Key Words: chemical and biological terrorism, agents, dissemination, myths

Since the early 1990s, federal and local public safety agencies have been working aggressively to improve our response capabilities for managing terrorist incidents that employ chemical and biological agents. This rush toward readiness was further compelled after the attacks of 9/11 and the anthrax mailings of 2001. Just in the past few years, thousands of law enforcement and emergency services personnel across the country have been pushed through fast-track courses on terrorism and domestic security and reassigned to new positions in homeland security. Publishers have been rushing to meet the demand for training and educational materials by putting out new books, videotapes, and CD-ROMs on chemical and biological terrorism and emergency response. To top all of this, every night a news broadcast features a new expert giving an opinion of the threat and our state of readiness.

Unfortunately, in this frenzy toward improved readiness, myths and assumptions have surfaced regarding chemical and biological (CB) terrorism. Given the fact that these myths often emerge from “official” sources, many of these beliefs and assumptions have gradually become accepted as facts by the new generation of homeland security professionals. Left unchallenged, these myths have contributed to a somewhat distorted and, in some cases, dangerous perspective of the threat.

When I present seminars on chemical and biological terrorism, I like to begin by clearing the slate and addressing what I refer to as the “Four Common Myths About CB Terrorism.”

Myth 1: The threat of domestic chemical and biological attacks is a new problem.
FALSE. Hundreds of actual and attempted covert attacks employing CB agents have occurred inside the United States, dating as far back as the beginning of the 20th century. In fact, perhaps the most significant fatal biological attack in the United States did not take place in 2001 with the anthrax mailings, but rather occurred in 1915. In this incident, a German physician by the name of Anton Dilger and a handful of German sympathizers infected thousands of livestock bound for our allies in Europe with bacillus anthracis (anthrax) and pseudomonas mallei (glanders). Though this was primarily an act of wartime sabotage, it is estimated that hundreds of U.S. service personnel and sailors contracted disease from eating the infected animals. Over the decades, we have witnessed hundreds of other examples of covert employment of CB agents in attacks including intentional poisonings, incidents of deliberate consumer product contamination, extortion attempts, and even the denial of access to abortion facilities.

Even as far back as the Middle Ages, adversaries have used toxins, infected corpses, and contaminated objects as covert CB weapons. The use of CB agents by terror-
ists today is the contemporary evolution of an old threat.

**Myth 2: CB Terrorism is technically difficult.**

**FALSE.** This depends on what is attempted. CB terrorism can be as simple as injecting a piece of fruit with mercury. In 1978, the Arab Revolutionary Council caused the Israeli fruit industry to cancel millions of dollars worth of European citrus exports after several pieces of mercury-injected fruit were consumed by European customers. The economic impact of this was quite significant and cost Israeli citrus growers 40% of their annual orange exports. Similar incidents, such as the 1982 and 1986 Tylenol poisonings, also caused U.S. businesses tremendous losses due to product recalls, lawsuits, and lost patronage. In most of these incidents to date, an easy-to-obtain toxic industrial chemical was employed as the agent and dissemination was no more complex than opening a bottle and filling a capsule.

As history has demonstrated, the simplest attacks are often the most successful. In the 1984 Rajneesh incident, perfume atomizers were used as spray devices to contaminate salad bars and food in public restaurants with salmonella typhimurium. Simple food contamination attacks have historically been the most common and the most successful method of CB attack by terrorists and other non-state actors. According an analysis of non-military incidents documented in the Chemicals and Agents of Biological Origin MX-Edition Database, the most common method of dissemination used by non-state actors was contaminated consumables (see Table 1). Simplicity has also been the rule with regard to terrorist and criminal selection of chemical and biological agents. According to data contained in the CABO-MX database, non-state actors were much more likely to employ chemicals than biological agents (62% of all attacks employed chemicals). The most common agents used in these attacks were easy-to-acquire toxic chemicals, such as cyanides, arsenic, mercury, thallium salts, pesticides, and rat poison (warfarin). This same observation with regard to choice of agents is also noted by Lena Melin in an analysis of 920 non-military CB incidents recorded in the Swedish Defence Research Agency's FOI NBC Defence database. In her report published in the *ASA Newsletter* (2002), Melin states: Although there is concern that individuals or groups could get in the possession of nerve or mustard gas, toxins, or other extremely poisonous compounds, most perpetrators tend to make an easy choice. Attacks with chemicals are mostly performed with the use of acid, household chemicals, pesticides, arsenic, tear gas, and pepper spray. The use of pesticide and cyanide in food or beverage has resulted in several mass casualty situations, especially in Asia.

**Myth 3: Terrorists will most likely use “military-style” employment methods to disseminate “militarily significant” agents.**

**FALSE.** Unfortunately, this is a common myth pervading the domestic preparedness community and one that is often reinforced by current Weapons of Mass Destruction (WMD) instruction manuals and by the scenarios used for WMD training.

There are approximately 60–80 chemicals and agents of biological origin that have been standardized by nations for use as military CB agents. These include agents that we commonly classify as nerve agents (organophosphate and carbamate chemicals such as sarin, VX, soman, and tabun), vesicant or blistering agents (mustard, lewisite, etc.), blood agents (hydrogen cyanide, cyanogen chloride, etc.), pulmonary agents (phosgene, chlorine, etc.), irritant and incapacitating agents, and several dozen biological agents (Bacillus anthracis, Yersina pestis, ricin, saxitoxin, etc.). To date, preparing for incidents involving these 60–80 agents has been the primary focus of domestic responder training and response technology research and development. However, agents identified as “militarily significant” only scrape the surface of the possible range of agents that may be desirable to terrorists.

To appreciate the differences between “militarily significant” agents and possible terrorist agents, it is first necessary to understand the difference in the criteria used by militaries and terrorists in selecting agents. The requisite characteristics of ideal military CB agents are very stringent.
Issues such as production cost, stability in storage, weaponization and dissemination versatility, and numerous other factors greatly limit the number of agents that a government may find attractive. The desired effects of military agents are also limited and aimed at supporting specific tactical or strategic requirements (kill, quickly incapacitate, area denial, obscure troop movements, etc.). In general, terrorists are not bound by the same constraints as nations. Any chemical or biological agent with appropriate dissemination characteristics and effects that could result in widespread panic or fear could be a candidate.

Many agents with properties desirable to a terrorist have been largely rejected by the military. One example is the fentanyl family of chemicals. Fentanyl is a powerful opioid analgesics commonly used as pharmaceuticals or as designer street drugs. Examples of fentanyl includes carfentanil, alfentanil, 3-methyl fentanyl, 3-methyl-thiofentanyl, and sufentanil citrate. Fentanyls are exceptionally powerful psychoactive chemicals with a relatively high level of toxicity. Though most countries have dismissed fentanyl as military CB agents, the properties of fentanyl as incapacitants or as potentially lethal agents may be desirable to terrorists. Another example of an agent with potential terrorist applications is MPTP, which is a contaminant that appears in poorly synthesized MPPP (a meperidine analog used as synthetic heroin). MPTP intoxication produces a condition called “chemically-induced Parkinson’s disease.” The symptoms appear as a rapid onset of Parkinson’s disease with often irreversible chronic effects. Anyone operating a clandestine drug lab is capable of manufacturing tactically useful concentrations of MPTP by exaggerating the conditions that result in accidental MPTP contamination. These two examples of non-traditional agents only scratch the surface of possibilities.

Overall, it is estimated that there are at least 500–600 agents with significant potential for terrorist employment (not including toxic industrial chemicals released in large quantity). Some CB weapons experts think this number is conservative and that there may be thousands of possible terrorist CB agents. Unfortunately, very little training and few reference resources address these other possible agents. Additionally, very few of our current incident support technologies (agent detectors, downwind hazard prediction tools, etc.) accurately account for the possible scenarios posed by these non-traditional CB agents.

The exclusive focus on “militarily significant” agents is also present in new industry initiatives aimed at reducing the risk of terrorists procurement agents. In the new security code added to the American Chemistry Council’s Responsible Care program, chemical companies are required to safeguard chemicals catalogued on the Australia Group List and the FBI Community Outreach lists. Both of these lists primarily describe precursor chemicals used in the production of classic military CB agents. In fact, the Australia Group List omits some important precursors for military chemical agents that were secret at the time of the Chemical Weapons Convention (CWC) in 1993. One example of this is the precursors related to the Novichok family of Russian third-generation nerve agents. In 1993, the existence of the Novichok agents was classified. Now it is public knowledge that at least one Novichok variant (A-232) is a simple binary agent derived from a common industrial solvent and a common pesticide precursor.

The other side of this myth is the assumption that terrorists will execute attacks using “military-style” employment methods—in essence, vapor or aerosol attacks. The vast majority of our WMD exercises and an overwhelming amount of literature are devoted to preparing for airborne-agent attack scenarios. However, when looking at previous incidents, the actual number of terrorist vapor and aerosol attacks is small compared to other forms of attack. This narrow focus on military agents and dissemination methods has even transferred over from the response community to security professionals. Most of the CB security-related manuals currently published by Jane’s Information Group, the Soldiers Biological and Chemical Command (SBCCOM), and the Centers for Disease Control (CDC) are primarily focused on protecting facility ventilation systems, building design to control unintentional air intake, air filtration, and other factors relevant to aerosol and vapor attacks. By contrast, little to nothing is present in these publications about vulnerabilities associated with the facility cafeteria, the employee break room, catered food and beverage, and other potential contamination opportunities.

**Myth 4: It is very easy to kill large numbers of people with CB agents.**

FALSE. Procuring and disseminating CB agents is very easy. However, assimilating all of the necessary conditions for a significant, mass-casualty attack is not as easy as it is often portrayed.

Several elements must be properly matched for a successful, mass-casualty CB attack: First, an agent with appropriate properties must be matched with the correct dissemination method. A system for disseminating the agent must then be constructed. The agent and dissemination system must then be delivered successfully to a venue where a large number of people will be exposed to the agent. As simple as this formula appears, most CB adversaries to date have made a mistake at one or more points along the way.

Members of the Japanese religious cult Aum Shinrikyo, despite their ambition, are one example of a threat group that never got the mass casualty formula 100% correct. Aum Shinrikyo devoted tremendous resources to manufacturing CB agents and dissemination systems. The cult poured millions of dollars into their development efforts, viewing CB agents as a catalyst to bring about a global apocalypse from which they would emerge as the dominant power. Nevertheless, Aum Shinrikyo never achieved their objectives of killing thousands of people. In fact, Aum Shinrikyo never succeeded in killing more than 12 people in a single chemical attack. Aum’s weapon engineers suffered numerous failures over years of work, including the acquisition of non-infectious biological strains, production of poor-quality chemical agents, design of ineffective dissemination devices, and more. In the infamous March 1995 Tokyo subway attack, Aum eventually abandoned sophisticated dissemination devices and relied on the simple evaporation of sarin poured from ruptured plastic bags. Even after they chose a reliable...
means of dissemination and a good venue for achieving casualties, the sarin used in the attack was contaminated with an odorous corrosive chemical that drove people away from the location of the agent. This greatly reduced the overall success of the attack. Had the agent been pure (odorless), the number of casualties could have been much higher.

It is important to note that if an adversary does get the “magic formula” correct, the number of potential casualties can far exceed anything we have witnessed in terrorist attacks to date. The objective of dispelling this myth is not to dismiss the possibility of a catastrophic mass casualty CB attack. Rather, the goal here is to develop a more balanced and rational perspective of the threat.

Be Cautious In Evaluating “Expert” Sources of CB Information

In addition to the four myths described in this article, be cautious when relying on published information sources. Many of the sources used for public safety information contain inaccuracies and unintentional misinformation. Given the shortage of experienced experts in the field of CB terrorism or CB warfare, many of these inaccuracies remain overlooked and unquestioned.

Innocent but potentially dangerous inaccuracies can be as simple as printing errors in field reference books. One such error appeared in the Jane's Chem-Bio Handbook (a very common reference used by emergency responders) and survived through several reprintings of the manual. In the Agent Indicator Matrix (pp. 15–17 of the handbook), the symptoms for nerve agents and blistering agents were reversed. Though most well-trained responders would recognize this, such an error could result in initial misidentification of an agent used in an attack or could contribute to confusion in the early stages of incident response.

There is also a tendency among authors of chemical and biological terrorism books and manuals to repeat information from other sources without verifying the source’s accuracy. One example of this is the diagram in Figure 1. For decades, authors and CB experts have described the umbrella displayed in this drawing as “The umbrella weapon used in the Bulgarian ricin ball assassinations” (1978). Even instructors at the FBI’s Hazardous Devices School were at one time presenting this drawing as an accurate diagram of the Bulgarian umbrella ball weapon. Unfortunately, few people over the years have stopped to question where this drawing originated. Following a series of attacks where tiny hollow platinum/iridium balls filled with ricin were injected into Bulgarian dissidents and a KGB double-agent, U.S. Secret Service Technical Services Agents were asked how the ricin balls recovered from both victims could have been injected using a device possibly disguised as an umbrella (two victims remembered seeing an umbrella at the time of the attacks). UNMOVIC Weapons Inspector Harvey J. McGeorge, at the time a U.S. Secret Service TSD Agent, prepared a concept drawing for a projectile weapon concealed inside an umbrella. This drawing was then presented to U.S. officials as a possible concept of how the Bulgarian weapon could have worked. After this drawing was subsequently reprinted inaccurately as “the Bulgarian umbrella ball weapon,” hypothesis became documented as fact and thus entered into history. To this day, U.S. intelligence sources still do not know how the actual weapon functioned.

Caution should also be used when referring to information that was originally developed to support military applications. First, a considerable amount of published information available about military agents and CB employment was originally yielded by research during the pre-1972 offensive development era. Many experts now question the accuracy of some of this information. For example, the military previously thought that the dose of inhaled anthrax to contract infection in 50% of exposed
people was 10,000–8,000 organisms. After studying the anthrax incidents of 2001, some researchers now think that the infectious dose (ID50) for anthrax may be much less than previously estimated.

In addition to the possibility of inaccuracies, military classifications and terminology can also be misleading when viewed in a domestic context. One example of this is the way the military categorizes agents as lethal agents, non-lethal incapacitants, smoke, etc. The psychoactive chemical BZ (3-quinuclidinyl benzilate) is labeled by the U.S. military as a non-lethal incapacitant. If used under appropriate conditions, BZ intoxication rarely results in fatalities. However, if BZ is used in hot weather environments, BZ intoxication can result in lethal effects due to suppressed perspiration. In fact, several military incidents involving BZ have resulted in accidental fatalities owing to this unexpected side effect.

Summary
Achieving readiness at the local and national levels for chemical and biological terrorism is essential to the security of our nation. Yet, in our efforts to inform the public and ourselves, we need to be careful not to fall into the trap of mistaking myth for fact, nor of blindly accepting information sources at face value. This is especially important when dealing with a highly technical and often ambiguous issue, such as chemical and biological terrorism. As public safety professionals, we have a responsibility to the public to question common assumptions and ensure that the information we base our decisions on is accurate and represents the facts.

References
2. Sources vary regarding the number of human casualties incurred as a result of the 1915 Dliger incident. However, McGeorge (2006), who has investigated this incident, cites reports estimating as many as “several hundred” casualties from the eating of contaminated meat while the infected livestock were in transit to Europe.
4. Information based on an analysis of 404 non-military incidents documented in the CABO-MX database. Source: Chemicals & Agents of Biological Origin, CABO-MX, 2000, (U). [computer database] Woodbridge: Public Safety Group. A similar investigation was also conducted by the author in 2002 of records contained in the CNS Monterey WMD Terrorism Database with similar results to the percentages yielded by analysis of the data contained in CABO-MX.
5. Ibid.
7. The number of 60–80 “standardized” military agents includes agents that have been formally adopted and weaponized by governments. This estimated number does not include candidate CBW agents and experimental agents that have not been formally adopted for production and weaponization.
11. Ibid.
13. Eldridge, J. (2005) Jane’s Nuclear, Biological and Chemical Defence, 2005-2006. Alexandria: Jane’s Information Group. Although the Jane’s NBC yearbook is primarily focused on equipment for military applications, virtually every CB detection system available to emergency responders is documented in the Jane’s yearbook. Most detection systems currently in use with domestic first responders were originally developed or have been adapted from military chem-bio detection systems.
18. Reference figure 1.
21. McGeorge, H., personal communication, 1999. According to McGeorge, a former UNMOVIC Inspector who researched the chemistry of the agent used in the 1995 Tokyo attack, the odorless corrosive chemical contaminant that drove people away from the agent was a product of the route used in synthesis of the sarin.
22. Sidell, F., Patrick, W., & Dashiell, T. (Eds.). (1999). Jane’s Chem-Bio Handbook. (pp. 15-17) Alexandria: Jane’s Information Group. The printing error in the Agent Indicator Matrix survived at least until the fourth printing of the manual in 1999. Although I have not confirmed, I have been told by re-
cent students that the error does not exist in more recent editions of the manual.
23. W. D., personal communication, 2006. W., a 2006 graduate of the FBI's Hazardous Devices School, claims that the umbrella weapon drawing was still being used at HDS as a factual representation of the weapon used in the ricin ball assassinations. This statement was also conveyed by another student, a police bomb technician, who attended one of my seminars in Pennsylvania in 2002.
24. McGeorge, H., personal communication, 1999-2006. I have had several conversations with McGeorge regarding this topic over the past decade. According to McGeorge, the concept drawing was developed in collaboration with a colleague to satisfy the needs for a briefing. The compressed gas system incorporated into the umbrella concept design was adapted from another weapon designed to disseminate hydrogen cyanide, completely unrelated to the Bulgarian/KGB incidents.

About the Author
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Learning Objectives:
After studying this article, participants will be better able to do the following:
1.) Recognize some of the common myths about chemical and biological terrorism that have emerged in the homeland security community.
2.) Use caution and critical evaluation when referencing published information sources about chemical and biological terrorism.
3.) Recognize important differences between chemical and biological (CB) warfare and CB terrorism.

CE Test for “Four Common Myths About Chemical and Biological Terrorism”
1.) According to information documented in the CABO-MX database, the most common type of agents employed in non-military CB attacks are:
A. Standardized military nerve agents.
B. Non-living agents of biological origin (biological toxins).
C. Easy-to-acquire toxic chemicals.
D. Fentanyl analogs.
E. Standardized military agents of biological origin.

2.) The most common mode of disseminating chemical and biological agents used by non-state actors (criminals and terrorists) is:
A. Contaminated food and beverage.
B. Explosive atomization.
C. Spray aerosol.
D. Thermal atomization.
E. Evaporation.

3.) MPTP intoxication causes:
A. Inhibited cell respiration.
B. Delirium.
C. Severe liver damage.
D. Neutralization of acetylcholinesterase often resulting in death due to uncontrolled stimulation of muscle cells.
E. Chemically-Induced Parkinson's disease.

4.) The ______________________ family of Russian third-generation nerve agents were classified during the time of the Chemical Warfare Convention in 1993.
A. Novichok
B. EA-series
C. Devchika
D. Organophosphate
E. Carbamate

5.) A weapon ______________________ was used to inject a tiny metal ball filled with ricin into two Bulgarian dissidents and a KGB double agent in a series of incidents in the late 1970s and early 1980s.
A. Disguised as a package of cigarettes
B. Disguised as an umbrella
C. Disguised as a cane
D. Unknown to U.S. intelligence sources
E. Called the M209 "Non-Discernable Microbiological Inoculator"

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