has been a concerted effort, including federal funding in the U.S., to provide emergency and rescue organizations with interoperable radios and communication protocols (FEMA, 2003). In King County, Washington (U.S.) the police, the State Department of Health, the county, the state, the Emergency Operation Centers (EOC's) and all local hospitals use a common communication device with preset channels (Mariotti, Personal Communication, 2004).

Still, very little is known to date about the psychosocial barriers or impediments to interagency communication under disaster conditions. As recently as the second Top Officials (TopOff 2) exercise in May of 2003, interagency communication at all levels appeared to be problematic. In addition to infrastructure problems, communication was adversely affected by power differentials between local, state and federal authorities and a "cultural clash" between agencies. TopOff 2 was the largest and most comprehensive multi-agency terrorism exercise ever held in the U.S. It brought together top government officials from more than 100 federal, state and local agencies as well as the Canadian government to test the domestic response to mock terrorist attack(s) employing weapons of mass destruction. In the Illinois venue sixty-four hospitals responded to a simulated outbreak initiated by a bioterrorist attack. The TopOff 2 after-action report noted that " . . . the lack of a robust and efficient emergency communications infrastructure was apparent." Most importantly, communication problems were the primary cause of flawed public policy decision making (DHS, 2003), as was the case in the original TopOff exercise in 2000 and in the case of the anthrax attacks in Florida in 2001.

In the event of a covert attack employing an imperceptible chemical or biologic agent, early communication and identification of the causative agent may well be crucial in initiating timely treatment designed to protect emergency workers and to initiate risk communication messages. While a chemical assay and confirmation of the sarin as the neurotoxic agent used in the Tokyo subway attack was not available until several hours after the attack (Taneda, 2005), there are now emerging technologies that may allow practically instantaneous point-of-service analysis of a chemical or bio-agent. The latter might include detection of a pathogen even before victims show signs or symptoms; e.g. BioWatch program (The White House, 2004). Thus, some

recent advances in point of service technology under development in the U.S. might improve initial communication and timely diagnosis of victims of a covert bioterrorist or chemical attack. This would, in turn, guide initial treatment, prophylaxis, and improve the safety of rescue workers and hospital personnel alike.

A recently published series of articles on developing risk communication messages for terrorist events employing so-called Weapons of Mass Destruction (WMD) has the potential to improve the effectiveness of early post-event information for the general public. Based on findings from a series of focus groups with diverse community representation, Centers for Disease Control and Prevention (CDC) researchers learned how U.S. citizens and U.S. EMS personnel were likely to view a threat of or an actual WMD event, what kind of information they need to be able to respond appropriately and what communication channels they will likely rely upon (Vanderford, 2004; Becker, 2004, Wray & Jupka, 2004, Glik, Harrison, Davoudi & Riopelle, 2004). Timely and accurate risk communication could reduce unwarranted fear in the general populace and perhaps reduce, to some extent, demands on the health care system stemming from psychosocial factors, e.g., the "worried well" victims seeking treatment. Improved risk communication in the immediate aftermath of a terrorist attack employing a biological, chemical or radiologic agent could also improve the efficiency and safety of any ensuing emergency medical service response.

Operational Logistics

As with many, if not most, disasters, victims self-transported to nearby treatment facilities. For many victims of the Tokyo sarin gas attacks this was St. Luke's Medical Center (Taneda, 2005). Similarly on September 11, 2001, at the Pentagon disaster site some surviving victims drove themselves or walked to nearby treatment facilities (DoJ, 2002). The problems arising from this self-transfer phenomenon are serious and complex. Without a pre-hospital triage system, such as Simple Triage and Rapid Transport (START), seriously injured victims who need immediate care might not get the timely and appropriate treatment (Hafen, Karren, & Mistrovich, 1992). Furthermore, the pre-hospital Incident Command System cannot accurately evaluate walk-in victim needs and appropriately meter the allocation of pre-hospital and area hospital resources (DoJ, 2002).

While there is ample evidence that disaster victims self-refer and self-transport to the nearest hospital, usually within minutes of a disaster, current Joint Committee on Accreditation of Healthcare Organizations (JCAHO) standards for emergency management hospital plans do not explicitly identify the problem of self-referral or self-transport (www.jcaho.org). Current JCAHO emergency management hospital standards also do not include plans for responding to surge capacity; that is, the influx of a massive number of disaster casualties and the need to treat them in a short period of time. The reality is that the casualty flow to nearby hospitals begins within minutes of a disaster with most casualties arriving at nearby hospitals on their own, in non-emergency vehicles within an hour and a half of the disaster impact (Auf der Heide, 1996). This is one of the operational lessons from the sarin gas attacks on the Tokyo subway system that we have yet to heed (Taneda, 2005).

Even if all available pre-hospital and hospital resources are allocated appropriately, surge capacity remains a problem for most EMS, Emergency Department and trauma hospital systems in the U.S. (AHRQ, 2004). Most hospitals in the U.S. lack adequate beds, equipment, isolation facilities and staff to respond to a large-scale terrorist attack. The Health Resources and Services Administration (HRSA) has set a critical surge capacity benchmark for all U.S. states, but converting from a current capacity system to a surge capacity system within a matter of hours still remains a daunting task in the U.S. (HRSA, 2004).

One federal program that predated 9/11 and which was developed to address at least one component of the problem of surge capacity is the Strategic National Stockpile (SNS). The SNS is a national repository of antibiotics, chemical antidotes, antitoxins and medical supplies needed in the event of a large scale mass casualty disaster or a bioterrorist event. It is managed, jointly by the Department of Homeland Security and the Department of Health and Human Services and is designed to augment state and local resources during a large-scale disaster or bioterrorism (Esbitt, 2003; Havlak, Gorman & Adams, 2002). The SNS is designed to supplement and re-supply state and local efforts in the event of an emergency anywhere and at anytime within the U.S. or its territories, within 12 hours of approval of a request. The SNS maintains caches of medications and chemical antidotes that could be accessed in the event of a chemical or biodisaster regarding the latter, many hazardous materials teams and medic personnel in the U.S. have been trained in the pre-hospital administration of nerve gas antidotes such as pralidoxime chloride (2 PAM or 2 PAM chloride). In fact, the patient care protocols of Pierce County Washington recently authorized emergency medical technicians to administer the Mark I nerve agent antidote for the first time (Medical Program Director – Pierce County, 2005). A combination of pralidoxime chloride (2-PAM or 2-PAM Chloride) and atropine may be administered for nerve gas poisoning. The availability of drugs in the field is crucial, since the optimal time window for administration of nerve gas antidote is brief – in the case of a significant exposure to certain neurotoxic agents the time window for the administration of the antidote is only seconds to minutes (Holstege, Kirk & Sidell, 1997). The SNS represents an advance in our U.S. preparedness circa 2005 since nerve gas antidotes stocks were insufficient in the aftermath of the Tokyo sarin gas attack and no plan or system was in place to augment their stores (Okamura, Suzuki, Fukuda et al, 1998).

Unfortunately the 12-hour response time for SNS is inadequate for a nerve agent exposure, where treatment must be accomplished quickly in order to save as many lives as possible. As a result, the CDC established the CHEMPACK program for the "forward" placement of sustainable repositories of nerve agent antidotes in numerous locations throughout the U.S., so that they can be immediately accessible for the treatment of affected persons. Presently a pilot program, the CDC maintain ownership of the CHEMPACK stockpile (CDC, 2004), but in conjunction with state and local officials, locates the antidotes in numerous strategically placed containers under controlled and monitored storage conditions for use in the event of an emergency involving nerve and other chemical agents.

We also need to consider surge capacity for mental health needs to provide care for victims, co-victims and communities following a terrorist attack with massive numbers of casualties (Hall, Norwood & Fullerton, 2002). Current JCAHO emergency management plans for U.S. hospitals do not include any mention of "worried well" nor other disaster mental health

issues (www.jcaho.org). Just as medical care providers may be overwhelmed by a mass casualty incident, likewise the social work staff of medical centers may be overwhelmed. Communities need to have plans in place to recruit those trained in mental health support from a wide range of fields – crisis intervention call lines, clergy, chaplains, counselors, clinics, etc.

Secondary Contamination of Emergency Responders and Hospital Personnel

Certainly EMS and hospital staffs in the U.S. are much more aware now of the potential for a terrorist attack in their communities employing nerve gas and other chemical agents. This awareness probably stems more from the events of 9/11 and anthrax attacks on the East Coast in this country in 2001 than from lessons learned from the Tokyo subway sarin gas attacks. Most urban fire departments and hospital personnel in the U.S. have, by now, been offered at least some awareness-level training and many now possess response teams with some Weapons of Mass Destruction (WMD) operational capabilities (Beaton & Johnson, 2002). Many U.S. public health workers and health providers have participated in WMD training and mass casualty drills, which have been documented to enhance knowledge and/or their perceived competency to respond to a WMD event in their communities (Beaton & Johnson, 2002; Beaton & Oberle et al, 2003; Beaton et al, 2004). An enhanced awareness of the signs and symptoms of a large-scale chemical attack could greatly limit, or even entirely prevent, secondary contamination of EMS and hospital staff, for instance, which was prevalent in the Tokyo sarin gas attacks (Taneda, 2005). Secondary transmission of sarin gas can occur since clothing and other belongings release sarin vapor for about 30 minutes after contact with sarin, leading to exposure of other people (i.e., secondary contamination). People may not be aware that they were exposed to sarin gas and other neurotoxic agents because they are odorless and colorless.

Another legacy of the Tokyo subway sarin gas attacks has been an increased appreciation of the importance of pre-hospital and hospital decontamination facilities (Jagninas & Erdman, 2004). Only limited decontamination of the Tokyo subway sarin gas attack victims was performed (Okamura, 1998). Pre-hospital or hospital decontamination could conceivably have reduced these victims' symptoms arising from sarin gas exposures via absorption and inhalation routes as well as many, if not most, cases of secondary contamination of hospital personnel. A related psychosocial assumption is that primary victims of a chemical attack with few or mild symptoms that quickly resolve might be less likely to have lasting and/or severe psychosocial sequelae (DeWolfe, 2003).

Partnered with the decontamination, hospital and EMS directives in the U.S. regarding Personal Protective Equipment in response to identified or unidentified hazardous materials exposure could further reduce the likelihood of secondary contamination of First Responders and hospital personnel (OSHA, 2004 29CFR1910.120[g]). Some staff at receiving hospitals in Tokyo in the aftermath of the sarin gas attacks were not even wearing latex gloves or gauze masks, let alone hazardous. material suits with respiratory protection which is the current U.S. standard to respond to a potential nerve gas agent. Of course, the Tokyo EMS and hospital personnel did not know what they were dealing with for several hours following the sarin gas attacks.

The "Worried Well"

One of the most challenging problems associated with a terrorist event are "worried well" who seek treatment out of fear or concern even though they have not been exposed to the chemical agent or pathogen (Bartholomew & Wessely, 2002). Following the terrorist attack on the Tokyo subway system "worried well" patients outnumbered patients with an exposure by a ratio of > 4:1. This response pattern is problematic since these "worried well" victims may consume scarce resources and may block access of critically-ill disaster victims who have experienced an actual exposure (Evans, Crutcher, Shadel, et al, 2002). These "worried well" patients, sometimes referred to as victims of "mass hysteria", represent a problem for the disaster response, but they also should be considered patients who are "not well" and who, at the very least, need an initial medical evaluation, understanding, guidance and a plan (Stein et al, 2004; Pastel, 2004).

Obviously, some kind of definitive test or pathognomic sign of exposure would be helpful in making a differential diagnosis but, lacking that, and complicating matters further, certain signs and symptoms of chemical and bio-exposure may overlap with cognitive and behavioral signs and symptoms of stress and anxiety (Beaton & Murphy, 2002). Therefore, it might be prudent to triage and hold presumably "worried well" patients for observation since more definite signs/symptoms of an actual exposure might emerge after some delay. Even if they have no direct exposure "worried well" victims would benefit from reassurance, some relevant information such as a fact sheet with guidance, a follow-up protocol, and available community resources. However, methodological sound research on such interventions for the "worried well" are still lacking (North & Pfefferbaum, 2002). At a pre-hospital WMD incident site such a triage protocol for "worried well" patients might also be possible (Copass, personal communication, 2001). However, given the large footprint of most disaster event sites and the perception by the public that definitive care is given at hospitals, medical centers must continue to expect and prepare for large numbers of self-referred victims with vague or mild complaints.

In a larger community context, timely and accurate risk communication might have reduced the number of worried well seeking medical treatment in the aftermath of a mass casualty event such as those seeking treatment in Tokyo two days or more following the attack. Effective risk communication might also have reduced the number of "white powder incidents' in the U.S. and calmed fears worldwide in the aftermath of the anthrax "attacks" on the Eastern seaboard of the U.S. in the fall of 2001 (ABC news, 2001). In these "attacks" anthrax powder was mailed in envelopes to several media and congressional authorities via the U.S. Postal system. As a result, a small number of individuals developed cutaneous or pulmonary anthrax and a large number of those potentially exposed received prophylactic antibiotics. For several months there were hundreds of reports of suspicious. "white powder/possibly anthrax" that were investigated. Virtually all of these "white powder" substances after December of 2001 (or west of the Mississippi) tested negative for anthrax. A distinct improvement from past practice, current response plans in many U.S. communities incorporate formation of a Joint Information Center (JIC). JIC's utilize local expertise and leadership to provide a single unified "voice" regarding important health risk communication information of the event, utilizing local media to distribute information broadly.

Lack of Mental Health Preparedness for Rescue Workers

Even though most samples of rescue and recovery workers show emotional resilience during and in the aftermath of disasters (Norris, Friedman, Watson, et al, 2002) at least some emergency responders such as firefighters do evidence secondary traumatic stress symptomatology (Beaton, Murphy, Johnson, Pike & Corneil, 1999). In certain cases their secondary traumatic stress reactions are transitory (Beaton, Murphy, Johnson & Nemuth, 2004), but some manifest chronic post traumatic stress disorder in the aftermath of disasters

Table 1. ("Psychological First Aid" excerpted from NIOSH fact sheet "Traumatic Incident Stress: Information for Emergency Response Workers")

What You Can Do On-site

Taking care of yourself will help you to stay focused on hazards at the site and to maintain the constant vigilance you need for your own safety. Often responders do not recognize the need to take care of themselves and to monitor their own emotional and physical health—especially when recovery efforts stretch into several weeks.
The following guidelines contain simple methods for helping yourself. Read them while you are at the site and again after you return home.

- Pace yourself. Rescue and recovery efforts at the site may continue for days or weeks.
- Take frequent rest breaks. Rescue and recovery operations take place in extremely dangerous work environments. Mental fatigue over long shifts can place emergency workers at greatly increased risk for injury.
- Watch out for each other. Co-workers may be intently focused on a particular task and may not notice a hazard nearby or behind.
- Be conscious of those around you. Responders who are exhausted, feeling stressed, or even temporarily distracted may place themselves and others at risk.
- Maintain as normal a schedule as possible: *regular eating and sleeping are crucial*. Adhere to the team schedule and rotation.
- Make sure that you drink plenty of fluids such as water and juices.
- Try to eat a variety of foods and increase your intake of complex carbohydrates (for example, breads and muffins made with whole grains, granola bars).
- Whenever possible, take breaks away from the work area. Eat and drink in the cleanest area available.
- Recognize and accept what you cannot change—the chain of command, organizational structure, waiting, equipment failures, etc.
- Talk to people when *YOU* feel like it. You decide when you want to discuss your experience. Talking about an event may be reliving it. Choose your own comfort level.
- If your employer provides you with formal mental health support, use it!
- Give yourself permission to feel rotten: You are in a difficult situation.
- Recurring thoughts, dreams, or flashbacks are normal—do not try to fight them. They will decrease over time.
- Communicate with your loved ones at home as frequently as possible.

(McFarlane, 1989). Obviously any intervention that could prevent the onset and progression of post traumatic stress disorder in emergency workers would be well received. Critical incident stress debriefing (CISD) has been proffered as potentially therapeutic (Mitchell & Everly, 2001). There is and continues to be, however, an ongoing controversy regarding the clinical efficacy of CISD as a stand-alone intervention, or even within the context of a critical incident stress management program (CISM) (McNally, Bryant & Ehlers, 2003). In fact, an NIH Consensus Conference Report on Mass Violence in 2002 noted the absence of methodologically sound data showing that debriefing actually deterred the onset or progression of PTSD and did not recommend its use for either rescue workers or for primary victims (NIMH, 2002). This same NIH Consensus Conference suggested that the term "debriefing" should no longer be used to describe this technique and also pointed to research evidence that it might actually cause psychological harm in some trauma victims. Likewise, "Psychological First Aid" for disaster workers (See Table 1) has been promulgated as potentially helpful (NIOSH, 2001) but this "intervention" has not been studied rigorously either.

Behavioral Health Preparedness and Treatment for Disaster Victims

One arena in which we have made very little progress in our mass casualty planning has been that of behavioral or mental health preparedness. This has been on the "back burner" and not integrated into most U.S. or state disaster plans. In fact, as recently as 2003, a systematic review of 31 U.S. state and territory plans concluded the state mental health disaster plans were "both variable and incomplete" and that "virtually all of the reviewed state (mental health) plans lacked key elements" (HHS, 2003). On a more positive note, this recent document observed that state mental health plans in process were now paying closer attention to terrorism and terrorist events (HHS, 2003). Most of the barriers to mental health disaster preparedness are well know and long standing. In addition to the persisting stigma of mental problems/disorders, many of the limitations and barriers to disaster mental health planning are noted in Table 2.

Table 2. Barriers to disaster mental health planning (from HHS, 2003)

- Lack of human and financial resources to do the work;
- Little political will to focus on disaster mental health over many years, once a disaster passes
- Mental health being overlooked in favor of safety and security concerns
- The lack of collaboration and consistency among federal departments and agencies including SAMHSA/CMHS, the Department of Justice, the Centers for Disease Control and Prevention, and the Health Resources and Services Administration and corresponding state departments and agencies receiving disaster and terrorism funding

- The lack of well-defined, "proven" and easily implemented programs in disaster mental health that can be adopted widely

Best practice "early intervention" guidelines to assist disaster victims in the immediate aftermath of a disaster have been identified and represent a range of options including efforts to reduce immediate danger, provide safety, foster resilience and provide social support, all in an effort to reduce long-term psychological disorders and to treat acute psychiatric reactions (Ritchie et al, 2004). We also have a better appreciation of the short-term and longer-term impacts of disasters in general, and of terrorist-induced disasters in particular, on the emotional and behavioral health of primary victims and co-victims in surrounding communities (Shariat, et al, 1999; Okumura, et al, 1998a; DeWolfe, 2000; North, et al, 1999; Pfefferbaum, 2000; Schuster, et al, 2001; Schlenger et al, 2002). We also recognize that certain vulnerable populations, such as children, may have special psychological needs following a terrorist disaster (Pfefferbaum, et al, 1999; Pfefferbaum et al, 2002). (See Table 3 for a listing of other vulnerable populations based on disaster research and findings with combat veterans.)

Table 3. Vulnerable populations to post-disaster and combat distress

- Pre-existing mental illness (Yehuda, 2002)
- Prior mental illness (McFarlane, 1989)
- Females (more short-term distress in U.S. sample post 9/11) and more long-term post-trauma symptoms in Japanese sarin gas attack victims (Silver, 2002; Kawana, et al., 2005)
- Those with intense and/or prolonged trauma exposures (Goldberg, et al., 1990)
- Hispanic and other immigrant populations, including refugees (Galea, et al., 2002)
- Weak or deteriorating psychosocial resources (Norris, et al., 2002)
- Pre-existing chronic medical illness (Bromet et al., 1998)

One compelling lesson from the sarin gas attacks on the Tokyo subway is that some victims of terrorist events continue to have post trauma symptoms even with treatment. For many victims post trauma symptoms persist for years following the event (Kawana et al, 2005). However, while we may now more clearly recognize the short term and long term impact of a terrorist event on primary and secondary victims, we still do not have conclusive evidence that early interventions are effective. Furthermore, the available evidence suggests that the standard early and long-term interventions for trauma victims (Cognitive Behavioral Treatment (CBT),

Eye Movement Desensitization and Reprocessing (EMDR) and Stress Management) are not helpful for all survivors. Dropout rates from studies of CBT in trauma samples are about 20% (Ballenger et al, 2000). Even in samples of PTSD patients who complete CBT, more than half may still meet the DSM-IV Criteria for PTSD at the post treatment assessment (Resick et al, 2002; Tarrier et al, 1999). Furthermore, even if PTSD symptoms are partially ameliorated, not all PTSD patients receiving CBT rate their post-treatment functioning as "good" (Marks et al, 1998).

Another lesson of the sarin gas attacks on the Tokyo subway system, also supported by other empirical findings and theoretical perspectives, is that trauma victims may manifest their symptoms cognitively, socially, behaviorally, emotionally, as well as physically (Van der Kolk, 1988; Van der Kolk, 1994; Krystal, et al., 1989). The assessment of posttrauma symptomatology reported by Kawana, et al. (2005) purposely included physical symptoms in an effort to detect and measure "masked PTSD" in sarin gas attack survivors. Too, there may be some conceptual overlap between "masked PTSD" and "multiple unexplained physical symptoms" not infrequently observed in the aftermath of chemical, biological and/or radiological incidents (Pastel, 2004). A chronic bioneuroendocrine dysfunction has been hypothesized that may, in part, account for these physical symptoms in trauma survivors (Yehuda, et al., 1991)

Conclusions and Future Directions

Compared to the 1995 Tokyo subway sarin gas disaster, there are no doubt both an increased awareness and improved, although still imperfect, communication and logistical capabilities to respond to a similar mass casualty event in the U.S. in 2005. However, most U.S. hospitals have yet to adopt realistic policies to triage and decontaminate and treat large numbers of victims of such a chemical attack who may self-transfer to the nearest available health care facility. There are also no current U.S. hospital standards nor widely adopted health care protocols to respond to the needs of the "worried well", co-victims of a covert or overt chemical or biological attack. The basis for effective health risk communication in the immediate aftermath of a WMD terrorist event has improved, at least in theory. Yet we still have a paucity of evidence-based treatments designed to ameliorate the distress of victims of a terrorist attack employing chemical weapons or to prevent the onset and progression of posttraumatic stress disorders and other adverse psychological outcomes in rescue workers and in hospital personnel. In most U.S. hospitals, states and jurisdictions there is still no mental health response component integrated into existing all-hazards disaster plans (HHS, 2003).

Use of psychotropic medications to ameliorate symptoms and sequelae of Acute Stress Disorder (ASD) and PTSD is a promising new area of treatment. Much has been learned from managing military combat-related PTSD, resulting in new approaches (Morgan, Krystal & Southwick, 2003). Propranolol, a beta-blocker, has benefited acutely traumatized burn victims (Pittman, et al., 2002), and stimulated further research. An important recent finding is the significant reduction in hyper-vigilance, flashbacks, intrusive memories, nightmares and insomnia in post-trauma patients given Prazosin, and alpha-1 antagonist (Raskind, et al., 2003). A "morning after" pill designed to mitigate psychic damage from acute trauma may not be too far off.

Chronic PTSD now has a range of FDA approved medication treatments including SSRI antidepressants (Sertraline, Fluoxetine, Paroxetine) and combination therapies with low dose mood stabilizers (Asnis et al., 2004) and/or low dose atypical antipsychotic (Stanovic, James & Vandevere, 2001). Carefully employed psychotropic medication combined with behaviorally oriented goal-directed therapy has the potential to offer disaster trauma victims better outcomes.

In terms of future directions, we still have not applied many of the psychosocial lessons learned from the sarin gas attack on the Tokyo subway system a decade ago. There may be special features of a deliberate, man-made covert terrorist attack, such as "uncertainty" that are particularly distressing and anxiety provoking and increase the risk of long-term mental health sequelae (Stein, et al, 2004). We are challenged to develop new interventions and to modify current standard trauma interventions to better treat victims of "the next" sarin gas attack.

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