

# Chemical, Biological, Radiological, and Nuclear Terrorism: The Threat According to the Current Unclassified Literature

Center for Counterproliferation Research  
National Defense University

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## EXECUTIVE SUMMARY

### Background

The prospect of chemical, biological, radiological, and/or nuclear (CBRN) terrorism is recognized by the United States government as an acute security challenge.<sup>1</sup> Particularly following the tragedy of September 11, 2001, but also for several years prior, senior U.S. officials and official government reports have underscored the likelihood, over time, of terrorist organizations coming into possession of such unconventional materials, and the prospect of their use against the United States homeland, U.S. forward-deployed forces, or U.S. friends and allies. Toward the end of the last century, this concern was heightened, among other events, by the Japanese cult Aum Shinrikyo's 1995 use of sarin in the Tokyo subway. The combination of increasing availability of technology and expertise, a perceived mass-casualty motive structure for particular terrorist organizations, the impending end of a millennium, a spate of conventional attacks against U.S. assets – World Trade Center, 1993; Oklahoma City Federal Building, 1995; American embassies in Tanzania and Kenya, 1998; and the *U.S.S. Cole*, 2000 – and both the widespread suspicion of terrorists seeking CBRN weapons and the actual sub-national employment of a chemical agent all contributed to this general assessment.

More recently, the prospective linkage between terrorist organizations and state actors with weapons of mass destruction programs has become an acute security concern. Indeed, this nexus is central to the logic of the emergent “Bush Doctrine.” As Secretary of Defense Donald Rumsfeld testified in May 2002, “we have to recognize that terrorist networks have relationships with terrorist states that have weapons of mass destruction, and that they inevitably are going to get their hands on them, and they would not hesitate one minute in using them. That’s the world we live in.”<sup>2</sup>

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<sup>1</sup> One clear theme that runs through the literature: a proliferation, and conflagration, of terminology relating to chemical, biological, radiological, and nuclear weapons. While the open-source literature variously characterizes this disparate problem set as CBRN, CBRNE, NBC, ABC, or WMD (and, more recently, WME), for readability the acronym CBRN is used throughout except for specific reference to particular weapon types (e.g., BW or CW for biological or chemical weapons, respectively).

<sup>2</sup> U.S. Congress, Senate Committee on Appropriations, hearing on *Fiscal Year '03 Defense Department Appropriations*, 110<sup>th</sup> Cong., 2<sup>nd</sup> sess., 21 May 2002.

In light of the potential severity and assessed increasing likelihood of confronting CBRN-armed terrorists, the Center for Counterproliferation Research was tasked with reviewing the open-source literature on the subject, with special emphasis on three types of information:

- Why a terrorist group might resort to the use of CBRN weapons, and the circumstances or conditions in which this could be most likely;
- What type of organizations, according to their characteristics and objectives, might be most likely to use CBRN weapons; and
- Which of the CBRN weapon types, and, as possible, which particular agents, would most likely be used, and for what intended effect(s).

In light of the abundance of available open-source literature on the subject of CBRN terrorism, the Center sought a representative sampling of recently published books and monographs, scholarly and professional journal articles, and studies and reports (available through the Internet or in hard-copy form) authored by “think-tanks” or other nongovernmental institutions. Intended to be illustrative rather than exhaustive, the review was constrained in three key ways: (1) only materials within the 1998-2002 time frame were considered; (2) no newspaper or weekly periodicals were reviewed; and (3) governmental reports and Congressional testimony were not examined. Nonetheless, this review suggests the need for a broader examination of official government sources, testimony to Congress, additional Internet-based material, and a systematic review of the classified literature on the subject. Similarly, the classified and unclassified literature on the related subject of nuclear, chemical, and biological warfare threats and response may yield additional, potentially important insights.

## **General Themes**

Most sources consulted fall into one of three broad categories: “a call to arms;” discussions of terrorist motivations; and discussions of CBRN threats. Before considering the range of threat assessments and conclusions made by the authors reviewed, it is important to examine some of the key features of the ongoing debate about CBRN terrorism. While each individual source addresses a somewhat different aspect of, or has a particular interpretation of, the CBRN problem set, in aggregate there are a number of commonalities in assumptions, assessments, and approaches.

***Recent Cases.*** Two issues included in nearly every discussion of CBRN terrorism are the continuing security problems in the former Soviet Union and Aum Shinrikyo’s 1995 sarin attack in the Tokyo subway. Particularly in relation to biological, radiological, and nuclear terrorism possibilities, the troubles in maintaining security at former Soviet installations are mentioned as a key variable in assessing BW and nuclear threats. Similarly, the diaspora of Soviet BW and nuclear scientists repeatedly is noted as a factor that could significantly affect the probability of terrorists acquiring these weapons. Here again, opinions diverge over how greatly instability in Russia and other

former Soviet republics may aid terrorism, yet almost all conclude that it may play a key role. Aum Shinrikyo, often viewed as the only terrorist group to even somewhat successfully employ chemical weapons, is cited both by those who discount the possibility of CBRN attacks – because of Aum’s difficulties in spite of its large financial, material, and skill base – and those who view it as the harbinger of greater CBRN terrorist attacks in the future. Discussion of Aum, whether by those who see it as the exception or those who see it as the first of a trend, is prevalent throughout today’s literature.

***State-sponsored CBRN Terrorism.*** State-sponsorship also finds its way into most discussions of CBRN terrorism. Just as with Aum, the waters are muddied with this topic as well. Often, the concept of sponsorship of a group is either equated or conflated with agents or agencies directly subordinate to state control. In this context, discussion of acquisition of CBRN by “groups” rather than states conveys a meaning that ranges from special forces to terror cells to, in some cases, individuals. Furthermore, the different postulated varieties of sponsorship lead to disparate conclusions regarding the prospective willingness of states to provide groups with CBRN weaponry or assist them in acquisition or production. All in all, the literature provides no clear or shared understanding of state-sponsorship, yet recognizes its fundamental importance in CBRN threat assessments.

***Focus on Biological.*** Of the weapon types considered – nuclear, chemical, biological, and radiological – a disproportionate share of the literature in the past three years has been devoted to the biological weapon threat. This is followed, in turn, by nuclear, radiological, and lastly, chemical weapons. In itself, this breakdown in the relative percentage of discussion may be indicative of the relative importance attached to each threat by the various authors and the CBRN community more widely. In other time frames, however (e.g., the early 1990s), the nuclear dimensions arguably received relatively greater attention.

***Nature of Terrorist Groups.*** One point of general agreement is the inherent “conservatism” of terrorist organizations. While recognizing that certain terrorist groups may be inclined toward innovation in weaponry and tactics, and risk-taking in operations or in weapon selection, many experts accept the notion that most terrorist organizations will prefer to use “tried and true” methods if these can achieve the desired effect. Innovation, particularly into the realm of CBRN, most authors would suggest, is often likely to be driven by factors other than an organization’s own curiosity or desire for experimentation. Both the increasing availability of material and, for many analysts, a penchant for mass-casualties among particular terror groups, are frequently viewed as drivers for the CBRN acquisition quest.

***Agent Selection.*** Within the literature much discussion revolves around what are considered the “key variables” affecting terrorist acquisition and use of CBRN. Some, such as state sponsorship, have been mentioned already. These variables affect both the strategic-level decisions of terrorist groups as well as tactical-level choices and include: group motivations, their target audience, structure and organization, history and learning

behavior, the education level of members, their level of state support, the “audience” they intend to influence, and, not least, the availability of CBRN material and their intended targets. Detailed further in the following three sections, these variables form the basis of many of the disputes and divisions found within today’s CBRN terrorism literature. And, as Table 1 demonstrates, when taken in aggregate, assessments regarding each variable can lead to widely divergent views on the terrorist CBRN threat writ large.

In the literature generally there is a noticeable lack of specificity regarding likely agents to be used by terrorists against U.S. targets. Few authors specify whether, for example, botulinum toxin would be more likely than anthrax, or VX rather than sarin. The same, however, cannot be said in a relative sense across weapon classes. While specific conclusions vary, many writers discuss the relative likelihood of nuclear, radiological, biological, or chemical attacks. Similarly, they tend to view differing levels of attack – small-scale attacks with limited casualties or large-scale mass casualty attacks – as either more or less probable, depending on a range of variables.

***Future Looks Bleaker.*** Finally, many articles addressing this issue tend to differentiate between the threat “today” and what it is likely to be in 5-10 or more years. In many assessments, the future threat is seen to be worse (sometimes dramatically so) than the current threat, despite some optimistic assessments of U.S. government responses to the prospect of CBRN terrorism. Much of this negative evaluation of the current trend has to do with rapidly proliferating technology to state and sub-national actors; the evident progress in weapons programs in nations including Iran, Iraq, Syria, Libya, North Korea, and others; and the continuing prospect of leakage and brain drain from former Soviet, South African, or other state programs.

*Key Themes:*

- *Three broad categories of literature on the subject (call-to-arms, motivations, single-issue works)*
- *An abundance of literature focusing on the BW threat, with less recently on nuclear and radiological, followed by CW*
- *A general assumption that terrorist groups are generally conservative in their approach to new weaponry and tactics*
- *The problems of post-Soviet security is a widespread theme in BW and nuclear discussions*
- *The case of Aum Shinrikyo is a key component of today’s debates on the prospects for CBRN terrorism*

## **Terrorist Motivations and Characteristics**

***A New Terrorism.*** Above all else, the concept that a “new” form of terrorism has emerged resonates through the recent literature. In particular, a number of authors have begun to question the long-held notion that “terrorists want more people watching than dead.” Many now claim that this view, espoused by Brian Jenkins several years ago, may have been true insofar as secularly motivated terrorist organizations were concerned, but that such an idea might not characterize well some contemporary groups. Unlike the left-

wing terrorist groups active in Europe from the 1960s to the 1980s – Italy’s Red Brigades, France’s Action Direct, and Germany’s Red Army Faction, for example – today’s purveyors of violence seem less prone to strictly “political” statements. Those who argue that a “new terrorism” is emerging point primarily to Islamic fundamentalism or religious extremism and its convergence with three other factors: the deliberate quest to acquire or develop CBRN weapons, a willingness to accept martyrdom, and a perception that the only “audience” of worth is that of a deity.

Much of the current literature argues that for many religiously oriented or millenarian terrorist groups, which frequently appear to view their struggle as part of a battle of “good versus evil” or as a precursor to judgment day or the apocalypse, a new mass-casualty motive structure has developed. In this view, such groups are detached from what might be considered “moral norms” or other social constraints and therefore do not feel restricted in considering the possibility of CBRN weapons use, let alone conventional explosives, against whatever target they choose. According to this argument, such groups may not wish to achieve a purely “political” goal, but rather wish to advance a religious or spiritual purpose. In this context, the terrorist’s principal audience, perhaps beyond those that assist their cause, is that of God.

Radical Islamic principles or fundamentalism is the most often cited form of religious motivation for terrorism – a point buttressed by the large number of Islamic groups included on the State Department’s annual list of foreign terror organizations. However, domestic “Christian Identity” groups, which often mix religious teachings with deep-seated racist and white supremacist beliefs, as well as hostility toward the U.S. Federal Government, also have demonstrated interest in CBRN weaponry. Importantly, many authors cite the 1995 Oklahoma City bombing – itself motivated by anti-government sentiments – as proof that domestic terrorists can be equally willing as foreign groups to consider mass-casualty attacks.

Others, however, have suggested that too much is made of religion as a motivation toward CBRN terrorism. Rather, the characterization of religious followers as mindless zealots and murderous fanatics may be overly simplistic and may overlook other reasons for groups pursuing CBRN – motives that may be more classically “political.” Indeed, a number of authors suggest that while religion may certainly be a major motivation for organizations such as al-Qaeda, another motivating factor for acquiring and using CBRN weapons may simply be their intrinsic shock value. For some, the mere threat of these weapons could cause substantial psychological, political, and even economic damage to a state. And in the case of radiological weapons, despite the fact that the number of immediate casualties would likely be far below those of a successful biological or nuclear attack, the potential for widespread public fear of radiation would likely nevertheless inspire acute psychological damage far in excess of the physical damage resulting from the attack.

*New Modus Operandi.* Intimately linked to the threat-value of these weapons is the view, somewhat widespread, that terrorists may seek CBRN because traditional methods may no longer be psychologically “effective.” In this view, the idea is that

much of society has become “desensitized” to acts of violence perpetrated with the “bomb and the gun” and that such tools can no longer create the same emotional impact or have a sufficient deleterious effect on morale. In contrast, the insidious nature of CBRN cannot help but deliver an enormous blow against a group’s targets and enemies.

While it may seem obvious that different terrorist groups may seek to attack very different targets based upon their underlying ideologies or beliefs, this is an important point with respect to the desire to propagate CBRN terrorism. Since target selection varies, and since particular technologies and expertise may be more readily available, groups may opt to purchase or develop one weapon type over another. For example, chemical weapons will generally have less of an effect on physical targets, such as buildings, than, for instance, a nuclear device. Similarly, a contagious biological agent that targets agriculture could in theory impose a greater economic cost than a chemical attack. Target selection is a key variable: a group may not seek to acquire simply what is the easiest to acquire, but rather what they assess would be most effective against a *specific* target or target set.

***Possession Equals Use.*** The issue of deterring CBRN terrorism is closely linked to group motivations. It is a near-universal opinion that deterring the use of CBRN by terrorist who have acquired it will be extremely difficult. Most conclude that acquisition of such weapons generally will lead to attempted use. A more recent, and oft-cited supposition is that had al-Qaeda had such weapons at its disposal, they would have sought to employ them. And with what many view as the most dangerous terrorist groups in the CBRN context – religious/millenarian groups that seek to inflict mass casualties on their enemies – preventing acquisition may be equally problematic.

*Key Themes:*

- *Religiously-motivated terrorists may be the most likely to use CBRN, particularly those that may also seek to simultaneously advance a political agenda*
- *Particular Islamic fundamentalist and other organizations abroad have expressed a clear interest in CBRN weapons, as have select “Christian Identity” and other right-wing groups in the United States*
- *Groups that place themselves outside normal societal mores may have little moral difficulty deciding to employ CBRN*
- *General agreement that “traditional,” secular leftist groups do not represent core CBRN terrorist threats*
- *Groups may not simply take what is easily available; they may be more likely to seek the weapon/agent that best suits their needs*
- *A group which lacks an “audience” among the public may be less constrained in CBRN use, and difficult to deter*
- *Many analysts postulate that for particular sub-national actors, possession of CBRN weapons will likely lead to the attempted use of those weapons*

## Terrorist Capabilities

Many analysts conclude that the organizational structures that have been employed in recent years by terrorists using conventional weapons – that of loose networks of independently-operating, specialized cells which come together on an ad hoc basis to carry out a specific attack – will also likely apply to future acts of CBRN terrorism. In part this is due to the assumed natural conservatism of terrorist organizations; once a successful approach is developed, it likely will be replicated. The intelligence challenge posed by such a structure is daunting, particularly if further compartmentalization on “special” weapon-related activities ensues.

***Resource Sufficiency and Technical Competence.*** The question of sufficiency of finances and other resources available to terrorist organizations for CBRN acquisition is roundly debated in the current literature. For some, a terrorist group need only control a budget equivalent to several million dollars and the means to acquire commercially available, often “dual-use” biotechnology to begin a rudimentary, but potentially deadly, biological weapons development effort. On the chemical side, some suggest that a similarly small amount of capital would be needed to begin purchasing precursors for CW agents. The nuclear problem for terrorists, of course, is much different. Yet many who espouse the view that a terrorist can gain a CBRN capability “on the cheap” suggest that a nuclear black market emanating in the former Soviet Union provides access at least to radioactive material, and perhaps even sufficient quantities of fissile material. At the extreme end of this argument, some even suggest that, based on the South African experience, a full-blown nuclear development program, minus the mining, refinement, and enrichment of fissile material, could be undertaken by a particularly well-funded terror organization.

These arguments are equally well represented among skeptics. Rather than requiring simply a few million dollars and commercially available equipment, acquisition of a CW or BW capability, let alone a nuclear capability, is harder to accomplish than much of the popular literature suggests. Critics of the “cheap” argument cite difficulties in acquiring virulent strains of BW agents, the hazards involved in preparing them (and similar safety issues regarding CW), and the difficulties in developing effective dispersal mechanisms. In particular, this argument is often rooted in the experience of Aum Shinrikyo. While at its height the group had assets totaling approximately one billion dollars, a diverse and highly trained scientific workforce, and little scrutiny from law enforcement and intelligence agencies for a number of years, it largely failed in its quest. Despite its strengths, Aum was unable to acquire nuclear devices from Russia (where its activities were particularly strong), develop an effective BW capability, or develop a mass-destructive CW capability. Skeptics note that the 1995 Tokyo sarin attack resulted in only a handful of fatalities and that the dispersal mechanism devised was simplistic in the extreme; and even this partial success transpired after a series of failed biological attacks against U.S. and Japanese assets.

Thus, the current literature is strongly divided on the issue of whether sub-national actors may possess sufficient technical and financial resources to develop a

viable CBRN capability. However, there are two points of general agreement on this topic. First, most agree that the black market in the former Soviet Union is attractive to groups that wish to acquire either CBRN weapons or the know-how to construct their own – though the actual severity of “loose nukes” and “brain drain” problems are debated. Second, any group that is able to recruit skilled professionals from relevant fields (chemistry, biology, physics, etc.) will increase its chances of obtaining or successfully developing CBRN weapons. Although some argue that a college education in these fields is sufficient or nearly sufficient for basic biological, chemical, or radiological devices, nearly all agree that a group with trained professionals will need less time to construct a CBRN capability and will increase its chances of conducting a truly effective attack.

***State Support.*** Today, most of the active terrorist organizations in the Middle East receive some form of direct or indirect support from states. Iran, for example, provides financial support to Hezbollah and HAMAS. Al-Qaeda received assistance from Sudan and Taliban-ruled Afghanistan. Furthermore, each of these three groups is thought to be interested in CBRN weapons; certainly, evidence uncovered in Afghanistan and elsewhere has underscored al-Qaeda’s CBRN efforts. However, the recent literature remains divided over the influence of and prospects for state-sponsored CBRN terrorism. One argument is that only by being able to marshal some (or many) of the resources of the state – diplomatic immunity, geographical sanctuary, intelligence information, national technological capabilities, and a large, steady source of funding, just to name a few – can a terrorist group hope to develop an effective CBRN capability. By contrast, while a state-sponsor may be happy to employ a terrorist group using conventional weapons for state purposes, providing a group, over which it might have only incomplete control, with CBRN weapons may be too great a risk for many states. The possibility that a truly massive attack could be traced back to the sponsor, or that the group might turn on its sponsor could prove a deterrent to CBRN “sponsorship.” In the end, however, most experts would agree that if a group did receive significant assistance in developing a CBRN weapons from a sponsor state, that group would have the best chance of acquiring real capability.

*Key Themes:*

- *Groups need an appropriate level of financial resources and the requisite technical/professional skill set to succeed in CBRN development, although there are numerous disagreements about what level of proficiency is needed or what level of resources may suffice*
- *While estimates of likelihood of success vary considerably, a widespread interpretation that particular organizations will be inclined to pursue, and perhaps attempt to employ, CBRN weapons*
- *State-supported groups are often assessed to have the greatest potential for successful acquisition and effective use*
- *If the trend in conventional terrorism applies, loose networks of small, specialized cells may be the most likely structural characteristic; compartmentalization is likely*

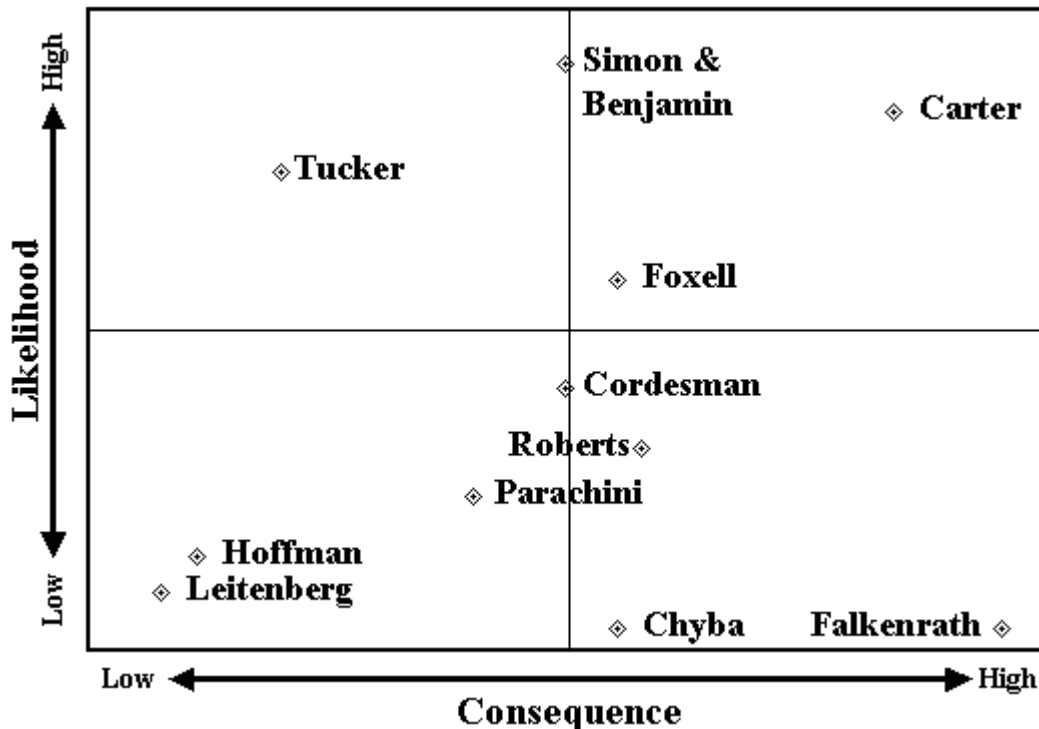


## Terrorist Choices, Methods, and Tactics

One of the principal fault lines in today's literature pertains to the overall likelihood of and damage from CBRN terrorist incidents. As illustrated in Table 1, experts remain widely divided in their conclusions regarding the consequences of CBRN attacks (in terms of political, economic, or other costs) as well as their overall likelihood or their frequency.

**Three Views.** To a large extent there is a tripartite division within the literature. One school of thought argues that both the likelihood of CBRN attacks and their potential consequences are high, and are virtually certain to increase. For this school, catastrophic terrorism employing CBRN is a near-certainty and a condition for which the government must be prepared. A second group takes the exact opposite stand, arguing that past cases of CBRN terrorism, specifically threats and hoaxes and low-level attacks (with limited casualties or injuries compared to conventional bombings), will continue to predominate. For those of this mindset, the 1995 Aum attack and the 2001 attacks in New York and Washington demonstrate that CBRN attacks require inordinate investments in time and effort and are unreliable while explosives, whether TNT or jet fuel, can be both effective and reliable.

**Table 1. Illustrative Matrix: CBRN Terrorism – Likelihood vs. Consequence**



There is an emerging third viewpoint that incorporates elements of the other two. According to these proponents, the threat of CBRN terrorism, both large- and small-scale is significant, but not likely to be ultimately catastrophic. Equally important, however, is their view that the threat is neither so small as to require only little or modest government

attention or resources regarding its prevention or response. Instead, the threat requires both sufficient attention and resources, but worst-case scenarios – with thousands to millions of casualties – may not be best viewed as either the principal or most likely CBRN threat. In a sense, proponents of this third view argue that the U.S. government must treat the CBRN threat as it would any other, with judicious risk assessment that does not cater either to hysterical doomsday fears or to arguments that deny any validity to the prospect of CBRN terrorism.

Unsurprisingly, recommendations for government responses to CBRN terrorism vary largely upon which of these three loose “schools” the author represents. This problem, that of sizing an appropriate response to the threat of CBRN terrorism, may be the most difficult to solve. Furthermore, the literature offers little clear guidance. Just as final conclusions about the threat occupy a wide range, so too is there an array of assumptions, analyses, and conclusions regarding the key variables of the CBRN terror equation. In the remainder of this section, those variables related to the choices, methods, and tactics made or adopted by terrorist groups are considered. These key variables account for much of the disparity between viewpoints.

***Weapons and Tactics.*** As the September 11, 2001 attacks demonstrated, choices in weapons and tactics by terrorists are perhaps the most difficult aspects of the terrorism problem to assess or predict. The small data set relating to terrorist attacks using chemical or biological weapons to date, and their virtual absence with respect to radiological or nuclear weapons, only increases the difficulty for assessing CBRN risks. Perhaps because this is so difficult to undertake with a reasonable degree of fidelity, or because there is very little evidence available in open source materials, most discussions of the CBRN terrorism threat do not specifically address questions relating to particular agent selection. Questions relating to terrorist choices, methods, and tactics, when addressed, generally result in hypothetical scenarios, and rarely result in declarations that one agent, rather than another, is the “real” threat.

However, while authors seem reluctant to suggest that one agent or weapon is the most pressing threat (except, perhaps, for smallpox), they tend to be more willing to view one class of weapons as more likely a threat than another. In particular, a sizable plurality of the available literature agrees that of chemical, biological, radiological, or nuclear weapons, the biological terrorist threat is the most pressing at this time. As Robert Kadlec argues, biological weapons have “utility across the spectrum of conflict” that allows them to be employed for a variety of attacks, large or small, against a wide range of targets, and with an equally wide range of effects. Furthermore, the insidious nature of BW, coupled with its ease of concealment and potential for mass casualties, increases its attractiveness to terrorist groups. Radiological devices, nuclear weapons, and chemical weapons, respectively, tend to be rank-ordered as lesser terrorist threats today.

***Scale and Scope.*** An ongoing debate concerns the “level” of future attacks. There is a deep split between those who suggest that future CBRN events will probably resemble those of the past – low casualty attacks, threats, or hoaxes – and those who

believe that the 1995 Tokyo and more recent attacks foreshadow further CBRN mass-casualty attacks. With the first viewpoint, mass-casualty attacks are often conceptualized as “low probability, high consequence” events for which there must be contingency planning, but toward which the vast majority of anti-terror resources should not be directed. Catastrophic CBRN terrorism, advocates of this view argue, is unlikely but not impossible. On the other hand, those who foresee a prevalence of mass-casualty CBRN attacks argue that the motivation to kill large numbers of people already exists and will eventually merge with a greater technical proficiency and “dual-use” capability that is spreading steadily throughout the world (and the civilian world in particular). Under these new conditions assessments based primarily on historical experience are seen as flawed and potentially dangerous. However, this viewpoint does not discount a similar increase in low-level attacks; these too, it is argued, will increase in number.

Both sides of the debate on “low-level” versus “catastrophic” CBRN terrorism agree, however, that policy-makers and strategists in the United States must not judge terrorist development, acquisition, and use strategies and tactics against our own standards. U.S. planners must recognize that terrorist groups simply might not care that a particular dissemination method is not as effective as another, or that one strain of an agent is less virulent than another. Similarly, terrorist groups – particularly those willing to accept martyrdom or which see their struggle as part of a larger battle – may care little for lesser safety standards as they prepare their weapons, whether radioactive, toxic, or contagious. In this light, assuming that a terrorist organization will not attempt a specific type of attack or will not use a particularly difficult agent could both be erroneous and, from a public policy standpoint, dangerous.

There are certain types of attack scenarios that have garnered attention among the terrorism community. The first is an attack against water supplies, reservoirs, etc., in major U.S. cities. This attack mode has been discounted in most studies given that the required amounts of chemical needed for a CW attack would be enormous and that water purification features might render most BW attacks ineffective. Aerosol distribution via a ground- or airplane-mounted sprayer has dominated much of the discussion of BW agents, particularly since September 11, 2001. Many see either as a viable attack mode, although note that such sprayers would need to be modified to achieve the correct particle size for effective dissemination. This scenario holds equally true for automobiles and boats. Third, those in both the “low-level” and “catastrophic” attack camps often cite dissemination of CW or BW on a smaller scale within a building via its ventilation system as a probable type of attack. Finally, for nuclear terrorism, an oft-noted attack scenario is that of a shipping container loaded with a weapon sailed into a U.S. port and detonated. Other scenarios envisage improvised chemical or radiological devices by, for instance, sabotaging or attacking particular industrial facilities or nuclear power plants.

Although overshadowed by fears of terrorists directly striking against human targets, “agro-terrorism” is clearly a rising concern. The use chemical or (especially) biological weapons against agricultural assets – livestock, crops, and even soil – is being reexamined as agencies across the spectrum of government try to understand and reduce vulnerabilities in America’s homeland. It is often argued that in addition to the

potentially substantial economic costs associated with such an attack, the psychological impact of an attack in the American “heartland” could prove attractive to some terrorists.

Key Themes:

- *Of all the questions surrounding CBRN terrorism, those regarding agent selection and the tactics/methods of actual use have proven the most difficult to answer; most authors refrain from addressing these questions or making specific predictions*
- *A major division in the literature between the “not if, but when” standpoint and the “low-probability, high-consequence” position*
- *Implicit agreement that whether the threat is low- or high-priority, and the consequences lower or higher, the U.S. Government cannot afford to ignore the prospect of CBRN terrorism and should prepare accordingly*
- *Another significant division is the break between those believing that small-scale attacks will continue to dominate versus those who argue that mass-casualty attacks will predominate in the future*
- *Terrorists may not follow the same standards or necessarily have the same requirements, capabilities, or intentions of a state CBRN program*
- *A majority of the recent literature argues that of all CBRN, BW attacks are the most probable*
- *While mainly focused on anti-personnel agents and attacks, a significant amount of literature addresses the potential for “agro-terrorism” using BW or CW*

## **Annotated Bibliography: The Threat of CBRN Terrorism – Views from the Open Literature**

**Beres, Louis René. “Israel, the “Peace Process,” and Nuclear Terrorism: Recognizing the Linkages,” Studies in Conflict and Terrorism 21, no. 1 (Jan-Mar 1998): 59-86.**

This article deals with the threat of nuclear terrorism primarily from an Israeli viewpoint. There are some sections that could generally be applied to nuclear terrorism, especially with regard to the potential for nuclear weapons/materials acquisition by terrorist groups. Beres argues, “Should the terrorist group(s) seek to acquire an assembled weapon, it (they) could aim at any of the nuclear weapons already deployed in national arsenals around the world. Moreover, because the number of nuclear weapons states is likely to grow, such terrorists are destined to have a steadily enlarging arena of opportunity.” Beres goes on to state, “Should they seek to manufacture their own nuclear weapons, anti-Israel terrorists would require both strategic special nuclear materials and the expertise to convert these materials into bombs or radiological weapons. Both requirements are now well within the range of pertinent terrorist capabilities.”

**Betts, Richard K. “The New Threat of Mass Destruction,” Foreign Affairs 77, no. 1 (Jan/Feb 1998): 26-41.**

Betts’ article is primarily a discussion of the change in both threat and perception of weapons of mass destruction since the end of the Cold War. As he notes, “the roles such weapons play in international conflict are changing.” Betts argues that whereas nuclear weapons were previously the single greatest and most feared threat, today that place is being supplanted by biological weapons. While the article is non-specific with respect to particular sub-national motivations, Betts argues generally that the United States is “a target for states or groups whose aspirations are frustrated by U.S. power.” Through the recent past, the United States has suffered conventional terrorist attacks, and historically, “few terrorist groups have shown an interest in inflicting true mass destruction.” Yet in Betts’ view the future may not resemble the past with respect to the potential for CBRN attacks. According to Betts, for groups intent on inflicting mass casualties, biological weapons “probably represent the greatest danger,” while the mass-casualty potential of chemical weapons is limited. Nuclear weapons are “not likely to be the WMD of choice for non-state terrorist groups.”

**Bowman, Steve, ed. Biological Weapons: A Primer. New York: Novinka Books, 2001.**

This book focuses exclusively on the threat posed by BW, addressing it primarily from a terrorist-use, rather than state-warfare, perspective. By and large, this book does not discuss at length the likely perpetrators of BW attacks, nor broach the question of their motivations (except tangentially when discussion targeting) or characteristics. This book focuses primarily on utility of BW to strike at U.S. vulnerabilities and posits how this

might be done. Bowman, the editor, begins by declaring that BW attacks, specifically terrorist ones, are a real threat; even the mere threat of an attack could cause significant disruption. He suggests that while many analysts believe that state-sponsorship of terrorist groups with BW is unlikely, a state committed to employing BW may very well use a supported terror group as one delivery mode. Like others, Bowman assesses that the spread of biotechnology bodes ill for the United States on the BW front, that it stands to worsen the threat of biological terrorism. Terry Mayer discusses the BW threat primarily from the perspective that inventive, relatively simplistic delivery means are within the grasp of lesser-developed potential adversaries of the United States. As he states, “the purpose of this article is to raise the awareness level about a very real and probable threat,” which, in his mind, has not been adequately addressed. Mayer suggests that two likely BW agents to be used against the United States are botulism and anthrax. Furthermore, he posits the possibility of eventual genetic manipulation of BW agents. Included in his treatment of BW are hypothetical terrorist BW attack scenarios – of the smaller-scale variety. Finally, like Bowman and Mayer, Bob Kadlec argues that the BW threat is real and that low-tech groups and countries pose a serious and increasing danger. In this view, agricultural sprayers could be “easily adapted” to efficiently disseminate BW agents. He views BW as having “utility across the spectrum of conflict” making its use, in whatever way, more likely than chemical or nuclear weapons. BW could be used to cause widespread and severe economic damage rather than human fatalities alone if, for instance, it were targeted at America’s agricultural sector. He warns that little attention or effort have been devoted to this vulnerability, and articulates a number of hypothetical attack scenarios on U.S. agriculture with BW.

**Bunn, George, Fritz Steinhausler, and Lyudmila Zaitseva. “Strengthening Nuclear Security Against Terrorists and Thieves Through Better Training,” Nonproliferation Review 8, no. 3 (Fall-Winter 2001): 137-149.**

This article discusses the threat to nuclear facilities posed by terrorists and thieves, and the authors suggest that the threat of nuclear terrorism has moved from hypothetical to reality. The authors argue, “There can now be little doubt that if such terrorists could acquire weapons-usable nuclear material from thieves and learn how to make nuclear weapons, they would employ them in their attention-seeking tactics.” Due to the spread of knowledge, the authors suggest that the one major obstacle to terrorist use of nuclear devices is the acquisition of nuclear materials. If such materials were acquired, it is well within the means of several countries and well-organized terrorist groups to construct a device. The remainder of the article focuses on existing U.S., Russian, and international programs for improving training of security personnel at nuclear facilities as a means of reducing the threat of nuclear terrorism/theft.

**Bunn, George and Fritz Steinhausler. “Guarding Nuclear Reactors and Material From Terrorists and Thieves,” Arms Control Today 31, no. 8 (Oct 2001): 8-12.**

While Bunn and Steinhausler are not actor-specific, they argue in general that there is a real and increasing risk of terrorists targeting civilian nuclear plants in order to create a

radiological disaster. Such an event, they say, is “frighteningly plausible.” Although they do not discuss the characteristics of groups who would conduct such attacks, they do point to the cases of the September 11, 2001, attacks and note that “if terrorists were willing to kill thousands of innocent people” by attacking the World Trade Center and Pentagon, “they would probably not have hesitated... to attack nuclear reactors in order to create clouds of radioactivity.” Clearly, the authors believe that groups motivated by the desire to inflict mass casualties would be difficult to deter or dissuade from carrying out a radiological attack. Moreover, they assess, a group that manages to obtain a sufficient amount of fissile material would probably be capable of constructing a crude nuclear device.

**Cameron, Gavin. “WMD Terrorism in the United States: The Threat and Possible Countermeasures,” Nonproliferation Review 7, no. 1 (Spring 2000): 162-179.**

Cameron examines the threat of WMD terrorism with the viewpoint that the threat of terrorist use of such weapons “has been overstated and misrepresented.” The threat cannot be dismissed entirely, he argues, but the more immediate threat to the United States stems from conventional terrorism. Cameron discusses the shifts in recent terrorism, including the rise of religious motivations and the desire for mass casualties, pointing that these trends are making terrorism less predictable. He argues that the United States is more likely to experience chemical, biological or radiological terror attacks, and that nuclear attacks are unlikely due to technical and material acquisition difficulties. In his view, this does not necessarily mean that such attacks will be mass casualty events, as there are technical difficulties with weaponization and dissemination that would reduce the likelihood of such attacks. His central point with regard to the threat of WMD terrorism is that it is “not presently obvious or immediate.” Moreover, the likelihood of mass-destructive terrorism using non-conventional weapons seems less plausible presently than the likelihood of another conventional attack of the variety seen at the World Trade Center or the Murrah Federal building.” He argues that countermeasures need to be geared toward more realistic threats.

**Cameron, Gavin. Nuclear Terrorism: A Threat Assessment for the 21<sup>st</sup> Century. New York: St. Martin’s, 1999.**

Although titled Nuclear Terrorism, Cameron’s book takes a relatively broad look at the psychological, organizational, and operational factors that influence terrorist groups. Generally, he relates these factors to “mass-destructive” terrorism, but most of his examples of terrorist groups and their behavior are of those that traditionally have perpetrated “conventional” terrorist acts. Cameron concludes that of the potential manifestations of “nuclear” terrorism, the use of radiological devices is much more likely to occur than actual nuclear detonation. He suggests that groups might use radiological devices to tap into the “nuclear” phobia of people without necessarily causing mass casualties, in order to gain greater attention for their cause. The increasing availability of fissile material due to problems in the former Soviet Union affects the likelihood of this occurring. Yet while the increased availability of material is a key factor, the author argues that motivations are the primary determinant as to whether or not a terrorist group

would choose to use a radiological or nuclear device. Cameron does not view “cost” as an overriding factor for many terrorist groups that would seek nuclear weapons, and observes that the concept of “martyrdom” should not be disregarded when considering the prospect for nuclear terrorism. The prospect of state-sponsorship and a tendency toward group conservatism are also important considerations. Terrorist groups, says the author, are generally conservative in their choice of weaponry, preferring tried-and-true methods over untested ones, although innovation does occur. States, furthermore, are unlikely to provide groups that are not completely under their control with nuclear weapons because of the possibility of responsibility being traced back to them and because they themselves might become vulnerable to blackmail. Of all terrorist groups, Cameron argues, religiously motivated ones are the most likely to resort to mass-destructive terrorism. For such groups, “violence is perceived to be part of an all-encompassing struggle between good and evil.” What is more, they lack the moderating influence of an external “audience” or “constituency.” The author states that there is a trend toward greater destructiveness in terror attacks, a trend that would be dangerous even without the increased likelihood of nuclear terrorism. Cameron also notes that chemical or biological weapons terrorism is more likely than a “nuclear-yield” terror attack. The book concludes by stating: “Mass-destructive terrorism is now the greatest non-traditional threat to international security...”

**Cameron, Gavin. “Multi-track Microproliferation: Lessons from Aum Shinrikyo and Al Qaida,” Studies in Conflict and Terrorism 22, no. 4 (Nov 1999): 277-309.**

Cameron compares the strategies that Aum Shinrikyo and al-Qaeda pursued in their attempts to acquire CBRN weapons. Chief differences between the two groups that influenced their CBRN acquisition strategies were in their respective motivations and organizations. Whereas al-Qaeda was (and is) motivated by a series of finite political objectives pursued for religious reasons (e.g., removal of Western troops from the Middle East, etc.), Aum was more motivated by the cult’s apocalyptic and millenarian leanings, as well as criminal and vengeance-related (e.g., against former cult members) reasons. Organizationally, the two groups were also very different, with Aum being a highly centralized and hierarchical group that in some ways mirrored the organization of the Japanese government and al-Qaeda being a “decentralized, diffuse, and flexible” as well as multinational and pan-Islamic organization. The chief similarity between the two groups was in the financial assets available to each group. Aum reportedly possessed assets totaling an estimated \$1 billion while al-Qaeda had access to Osama bin Laden’s personal fortune of an estimated \$100-400 million. These substantial assets allowed these groups a great deal of independent action on a global scale, unlike most terrorist groups, and had a direct influence on their CBRN acquisition strategies. With the monetary assets available to them, Cameron argues that both Aum and al-Qaeda decided to manufacture their own chemical and/or biological weapons, rather than attempting to acquire them from a secondary source. Cameron then outlines the strategies both groups followed in their attempts to acquire nuclear, chemical and biological weapons. In all three areas, both groups followed multinational, multi-track strategies, simultaneously seeking to acquire nuclear, chemical and biological weapons or materials by purchasing



them from secondary sources (mainly the former Soviet Union) and by setting up their own manufacturing processes. Cameron suggests that this was because both groups were intent on acquiring a weapon of mass destruction, regardless of whether it was nuclear, chemical, or biological. Both groups encountered significant difficulties in their attempts, although some of Aum's efforts in the chemical area were somewhat successful. Cameron concludes that it may be possible that future terrorists groups may pursue the same paths that Aum and al-Qaeda took by setting up their own manufacturing processes.

**Cameron, Gavin and Jason Pate. "Covert Biological Weapons Attacks Against Agricultural Targets: Assessing the Impact Against US Agriculture," Terrorism and Political Violence 13, no. 3 (Autumn 2001): 61-82.**

This article discusses the potential threat of agricultural terrorism to the United States, looking at briefly at how the threat has been perceived in the United States and at the programs initiated to deal with this threat. The authors then examine the definitions of agricultural bioterrorism, the difficulty of distinguishing between deliberate and natural outbreaks, and the diversity of the U.S. agricultural sector. The article also examines a small database of chemical and biological incidents directed at agricultural targets by sub-national groups and individuals, providing some insight on the agents selected as well as delivery systems chosen. Although the authors conclude that agricultural pathogens may be acquired more easily than human pathogens, the historical record indicates that attacks against agriculture have been limited and of low sophistication. In their view, this would seem to indicate that either the technical obstacles to agroterrorism are significant or "that there is little indication that sub-national groups are interested in this type of attack."

**Cameron, Gavin, Jason Pate, Diana McCauley, and Lindsay DeFazio. "1999 WMD Terrorism Chronology: Incidents Involving Sub-National Actors and Chemical, Biological, Radiological, and Nuclear Materials," Nonproliferation Review 7, no. 2 (Summer 2000): 157-174.**

This article, true to its title, is a chronology of 1999 WMD terrorist/hoax incidents preceded by a short method description and summary. Its primary usefulness is in providing a glimpse into the wide array of possible BW terrorist options. The article reviews 175 incidents, including actual uses of agents, attempted acquisition, possession, hoaxes or pranks, or "plot only." Almost one hundred of the incidents reviewed were hoaxes, pranks or threats, while only 39 involved the actual use of an agent. Of the incidents covered in the review, the vast majority involved biological and chemical weapons (95 and 82 incidents, respectively), while only 10 involved nuclear or radiological materials. The predominant biological agent of choice was anthrax, which featured in 83 cases (many of which were hoaxes), while the most common chemical agent was tear gas. In the nuclear area, there were two threats against nuclear facilities and one incident involving radiological materials. The authors/compiler conclude that the primary scene of BW attacks happens to be the United States, though their results may be skewed due to better reporting of events in the U.S. press. On the subject of

motivations in the incidents reviewed, the authors divided the incidents into two categories: politically/ideologically- and criminally-motivated. The division between the two categories was roughly equal. Based on this division of motivations, the authors conclude that “both criminally and ideologically motivated actors appeared equally interested in WMD materials.”

**Carter, Ashton, John Deutch, and Philip Zelikow. “Catastrophic Terrorism: Tackling the New Danger,” Foreign Affairs 77, no. 6 (Nov/Dec 1998): 80-94.**

This article is principally devoted to a recommended reorganization of the Intelligence and law enforcement communities to address the threat of CBRN terrorism and to specific approaches in the realms of consequence management, deterrence, and government-industry and international cooperation. (Written in late 1998, some of their suggestions have come to pass after September 11, 2001.) On the threat side, the authors clearly see CBRN terrorism, in an effort to achieve in mass casualties, as a real threat. They argue that U.S. adversaries are pushed toward “asymmetric” strategies by U.S. conventional military might. Because of this and “elaborate international networks” of criminals, terrorists, and arms dealers, “the danger of weapons of mass destruction being used against America and its allies is greater now than at any time since the Cuban missile crisis of 1962.”

**Carus, W. Seth. “Biological Warfare Threats in Perspective,” Critical Reviews in Microbiology 24, no. 3 (Sept 1998): 149-155.**

Carus briefly examines the issue of biological warfare, attempting to separate the credible facts of the issue from the hype with which the subject is often portrayed, especially in the popular media. He briefly outlines countries suspected of pursuing offensive BW programs, based on public reports from government agencies, and discusses technical assessments of those BW programs. Carus outlines three trends in BW proliferation: no evidence of growth in the number of countries pursuing BW programs, some success in constraining the pace of proliferation, and the disturbing trend of some BW proliferators seeking to enhance their BW capabilities. He argues that the threat of bioterrorism is difficult to assess, “simply because there has been so little of it.” He mentions that some 40 groups have shown interest in BW, but “it appears that any involvement with biological agents was neither serious nor sustained.” He acknowledges that the threat of BW use by non-state actors is legitimate but “there is no evidence to suggest that the threat is imminent or that any group has acquired and mastered the complex technology of biological warfare.”

**Casagrande, Rocco. “Biological Terrorism Targeted at Agriculture: The Threat to US National Security,” Nonproliferation Review 7, no. 3 (Fall-Winter 2000): 92-105.**

Casagrande discusses the threat of agricultural terrorism, the threat of which he argues is greatly underestimated by government officials, in spite of the potentially huge economic impact of a successful attack. He addresses four areas of the issue, the acquisition of

pathogens, the employment of pathogens, groups that may be motivated to resort to agroterrorism, and measures that can be taken to prevent and mitigate such attacks. He argues that obtaining plant and animal pathogens is a relatively easy task, with isolating pathogens from the environment and obtaining pathogens from state sponsors being the most likely sources. These avenues for acquisition require less specialized equipment and expertise, unlike human pathogens. As for employment, Casagrande suggests that this issue is not as difficult as it can be with human pathogens: “terrorists can chose among several plant or animal pathogens that need to come in contact with only the surface of the target host to cause infection.” Also, he points out that for many diseases, once the initial infection has been established they can be spread effectively through the wind. He does acknowledge that terrorists would need different procedures for targeting livestock (which has an industry-wide trend of consolidating animals on fewer numbers of larger farms) and crops (which are spread out over thousands of acres). As motivating factors, he cites the potential for large economic impact and the relatively less severe consequences for agroterrorism attacks (which do not necessarily cause any loss of human life). Casagrande suggests that four types of terrorists would consider resorting to agroterrorism, those with political, religious, or criminal goals, and those fanatically devoted to a single issue. In certain cases, the goals of those groups might be satisfied or furthered through the use of agroterrorism compared to other methods. He concludes by offering suggestion to prevent or mitigate the agroterrorism threat at several levels, including acquisition prevention, increased surveillance, and stiffer legal consequences.

**Chyba, Christopher F. “Biological Terrorism and Public Health,” Survival 43, no. 1 (Spring 2001): 93-106.**

This article focuses mainly on the public health response to the threat of bioterrorism, a “high-consequences but low-probability event” that must be viewed as serious, but without the attendant hype. Chyba argues that BW terror attacks could take many forms: “An attack could be overt and announced; it could be covert and insidious; or it could be used to cause economic damage and social panic by following covert releases with credible announcements and threats.” He notes that it may be difficult to tell the difference between natural and man-made outbreaks, and notes the low inspection rates for imported food, suggesting that this could be a vulnerable and likely mode of transmission for bioterrorism. He also underscores that important differences exist between BW and CW, differences that must be understood by responders, and suggests that responses to bioterrorism will differ greatly from responses to nuclear and chemical terrorism, probably much more closely resembling responses to “emerging infectious diseases.” Chyba suggests that too much “hype” has been injected into the debate on bioterrorism, resulting, perhaps, in misperceptions and an increase in the problem of BW hoaxes. The article does not discuss the variety of groups that might seek BW, their motivations, specific tactics and goals, or the agents that they might seek to employ.

**Claridge, David. “Exploding the Myths of Superterrorism,” Terrorism and Political Violence 11, no. 4 (Winter 1999): 133-148.**

The author examines the concept of “superterrorism” advanced in recent years by many observers and experts, taking issue with many of its underlying tenets. Proponents of superterrorism hold that terrorism today is fundamentally different from that of past decades. These “new terrorists” are “prepared to break new ground, to ruthlessly innovate in the name of their cause....These new players are generally assumed to be religiously motivated, with no regard for human life, and less of a perception of the traditional linkages between victim, target and audience than ‘traditional’ terrorist groups.” In the “superterrorist” view, the new terrorist are likely to escalate to the use of CBRN in their attacks, as suggested by the Aum Shinrikyo’s experience and the efforts by other terrorist groups or individuals to acquire CBRN weapons or materials. Claridge argues that much of the supposed threat of superterrorism is in fact exaggeration and misinterpretation of facts and events in the evolution of terrorism. As for the subject of CBRN terrorism, he similarly takes issue with the current presentation of the threat, referring to it as “scaremongering.” He argues that for most terrorist groups – including Islamic fundamentalists – there is no attraction to CBRN, and that it is not necessarily inevitable that terrorists will graduate to CBRN use. He also posits that “it is a mistake to assume that simply because there may be better access to materials or knowledge of the means to construct a weapons of mass destruction, that terrorists groups will be naturally attracted to doing so.” In the end, while Clardige does not completely rule out the threat of CBRN terrorism, he intimates that any potential threat will come from a specific subset of terrorist organizations: “cults and millenarian groups.”

**Cordesman, Anthony H. “Defending America: Asymmetric and Terrorist Attacks with Radiological and Nuclear Weapons.” Center for Strategic and International Studies, 23 Sept 2001.**

In discussing the prospects for radiological and nuclear terrorism, Cordesman does not address in-depth the motivations or characteristics of groups likely to use such weapons. Rather, discussion of motivations is limited primarily to the fact that there is a prestige factor that must be taken into account with nuclear devices – that their possession, threatened use, or outright use will elevate a group to an incredibly high standing and draw enormous attention to itself and its goals. The subject of nuclear and radiological terrorism is addressed primarily in terms of the unique attributes of these weapons and their effects – physical destruction and psychological, social, and economic impact. Noting that conventional terrorist attacks with high explosives continue to be more likely at present than CBRN attacks, Cordesman argues that the risk of terrorists employing such weapons is increasing. This includes the threat of nuclear and radiological attacks. Regarding radiological devices, the author notes that their effects are likely to be more similar to chemical weapons than nuclear or biological ones. “They are not catastrophic, and even the contamination of most critical facilities could be dealt with – at the cost of interruptions in service and efficiency.” As for what types of radiological weapons could be employed, Cordesman offers a laundry list of radioactive isotopes found in commercial, military, and medical fields. What is more, the prospect of sabotage at a

nuclear power plant is viewed as quite possible. With actual nuclear devices, Cordesman notes: “factors seem to limit the probability of a nuclear attack on the US. However, effective Homeland defense must deal with the risk of such attacks over at least a 25-year period, and the process of proliferation described earlier does not create high confidence that the US can count on future restraint.” One probable method of attack would be the detonation of a device aboard ship arriving into an American port. As for the factors limiting the risk of a nuclear attack at present, Cordesman cites the probable reluctance of a state to supply a terrorist organization with such a weapon and the difficulty in acquiring or manufacturing fissile material. However, he acknowledges that worldwide proliferation continues to be dynamic and poses greater and greater risks. Furthermore, the possible use of nuclear or particularly lethal biological weapons by other states could reduce the taboo against their use in the minds of terrorists or terror sponsors. “No one looking at the history of the 20<sup>th</sup> Century,” he argues, “has any reason to assume that sudden catastrophic events will not occur in the 21<sup>st</sup> Century. At the same time, no one can assume that because such events can occur, they will occur. There simply is no clear nexus of probabilities to act upon.”

**Cordesman, Anthony H. “Defending America: Asymmetric and Terrorist Attacks with Chemical Weapons.” Center for Strategic and International Studies, 24 Sept 2001.**

As with the other works in the “Defending America” series, Cordesman does not address the underlying motivations or characteristics of terrorist groups and instead focuses on the nature of the weapons – in this case, CW – and their unique attributes and effects. He sees that main threat from CW, unlike biological and nuclear weapons, in terms of low-level attacks that probably will not generate mass casualties. Chemical weapons, while a clear threat, will not necessarily kill more people than bombings. Cordesman argues, “it is easy to exaggerate the lethality of most chemical weapons,” and that it is “an illusion that the effects of chemical weapons are always radically worse or more repellent than the damage done with conventional weapons.” He is skeptical both of the effectiveness of CW agents in open environments and the available open-source literature on the subject. That being said, Cordesman recognizes that use of CW against the U.S. homeland or U.S. interests is an existing, and growing threat. In terms of tactics, CW poses the most likely risk of being used in a number of small-scale attacks, perpetrated either with weaponized agents or industrial chemicals, or by causing chemical accidents through sabotage. Such attacks could be conducted either simultaneously or sequentially as part of an extended terror campaign that is directed as much at causing panic as at killing. Contamination of a building via its ventilation system and industrial sabotage are seen as viable avenues of chemical attack. Cordesman notes the high casualties caused by the 1984 Bhopal accident in India as evidence of the gruesome potential of CW at a larger scale. Also mentioned is the case of Aum Shinrikyo. Cordesman notes that in Aum’s case, the selection of sarin gas for its attack on the Tokyo subway may have been motivated not because of sarin’s “superiority” over a different agent, but rather because “it was relatively easy to manufacture.” He argues that Aum’s failure to effectively deploy its sarin was due more to “Aum’s peculiar internal structure and lack of effective organization than the technical problems in manufacturing chemical weapons per se.”

**Cordesman, Anthony H. “Defending America: Asymmetric and Terrorist Attacks with Biological Weapons.” Center for Strategic and International Studies, 24 Sept 2001.**

As the title suggests, this part of the “Defending America” series covers the BW threat both in the context of adversary use by a state as well as a sub-national terrorist organization. Much of the book is devoted to charts and statistics detailing the specific characteristics of biological agents – infective doses, communicability, lethality, persistency, and other such attributes. In addition, the author briefly notes two specific state BW programs, Russia’s and Iraq’s. Cordesman does not delve deeply into the issues of motivations for terrorist use of BW, nor does he explore group dynamics and characteristics. He does suggest, however, that Aum Shinrikyo may not represent “anything other than a fluke,” arguing: “Few religious extremist movements turn to radical terrorism of the kind that involves the potential use of weapons of mass destruction.” However, Cordesman notes that the variety of biological attack methods is nearly inexhaustible. So many high-value targets are at risk and so many vulnerabilities exist that biodefense will remain problematic for the foreseeable future. Humans, obviously, are highly susceptible, but also at risk is U.S. agriculture. Cordesman notes that agro-terrorism involving BW has been overlooked until recently and is nearly unprotected against a serious attack. Such attacks could come in any number of forms, from contamination of food and water, to bombs and missiles, to aerosol clouds from sprayers, ground or aerial. To matters worse, attacks “could involve a *mix* of different biological weapons” that could confuse and disrupt identification of and response to an attack. There are “no rules preventing multiple attacks and/or the use of multiple biological weapons at the same time.” The author does agree that the technical barriers to non-state acquisition and use of BW are steadily decreasing as biotechnology and scientific expertise proliferates worldwide. “While the technical skills involved in making such agents are high, biological weapons can be relatively easy to manufacture if such skills are present, and such skills and the required equipment are becoming increasingly common.” However, he is dismissive of arguments made elsewhere that a basic introduction to biology and chemistry in college would be sufficient for a group to engage in bioterrorism. On this issue of large- versus small-scale attacks, Cordesman suggests that all levels are possible and that past experience offers little in terms of predicting the future. Furthermore, he argues that “the frequency of given types of attacks is not a meaningful criterion” for risk assessments. Though most incidents to date have been low-level attacks or hoaxes, “some attacks,” including those causing large casualties, “will almost certainly eventually succeed.”

**Crelinsten, Ronald D. “Terrorism and Counter-Terrorism in a Multi-Centric World: Challenges and Opportunities,” Terrorism and Political Violence 11, no. 4 (Winter 1999): 170-196.**

Crelinsten’s main objective is to assess terrorism and counter-terrorism in an increasingly multi-polar world, comparing past and present incidents to evaluate the underlying trend line. With regard to CBRN terrorism, he draws on a 1980 article by political

psychologist Jeanne Knutson that discussed the “implicit rules of the game” that constrained the actions of terrorists. In particular, he references Knutson’s “third dilemma,” which posited that “there is a maximal and a minimal degree of terror which may be employed.” That is to say, too low of a threat level will result in the terrorist group not being taken seriously, while the opposite will result in the terrorist group losing all room to maneuver and inevitably pressing the government into a forceful response. Using Knutson’s findings as a basis, Crelinsten posits that it is highly unlikely that a “terrorist group with a specific goal and a desire to impose specific demands would actually resort to such mass-destructive tactics at all.” Again referencing Knutson, he cites two exceptions to the rule that terrorists tend not to use mass destruction as a tactic. First is “the psychotic whose capacity to ‘plan, devise action, and further goals’ is greatly diminished,” and the second is “the irrationality built of the fanatical means-end component of the ‘soldier’ psychology – a psychology which pressures for victory with an accompanying avoidance of the psychological impact of general acts of destruction.” However, Crelinsten asserts that the growth of a multi-centric world has made the conditions necessary to produce these states – intense training and conditioning as well as societal isolation – much harder to maintain and potentially more noticeable to law enforcement and security agencies (thus providing early warning of potential threats). He then turns to a discussion of the frequent assertion that it is “irrational,” religiously motivated groups (such as Aum) that would be most likely to use CBRN weapons. Crelinsten points out that the case often used to support this view – Aum Shinrikyo – may be inaccurate in that the attack on the Tokyo subway was a the result of a mixture of religious and political goals: at the same time the Aum was attempting to bring about Armageddon, they were also trying to deter police investigations into their activities. Crelinsten’s conclusion regarding the ongoing discourse on CBRN terrorism is “that WMD terrorism cannot be predicted with certainty at this time and that much of the current discussion constitutes projection of fear based on a focus on capabilities and impact more than accurate prediction based on an understanding of motivations and goals.”

**Falkenrath, Richard A. “Confronting Nuclear, Biological and Chemical Terrorism,” Survival 40, no. 3 (Autumn 1998): 43-65.**

Falkenrath’s article provides a useful primer to the general issues of NBC terrorism (radiological is not discussed): weapon characteristics and accessibility, the likelihood and effects of an NBC attack, and the evolving government response. Though in some respects dated by the events of September 11, 2001, the piece generally remains applicable and useful. Falkenrath views NBC terrorism as a “low-probability, high-consequence threat” that is likely to increase in the future. In his eyes, this threat is “serious, often underestimated but not apocalyptic.” According to Falkenrath, religious group, particularly those from the Middle East (where “religious and political motives for terrorism clearly reinforce one another”) are the likeliest to seek and, if successful in acquisition, employ NBC. Like others, Falkenrath sees a growing trend toward mass-casualty terrorism disassociated from (secular) political objectives. Though he points out the conventional explosives continue to be used primarily and with severe effects, the potential for NBC terrorism will continue to expand. “Since the fundamental cause is

social progress, this expansion of latent non-state actor NBC potential is inexorable, and is not reversible by governments.” Falkenrath suggests that the future will buck the historical record of few NBC-related terror attacks. Of note, Falkenrath stresses that the proliferation of technology and know-how is almost inherently unstoppable and will lead to more terrorist groups becoming capable of conducting NBC attacks, although the number capable of mass-casualty NBC attacks will remain much smaller.

**Falkenrath, Richard A., Robert D. Newman, and Bradley A. Thayer. America’s Achilles’ Heel: Nuclear, Biological, and Chemical Terrorism and Covert Attack. Cambridge: MIT Press, 1998.**

With respect to CBRN threats from non-state actors, the authors contend that while use of such weapons has to date been limited, “a threat assessment based solely on extrapolation from the past would be misleading.” Strongly agreeing with the widely-held perception of a “new terrorism” focused on perpetrating increasingly lethal attacks, Falkenrath, Newman and Thayer contend that conventional explosives will continue to be the first choice for most terrorist organizations but that a small number of groups will seek and use CBRN weapons to achieve mass casualties. For them, the near-term likelihood is limited, but the spread of materials – but more particularly, know-how – will steadily increase the probability. In addition to groups and states that pour resources into developing such weapons, the “gradual increase in potential NBC capabilities is in part a byproduct of economic, educational, and technological progress.” What is more, since “the fundamental cause,” of the increasing availability and understanding of relevant technologies, “is social progress, this expansion of latent non-state actor NBC potential is inexorable, and is not reversible or even manageable by governments.” Clearly, the authors take a “not if, but when” approach to CBRN terrorism, though they argue that the numbers of such incidents likely will remain well below those of conventional attacks. Religiously motivated groups, most likely, but not exclusively, Islamic, are the most probable groups to commit CBRN terrorism. Christian Identity or far right-wing anti-government groups within the United States have also demonstrated interest in these weapons and pose a risk. Furthermore, the evolving terrorist tendency to organize in loose structures that form on an *ad hoc* basis “for specific purposes, sometimes to commit a single attack” may apply equally for likely CBRN terrorists as for “conventional” ones. Finally, the authors note that certain factors (beyond the capability to inflict large numbers of casualties) increase the probability of CBRN use in years to come. These include the prestige and symbolism associated with these weapons (a group could raise its status by gaining the “trappings of a state”) and the possibility of “copycat” attacks once the CBRN taboo is unalterably broken.

**Ford, James L. “Radiological Dispersal Devices: Assessing the Transnational Threat.” (Strategic Forum, no. 136) Institute for National Strategic Studies, National Defense University, Mar 1998.**

Ford examines the threat of radiological dispersal devices (RDDs), focusing primarily on the physical and psychological effects on targeted populations. He states that in spite of the growing attention focused on RDDs in the wake of the 1991 Gulf War, much of the



public information is incorrect, overstated and potentially misleading. He cites the general view of national laboratory scientists, who argue that constructing an effective RDD is more difficult than popularly assumed. Ford also argues that public perceptions of the physical effects of RDDs is equally misstated, given the difficulties in constructing a large, lethal RDD (which would most likely be beyond the means of many terrorist groups). Ford also highlights the tremendous psychological (and by extension, political) effects of an RDD, which could have more of an impact than the actual physical effects. He concludes by outlining the 1997 recommendations of the Defense Science Board regarding a response strategy for RDDs, including improved military training and preparedness and public education on the threat.

**Foxell, Joseph W. “Current Trends in Agroterrorism (Antilivestock, Anticrop, and Antisoil Bioagricultural Terrorism) and Their Potential Impact on Food Security,” Studies in Conflict and Terrorism 24, no. 2 (Apr 2001): 107-129.**

The author addresses the issue of agroterrorism, an area that he states “has been seriously underrated until recently.” Foxell argues that the shift in terrorism that has occurred in recent years increases the likelihood of terrorist attacks directed against U.S. agriculture and food supplies. He outlines several key factors that make this possible, including: relatively easy access to plant and animal pathogens, aided further by the spread of information on the Internet; the potential for significant impact, not in terms of the numbers of casualties, but rather economic dislocation and shortages; and, of principal importance, the vulnerability of the U.S. agricultural sector. Foxell then outlines several possible techniques that terrorists could use to strike the agricultural sector, including: contamination of crops or livestock; contamination of animal feed, supported by references to several U.S. cases of terrorist/criminal contamination using organic pesticides or herbicides; the use of adulterated seeds; and contamination of municipal water supplies, which he acknowledges would be “highly complex and difficult” requiring terrorists to “overcome significant obstacles.” With respect to motivations, Foxell argues that the rise in the threat of agroterrorism is part of the larger shift in the motivations of terrorists that other authors have noted, as well as the ongoing threat of state-sponsored terrorism – many states known to have biological warfare programs have reportedly researched and/or stockpiled agroterrorism agents. In his conclusion, he reiterates that the United States is presently unable to deal with such a threat since, “the case has yet to be made to the American public – and even to decision makers.”

**Foxell, Joseph W. “The Debate on the Potential for Mass-Casualty Terrorism: The Challenge to US Security,” Terrorism and Political Violence 11, no. 1 (Spring 1999): 94-109.**

The author examines the threat of terrorism to the United States, especially CBRN terrorism, and suggests that the threat is increasing. Foxell argues that previous factors that deterred terrorists from using CBRN – lack of technical skill or information, or the potential for a public backlash at committing such a “monumentally reprehensible act” – are weakening. In his view, the world is witnessing “a paradigm shift in terrorism in which total annihilation of opposing cultural and economic systems has become the

straight-out ambition of a new breed of terrorists. Thus, these quintessential terror weapons (i.e., mass-destructive agents used against civilian populations) suddenly offer not only an option but an expedient.” Combined with the growth in numbers of groups with no “audience” or constituency to appeal to and the “persistence of purely antithetical religious, cultural, social, political, and economic cleavages within global inter-communal societies,” the moral restraints against atrocity or CBRN terrorism no longer exist. He suggests that a “new wave” of terrorists, comprised “religious fanatics, ethnic-cleansing terrorist movements, mind-control and millenarian cults, ‘morality terrorists’, and ‘for-profit’ extortionists.” Groups such as these, the author concludes, would be the most likely to use CBRN, “as their idiosyncratic, self-encapsulated world views each qualify a climate in which the world’s judgment is unimportant.” Foxell argues that terrorists “will continue to seek more powerful weapons” to increase the shock value of their attacks, thus making it more likely that terrorist groups will use such weapons. The increasing availability of information, technology, and materials on the Internet and through gray and black markets, as well as the possibility of foreign assistance, foreshadows a growing threat from CBRN. The author posits particular attack scenarios, and concludes with a brief discussion of the measures taken by the United States government in response to this threat.

**Garrett, Laurie. “The Nightmare of Bioterrorism,” Foreign Affairs 80, no. 1 (Jan/Feb 2001): 76-89.**

This article provides a brief and general overview of the prospective bioterrorism threat, but does not offer insight into the potential severity or range of bioterrorist challenges. The main thrust of Garrett’s article is on the response side, from vaccine stockpiles to epidemiological surveillance to government anti-terrorism programs, with a conclusion that more must be done to avoid a “train crash.” This article does not address either the objectives or motivations of groups or the agents they would likely seek with respect to bioterrorism, let alone their desired effects or likely tactics.

**Gressang, Daniel S. “Audience and Message: Assessing Terrorist WMD Potential,” Terrorism and Political Violence 13, no. 3 (Autumn 2001): 83-106.**

This article attempts to construct a model for determining the likelihood of terrorist use of CBRN, one that moves beyond “simple considerations of access and capabilities.” The author instead suggests three factors that can be used to determine the likelihood of a terrorist group using CBRN weapons. The first factor is the core audience with whom the group seeks to communicate. Gressang posits that this can be a human audience (such as a population of constituency that the group operates in support of or on behalf of) or an ethereal audience (such as a religious deity), and that the later “may be prone to accept greater levels of violence and, perhaps, see considerable utility in the use of mass-casualty weapons.” The second factor is the content of the message directed on the core audience. Gressang argues that most terrorist groups seek social or political change, which is reflected in their message, while some groups preach a message of destruction (of an enemy, a people, a state, etc.). Because the desire to effect change requires that something survive the violence in order to be changed, Gressang argues that only those

groups with a message of destruction would likely use CBRN. Third is social interaction, or the level of the relationship of the group to the society in which it exists. This relationship can be reciprocal, with the group receiving some sort of response from the target audience, or it can be inapposite, with the group isolating itself and severing all ties with the society around it. Using these factors, Gressang hypothesizes that groups that are at the negative extremes of each spectrum would seriously consider the use of CBRN with the intent to cause mass casualties. The author acknowledges that his model is incomplete at this point, but suggests that it can be refined and can serve as a starting point for future discussions.

**Gurr, Nadine and Benjamin Cole. The New Face of Terrorism: Threats from Weapons of Mass Destruction. New York: I.B. Tauris & Co., 2000.**

The authors seem to take the position that the CBRN terrorist threat is real, but the debate on the subject of has often been over-sensationalized in the United States, especially when compared to only limited discussion in other countries. They argue that a precedent has been set with regard to acquisition and use of CBRN weapons by sub-national actors. However, they suggest that not every terrorist group will be motivated to opt for such weapons, rather it is likely that only a small number of groups will pursue CBRN acquisition or development. The reasons for this lie in the technical constraints and the motivations of terrorist groups. While the technical constraints that in the past limited terrorist acquisition of CBRN are weakening, it is not a given that every terrorist group will have the requisite technical skills or financial and time resources needed to acquire or develop and effectively deliver such weapons. What weapons terrorists do develop are most likely to vary considerably in quality, though tending more to lower levels. Also, the authors argue, the use of CBRN weapons may not fit in with the goals and motivations of some groups. Gurr and Cole appear to agree with the prevailing view that terrorist groups predominantly religious in character show the strongest motivation to acquire CBRN. With the exception of racial extremists, Gurr and Cole do not believe that secular terrorist groups would opt for CBRN weapons. The authors conclude that future CBRN terrorist events are a relatively low-likelihood given that many terrorist groups lack the expertise and resources required to acquire CBRN materials and weapons, as well as the fact that such weapons may not be the means to advance the goals of some terrorist groups. Nevertheless, “there is a small cadre of groups and individuals who could develop them, and would use them, and therefore the threat is real.”

**Hoffman, Bruce. “Change and Continuity in Terrorism,” Studies in Conflict and Terrorism 24, no. 5 (Sept 2001): 417-428.**

Hoffman argues that the expected graduation of terrorists from guns and bombs to CBRN weapons has not occurred and is an unlikely threat. He challenges the notion that the Aum Shinrikyo case represented a watershed event with regard to CBRN terrorism, stating that rather than showing the ease with which a terrorist group could acquire CBRN weapons the case showed “the immense technological difficulties faced by any non-state entity in attempting to weaponize and effectively disseminate chemical and

biological weapons.” He also criticizes U.S. planning for CBRN terrorism for focusing on worst-case scenarios instead of less serious incidents that may, in fact, be of more utility to terrorists. In conclusion, Hoffman argues that while there is a threat of CBRN terrorism, it is an unlikely one and will not shake the foundations of the nation, as some observers suggest.

**Hoffman, Bruce. Inside Terrorism. London: Victor Gollancz, 1998.**

Hoffman’s book takes a broad look at the overall phenomenon of terrorism and devotes only a portion to the issues of CBRN terrorism specifically. This section simply of the book provides an (incomplete) overview of recent CBRN terrorism incidents or threats. In this brief review, Hoffman notes that a trend has emerged in terrorism that appears to focus on the creation of mass casualties. This, coupled with evident religious motivations and the increasing availability of sophisticated conventional weaponry and CBRN technology and materials, bodes ill for the future. He concludes that religiously motivated groups appear to be the most likely to seek out and employ CBRN weaponry.

**Jacobs, Stanley S. “The Nuclear Threat as a Terrorist Option,” Terrorism and Political Violence 10, no. 4 (Winter 1998): 149-163.**

This article deals examines the concept of nuclear terrorism, with the goal of determining the likelihood of this form of terrorist act. The author examines possible avenues for terrorist acquisition of nuclear materials, including theft of an intact nuclear weapon, construction of a nuclear device, construction of a radiological weapon, and reactor sabotage or destruction. The author then attempts to explain why there have been no nuclear terrorist incidents. He attributes this to three reasons: (1) conventional means may accomplish terrorist objectives; (2) conventional means tend to be safer and have relatively predictable consequences; and (3) conventional means have “consequences and outcomes which have a ‘history,’ both in terms of damage and in terms of public opinion.” Nevertheless, Jacobs warns against complacency, suggesting that it is not a given that “this state of affairs will continue indefinitely” and that current national and transnational measures designed to combat this threat may not have contained the threat. He concludes by arguing that the first terrorist use of a nuclear or radiological device will set a dangerous precedent: “Terrorist groups will realize that it is technically possible to create a weapon which was formerly only available only to the world’s most advanced countries.”

**Kamp, Karl-Heinz, Joseph F. Pilat, Jessica Stern, and Richard A. Falkenrath. “WMD Terrorism: An Exchange,” Survival 40, no. 4 (Winter 1998-99): 168-183.**

This forum followed Richard Falkenrath’s Autumn 1998 article on CBRN terrorism. Kamp strongly discounts the possibility of nuclear terrorism, arguing, in a relative sense, that radiological (including attacks on nuclear plants), chemical, and biological terrorism was much more likely. He argues that a credible threat or use of nuclear weapons by terrorists is “far-fetched.” Contrary to Falkenrath, Kamp believes that terrorists still are

more interested in sending political signals than in wantonly causing mass casualties. While “those groups interested in mass-murder will almost certainly not use nuclear weapons,” CBW “are quite simple to acquire or produce.” Pilat is skeptical about CBRN terrorism generally. He argues that the risk of CBRN terrorism maybe rising, but is uncertain: “most terrorists have not yet demonstrated that they can fully exploit these new vulnerabilities, nor that they desire and are able to wield NBC instruments effectively.” He agrees that there is a trend toward more deadly terrorist attacks, but argues that this does not necessarily lead to NBC terrorism. Furthermore, Pilat is skeptical of the “caricature of religious terrorists as unconstrained mass killers...” Hoaxes, he argues, will be more likely than actual attacks. While “significant” NBC terrorism is possible, it is not probable; should it occur, “it would more likely be chemical or biological than nuclear, with chemical terrorism perhaps the most likely prospect of all.” Stern generally agrees with Falkenrath’s arguments, noting that groups likely to be successful in WMD attacks would have to be extremely organized and ruthless, and that *ad hoc* groups would fit this template better than traditional terrorist groups. Stern also warns of too much hype but clearly sees CBRN terrorism as a significant and growing threat.

**Lavoy, Peter R., Scott D. Sagan, and James J. Wirtz, eds. Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons. Ithaca: Cornell University Press, 2000.**

While the underlying thrust of the Lavoy, Sagan, and Wirtz edited volume is on state actors, Jessica’s Stern’s chapter on “Terrorist Motivations and Unconventional Weapons” addresses the broader issues of CBRN terrorism and the Aum Shinrikyo cult in particular. Stern does not discuss distinctions between specific CBW agents, but does draw a contrast between the relative ease of acquisition and prospective effectiveness of use (for terrorists) of nuclear, chemical, and biological weapons. Stern concludes that the threat of CBRN terrorism is real, centered on religiously-motivated (generally millenarian) terrorist groups. Though she considers state-sponsorship to be a distinct possibility, and deterrence in such cases uncertain, the primary danger remains religious terrorists who are “unconstrained” either by fear of government action or moral considerations. The author argues that high-tech CBRN attacks are likely to remain exceedingly rare, but that low-tech approaches are well within the capabilities of terrorist groups and that such attacks, particularly with chemical weapons in enclosed spaces, are likely to be the most common form of CBRN terrorism. In the article, Stern notes that such attacks might not always have mass-casualties as a primary goal. Economic effects through anti-crop and anti-livestock attacks, or by simply contaminating an area (with chemical or biological agents) would cause severe financial hardships for a victim country. Stern also considers that CBRN weapons might be desired, rather than conventional explosives, because of the unique psychological damage they might cause. In the nuclear realm, Stern notes that the financial costs of the South African nuclear program, for instance, may be within the range of funds available to some well-financed terrorist groups. Coupled with the increasing availability of materials and know-how due to problems in Russia, this fact makes terrorist acquisition of nuclear weapons not as far-fetched as some might think. In conclusion, Stern believes that indoor attacks or food contamination are the two most likely forms of CBRN terrorism – and thus not the often-envisaged “mass casualty”

scenarios characterized by outdoor releases of aerosolized agents. However, unlike others, Stern suggests, “there is likely to be a negative correlation between psychological motivation to commit extremely violent acts and technical prowess,” or conclusion that would seem to run contrary to the case of Aum Shinrikyo.

**Lederberg, Joshua, ed. Biological Weapons: Limiting the Threat. Cambridge: MIT Press, 1999.**

This book addresses the challenges of bioterrorism and biowarfare more generally. In addition to bioterrorism threats, the contributors discuss epidemiological issues, medical countermeasures, historical cases (such as the Sverdlovsk incident), and individual country assessments (Iraq). Specifically regarding bioterrorism, most of the contributors, particularly Seth Carus, Jonathan Tucker, and Jeffrey Simon, stress that bioterrorism is a real threat, but that cataclysmic incidents are much less likely than smaller-scale attacks. Clearly, as Carus points out, there are “sufficient indications of interest” in BW by terrorist groups and historical cases of small-scale use, and recent attempts at large scale attacks (Aum). However, BW seems to be attractive to only a segment of the terrorist world. In particular, religiously motivated groups with apocalyptic views, driven by a charismatic and/or paranoid leader or leadership apparently have been the most likely to seek out and use BW. Complicating this quest, say the authors, is the not-insubstantial technical proficiency required to produce extremely virulent agents. What is more, the difficulties involved with proper aerosolization and the creation of milled, powdered agents (rather than the less effective slurry) further hampers a group’s ability to cause mass casualties. And while the authors note that it is possible for these technical hurdles to be overcome through selective recruiting (as in Aum’s case), they are likely to be best overcome only through state sponsorship. While the contributors may not agree on this point, state sponsorship of bioterrorism would appear to be a difficult proposition due to the inherent risk of discovery and retribution against the sponsoring state. In summary, the contributors generally agree the BW threat is real, today, but the threat of massive casualties (hundreds of thousands) is significantly less than that of “small- to medium-scale” attacks. Current technical barriers to developing advanced BW, assuming indigenous, unassisted production, remain greater than what media reports often suggest and the difficulty in achieving efficient release is also substantial. As Tucker points out, there appears to be a widespread tendency to confuse state BW capabilities with those of terror groups. In this light, fanatical religious groups with state backers or substantial human and financial resources appear to be the biggest risk at this point, and the possible agents to be used could include everything from incapacitating agents to highly lethal ones. What groups would chose to employ would probably be affected by very individual factors, such as what may be available and what group members’ skills are, as well as the targets for attack.

**Leitenberg, Milton. “An Assessment of the Biological Weapons Threat to the United States,” The Journal of Homeland Security, (January 2001): Online.**

Leitenberg examines the threat of biological weapons to the United States, with the threat of bioterrorism as a subset of that examination. He briefly examines state offensive

biological weapons programs and the potential for state-sponsored bioterrorism, the historical record of biological weapons use by non-state actors, and the Aum Shinrikyo case. On the subject of the threat of bioterrorism in the United States, Leitenberg takes a critical view of how the threat has been portrayed by the media and government officials. In his view, “terrorist use of a BW agent is best characterized as an event of extremely low probability, which might...produce high mortality” (emphasis in original). The discussion of the threat has been characterized by gross exaggerations, extravagant rhetoric, and a lack of sound statistics and threat assessments. With regards to the technical requirements for terrorist production and use of biological agents, Leitenberg suggests that the process may not be as easy as some commentators suggest, citing as support the difficulties faced by and resources devoted to state offensive BW programs. In conclusion, Leitenberg states that the threat from proliferation of BW is greater than the threat of their use by non-state actors, and argues that the current national discussion on the latter “is characterized by gross exaggeration, hype, and abstract vulnerability assessments instead of valid threat analysis.”

**Leitenberg, Milton. “Aum Shinrikyo’s Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation,” Terrorism and Political Violence 11, no. 4 (Winter 1999): 149-158.**

The case of Aum Shinrikyo is considered by many to be a watershed event in the field of bioterrorism. The Japanese cult is known to have worked with several biological agents and attempted to use some of these in attacks, with botulinum toxin and anthrax receiving much of the media attention. Leitenberg challenges these reports, stating that much of the information that has come out regarding Aum’s biological activities has been misstated or exaggerated. He argues that, “despite semi-professional capabilities, substantial time and effort, *all* of [Aum’s BW] efforts *failed*.” Each of the major allegations regarding Aum’s BW activities – botulinum toxin, anthrax, Q Fever, Ebola, and genetic engineering – are examined in turn, and Leitenberg argues that many of the so-called facts were in reality “grossly inaccurate.” He states that there are two lessons that can be drawn from the Aum case that pertain to terrorist ability to produce biological weapons. The first is that “the Aum utterly and totally failed, after no small expenditure of time and money.” The second concerns the fact that, in all the time since information about Aum’s efforts became known, few have questioned or challenged the misinformation that has been circulating, and that the conclusions that should have been drawn from this incident “have been precisely the opposite of the one that has been purveyed.”

**Maerli, Morten Bremer. “Relearning the ABCs: Terrorists and ‘Weapons of Mass Destruction,’” Nonproliferation Review 7, no. 2 (Summer 2000): 108-119.**

Maerli presents the argument that the threat of atomic (i.e. nuclear and radiological) terrorism is actually greater than that posed by chemical and biological terrorism. Consequently, the current U.S. focus on the latter is misplaced, and ignores the risk of atomic terrorism. Maerli argues that it would be easier for terrorist to design and construct a crude nuclear weapon than it would be for them to produce biological agents. He bases this argument on the availability of information concerning bomb design and

planning, the potential for nuclear theft or diversion from the former Soviet Union, and the “reliability” of crude nuclear weapons compared to crude biological weapons. As to why terrorists would choose crude nuclear weapons, Maerli suggests that they would provide the “showy attacks that produce a great deal of noise” that most terrorists reportedly favor, a need that could not necessarily be satisfied by biological agents. In addition, terrorists would be able to capitalize on the psychological impact stemming from the fear of radiation among the general population. Maerli does not suggest that the threats of chemical or biological terrorism should be dismissed entirely, and argues that it is probable that firearms and conventional explosives will remain the terrorist staples. When terrorists choose to use CBRN weapons, however, Maerli argues that the unreliability and unpredictability of biological weapons makes them an unlikely threat. “Today, due to their inherent features and demonstration effects, crude nuclear weapons may prove to be a more reliable, tempting and prestigious option than crude biological weapons for aspiring large-scale terrorists.”

**Manwaring, Max G., ed. Deterrence in the 21<sup>st</sup> Century. Portland: Frank Cass, 2001.**

In this edited volume, the chapter by Daniel S. Gressang relates to CBRN terrorism. More than simply a discussion of new terrorist threats, including CBRN, per se, in this chapter Gressang addresses what he argues to be a mistaken approach to the understanding of terrorism generally. In his view, rather than simply examining the structures of terrorist organizations and their rhetoric, terrorism should be viewed as a “process” with various inputs and outputs related to “influencing” a group’s “audience.” On the subject of CBRN terrorism specifically, the author primarily describes the perceptions prevalent in today’s literature, mainly the view that a trend toward increased casualties is underway and that religiously motivated groups pose the gravest risk. In this chapter the author does not address the relative likelihood of chemical, biological, radiological, or nuclear terrorism nor does he discuss specific agents or tactics. At no time does Gressang strongly announce his own view, though he does suggest that “terrorism has changed, but not for the better.” “We see fewer instances of terrorism in total, but seem to see more terrorist ‘spectaculars’ with mass casualties than in the past.” Thus, the author appears to agree that the trend toward mass casualties is real and threatening. However, he appears to be more skeptical regarding religion as a primary cause for this. Rather, the author suggests that the real risk of mass-casualty terrorism, with or without CBRN, comes from groups that have evolved beyond or rejected common “social mores” and are “non-adaptive” to basic social constraints – of which the author believes there has been only one real case (Aum Shinrikyo). Similarly, groups that form on an *ad hoc* basis may also be dangerous, primarily due to their secrecy and difficulty to track and penetrate.

**Marlo, Francis H. “WMD Terrorism and US Intelligence Collection,” Terrorism and Political Violence 11, no. 3 (Autumn 1999): 53-71.**

This article focuses mainly on the benefits and shortcoming of the various intelligence disciplines (INTs) as they apply to efforts to detect CBRN terrorism. The author cites



some of the reasoning behind the growing threat of CBRN terrorism, including the spread of information and technologies (“...the technical and scientific hurdles to creating WMD simply no longer exist.”) and the supposed change in the nature of terrorist groups in recent years. Marlo then outlines a five stage process that he believes terrorists would follow in order to launch a CBRN attack: “(1) decision to obtain and use WMD; (2) acquisition of expertise, production equipment, and material; (3) production of weapon; (4) testing; and (5) planning and conducting an attack.” Using this process as the baseline, the author then looks at several intelligence disciplines (signals intelligence, imagery intelligence, other technical intelligence, human intelligence (official and unofficial covers), and open source intelligence) and how effective they might be in detecting terrorist WMD aspirations in the various stages of the process.

**Mayer, Jean-François. “Cults, Violence and Religious Terrorism: An International Perspective,” Studies in Conflict and Terrorism 24, no. 5 (Sept 2001): 361-376.**

Although this article does not address the issue of CBRN terrorism specifically, it is of potential utility in the context of a frequent refrain: that particular religious groups may be among the most likely to turn to CBRN. The author examines violence in religious and cult groups, identifying different types, directed against internal or external threats. He then examines past cases, outlining lessons learned about religious violence, including the assertion that while apocalyptic thinking in a group “creates an atmosphere conducive to the legitimization of violence and – in some cases – terrorist actions,” such views in-and-of themselves are not an indicator of violence and may be less important than other internal or external factors. The author also argues that low levels of violence by such groups usually precede more serious acts, a factor that may be useful to intelligence and law enforcement agencies. A chart depicting the author’s various factors (based on his case studies) suggests that groups which lean toward terrorist attacks tend to see the world as black and white, contain conspiracy theories in their basic ideology, and perceive real or imaginary assaults against the group.

**McCloud, Kimberly and Matthew Osborne. “WMD Terrorism and Usama bin Laden,” Center for Nonproliferation Studies, 20 Nov 2001, Online.**

This brief report provides a summary of the February 2001 testimony given by alleged former al-Qaeda member Jamal Ahmad al-Fadl at the trial of the persons involved in the August 1998 bombings of U.S. embassies in Kenya and Tanzania. During the course of his testimony, al-Fadl discussed his role in an alleged attempt by Osama bin Laden to obtain uranium in Sudan in late-1993 or early-1994. According to al-Fadl, he participated in the early meetings to arrange the sale of a quantity of uranium to al-Qaeda for \$1.5 million. However, after his initial role, al-Fadl was cut out of the negotiation process and was unaware as to whether or not the transaction was actually completed. The report also includes a brief chronology of significant events that highlight bin Laden’s interest in acquiring nuclear weapons, including several attempt by bin Laden aides to acquire nuclear materials or complete weapons.

**Moodie, Michael, Jonathan Ban, Catherine Manzi, and Michael J. Powers.**  
**“Bioterrorism in the United States: Threat, Preparedness, and Response.”**  
**Chemical and Biological Arms Control Institute, 2001.**

The Chemical and Biological Arms Control Institute presents four key findings regarding the threat of biological terrorism. First, “a key relationship exists between the degree of risk and the level of casualties desired in an attack.” Second, there is still cause for concern, even though the likelihood of catastrophic biological terrorism remains small. This is due to uncertainty regarding the point at which the response system becomes overburdened, and the psychological impact and social disruption that could result from an attack. Third, among terrorist groups, those with connections to state governments and those “outside the traditional scope of governmental scrutiny,” such as religious groups, right-wing groups, millennial groups, deserve particular attention. This is because state-sponsored groups would have access to the resources, skills, and materials to carry catastrophic attacks, while the latter groups tend to lie outside the spectrum of government surveillance. While they are most likely incapable of executing large-scale attacks, smaller-scale events would be within their purview. Fourth, the “environment of uncertainty surrounding bioterrorism will remain.”

**Mueller, John and Karl Mueller.** “The Methodology of Mass Destruction:  
Assessing Threats in the New World Order,” Journal of Strategic Studies **23,**  
**no. 1 (Mar 2000): 163-187.**

This article addresses the definition of “weapons of mass destruction,” in particular challenging the classification of chemical and biological weapons in this category. The authors then propose the inclusion of economic sanctions as a weapon of mass destruction, citing the case of UN sanction against Iraq as evidence. The authors contend that economic sanctions against Iraq have killed more people than all the combined uses of chemical, biological, and nuclear weapons and ballistic missiles. The authors make several brief mentions of terrorism, holding that it is mainly a law enforcement issue that can be handled (but not necessarily eradicated) by judicious and determined police work. With regard to CBRN terrorism, the authors allow that some terrorist groups and rogue states may “in the future” overcome the difficulties associated with the development and effective use of biological weapons, but state that the historical record for the use of such weapons is not encouraging for such groups. The authors seem to agree with the conclusion of David Rapoport that “terrorists and rogue groups tend to be more effective when they use familiar, conventional weapons because decisions about their use are easier and because accidents are less likely to happen in conditions of great uncertainty.”

**Parachini, John V.** “Comparing Motives and Outcomes of Mass Casualty  
Terrorism Involving Conventional and Unconventional Weapons,” Studies in  
Conflict and Terrorism **24, no.5 (Sept 2001): 389-406.**

Parachini compares six cases of mass-casualty terrorism involving the use of conventional (high explosives) and unconventional (CBRN) weapons as a means of testing the assertion that the new wave of terrorists will be drawn to CBRN weapons as

part of their desire for large numbers of casualties. Cases examined include: the Rajneeshee use of salmonella, the use of chlorine gas by the Liberation Tigers of Tamil Eelam (LTTE), Aum Shinrikyo's sarin gas attack, the World Trade Center bombing, the Oklahoma City bombing, and the U.S. embassies bombings in Africa. The first three used unconventional weapons, while the latter three used conventional high explosives. Parachini compares the motives and outcomes in each case, arguing that the cases of mass casualty terrorism using high explosives were examples of symbolic violence, while the instances of CBRN usage were more of an operational or instrumental nature in which religious ideology played little role (for example, the LTTE used the chlorine gas as a first round in a renewed military offensive, and Aum launched the sarin attack to head off a police investigation of the cult). With regard to outcomes, Parachini concludes that the cases involving the use of unconventional weapons, "the attacks proved much more difficult and much less effective than the perpetrators imagined," while the attacks with conventional high explosives "were spectacularly successful." The use of conventional high explosives resulted in consistently higher casualties than did the use of unconventional weapons. Parachini concludes that the cases examined call into question the notion that the new terrorists will inevitably graduate to WMD use, and calls for a assessing a better balance between threats from conventional and unconventional terrorism.

**Parachini, John V. "Non-Proliferation Policy and the War on Terrorism," Arms Control Today 31, no. 8 (Oct 2001): 13-15.**

Parachini discounts the likelihood of a mass-casualty CBRN terrorist attack, but concludes that the "consequences... could be so catastrophic that serious government attention is warranted." With respect to possible types of CBRN weapons, the author suggests that a full nuclear device would be the least likely to fall into terrorist hands or be developed by them. He further suggests that the 1995 Aum Shinrikyo sarin attack may be an exception rather than a rule. Terrorists, he states, "appear more likely to use what they can readily acquire," rather than take the difficult route to a CBRN capability. Nevertheless, because of the threat, Parachini states that arms control organizations and agreements, and the U.S. government, must adapt to these new threats and strengthen nonproliferation norms.

**Pate, Jason, Gary Ackerman, and Kimberly McCloud. "2000 WMD Terrorism Chronology: Incidents Involving Sub-National Actors and Chemical, Biological, Radiological, or Nuclear Materials," Center for Nonproliferation Studies, 13 Aug 2001, Online.**

This report attempts to summarize events related to sub-national actors and CBRN materials during the calendar year of 2000, and is a follow-on to a similar chronology for 1999. The report breaks the events down by region, type of event (actual use, threat of use, acquisition, hoax, etc.), general type of agent used (chemical, biological, nuclear, radiological, unknown), specific agents used or possessed, and motivations (political/ideological, criminal). The authors of the report also attempted to determine trends with regards to actors' motivations. The authors reported that the number of

politically or ideologically motivated incidents, compared to criminally motivated (which were predominant in 1999), had begun to increase. Of particular note, the authors also suggest that while the data “reflect a trend towards the increased use of CBRN materials by sub-national actors,” the current threat from CBRN terrorism will be “characterized primarily by ‘low-end’ agents, delivery systems, and incidents.”

**Perry, William J. “Preparing for the Next Attack,” Foreign Affairs 80, no. 6 (Nov/Dec 2001): 31-45.**

Early in his article the author notes that, “Nuclear or biological weapons in the hands of terrorists or rogue states constitute the greatest single danger to American security – indeed, to world security – and a threat that is becoming increasingly less remote.” For Perry, the trafficking of fissile or radioactive material and the unique attributes of biological weapons would make them attractive to terrorists. He also notes that any attack is likely to be covert rather than overt. While Perry stresses the need to improve intelligence, consequence management, and nonproliferation efforts, he does not delve in any detail into the phenomenon of terrorism or the characteristics of group, their motivations, or likely methods of attack.

**Propst, Rod. “New Terrorists, New Attack Means? Categorizing Terrorist Challenges for the Early 21<sup>st</sup> Century,” Journal of Homeland Security (Mar 2002, online).**

Propst examines the question of whether or not the early 21<sup>st</sup> Century is seeing the emergence of a new breed of terrorists, as suggested by some observers. He examines both the “old” and “new” terrorists, developing general definitions of both. The “old terrorists,” according to his typology, tended to be social-revolutionary leftists or nationalist-separatist groups, more politically motivated. The “new terrorist” is likely to be one of five types of terrorists, Propst argues: “a religious, extremist terrorist; a transnational terrorist; a ‘new religions’ terrorist; a right-wing terrorist; an isolated, rogue terrorist from a shared ‘community of belief.’” In general, Propst sees the new terrorists as more religiously than politically motivated, less constrained in their use of violence, and more likely to strike for shock value rather than symbolic or didactic reasons. With regard to terrorist attack means, Propst argues that “a *continuation of terrorism by ‘conventional’ attack means is more imminent and most likely*” (emphasis in original). He bases this argument on an examination of the strengths and weaknesses of conventional and CBRN attack means, a historical review of terrorist attacks, and views from “professionals” (media, academia, public figures, and terrorists). He concludes that there is a “definable” new terrorist emerging, and argues that attack means – conventional versus CBRN – is not an either-or proposition. These new terrorists, in his view, are more likely to use CBRN than old terrorists, but the immediacy of that threat is uncertain and it is more likely that the new terrorists will continue to use conventional means but in a much less constrained manner than their predecessors.

**Roberts, Brad, ed. Hype or Reality: The “New Terrorism” and Mass Casualty Attacks. Alexandria, VA: The Chemical and Biological Arms Control Institute, 2000.**

Based on several short chapters by specialists, Hype or Reality concludes that current assessments of CBRN terrorism are made of nearly equal parts of “hype” and “reality.” While future terrorist incidents involving CBRN weapons are not inevitable, the possibility of such will increase over time. “Catastrophic” CBRN attacks, it is argued, are far less likely than low-level attacks that would produce casualties only equal to or less than conventional bomb attacks. Bruce Hoffman and Joseph Pilat, in particular, argue that large-scale attacks depicted in movies and in some scenarios are unrealistic given the technical proficiency of most groups and the historical record. Of contemporary terrorist groups, however, those most attracted to CBRN will probably be millenarian or religiously-based terrorist groups. According to James Campbell, groups that combine religious fanaticism with “closed-cell” networks detached from the larger society and under the control of a charismatic, megalomaniacal leader pose the largest risk. Shoko Asahara and his Aum Shinrikyo cult fit this profile, yet, as Milton Leitenberg points out, they failed in their quest for an effective CBRN capability. Most authors remain skeptical of the potential for peacetime sponsorship of terrorist organizations with CBRN weapons, but Brad Roberts notes that in time of crisis or war a rogue state could employ such weapons in terrorist-style attacks against the United States – attacks that could either be denied or conducted in such a way as to suggest an alternate perpetrator. Of the types of weapons considered, nuclear weapons are viewed as the least likely to be used in terrorist attack, while some authors contend the chemical weapons will be the most likely. Should they be used, Paul de Armond suggests that a transition away from conventional explosives and toward CBRN probably will be incremental as groups imitate the tools and tactics of others. Finally, almost all authors stress that low-tech, low-level attacks, which they hold most probable, nonetheless deserve “appropriate” governmental concern. As Campbell argues: “Low-tech should not be taken as synonymous with amateurism: if the attack results in tens or hundreds of casualties and a tremendous amount of collateral disruption, does it really matter how “technically” competent the terrorist was?”

**Roberts, Brad, ed. Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses. Chemical and Biological Arms Control Institute, 1997.**

This edited volume examines the threat of chemical and biological terrorism in the wake of Aum Shinrikyo’s March 1995 sarin gas attack. Joseph Pilat argues that the prospects for CBRN terrorism have been exaggerated in the wake of the Tokyo incident. In his view, it remains a low-likelihood, high consequence event – probable but not inevitable. The low likelihood of terrorist groups combining the necessary technical skills, materials and motivations reduce the probability of CBW terrorism. If such terrorism were to occur, it is most likely to be chemical with bio second and nuclear a distant third. James Adams focuses on proliferation and “porous borders,” examining programs in Iran and Libya as well as the proliferation threat from the former Soviet BW program. This presentation leads to his argument on CBW terrorism: “terrorist groups are more likely to acquire their

WMD from friendly nations than they are to develop them.” Brain Jenkins argues that three sets of factors influence the likelihood of CBW terrorism: technical factors, policy factors (actions governments take to limit vulnerabilities), and political factors (terrorist motivations). Jenkins focuses on political factors, examining how terrorist motivations acted to limit the level of violence in the past and whether or not there has been a change in terrorist motivations that would make CBW terrorism more likely than in the past. Jenkins argues that CBW terrorism is probable, but will not become the “truck bomb” of the future, and also suggests that the technical constraints of obtaining, manufacturing, storing, and effectively disseminating large amounts of CBW will act as a damper. If CBW terrorism does occur, he argues, it will most likely take the form of threatened rather than actual use, will most likely involve chemical rather than biological weapons, will be a small-scale attack, and will more likely involve an agent readily available in an industrialized society (such as cyanide or rat poison) than “more exotic” chemical or biological weapons. Karl Lowe considers bioterrorism to be probable, but argues that there are many technical constraints that would limit its use by some sets of terrorists. The production and effective dissemination of biological weapons is not as easy as conventional wisdom suggests, and terrorist groups are not likely to possess the required mix of technical, scientific, and military skills to carry out an effective BW attack. The group most likely to do so, Lowe argues, is one that has state sponsorship and access to that state’s BW efforts.

Ron Purver examines several of the purported reasons and constraints that were alleged to have restrained past CBW use. While acknowledging that some of these constraints are still active, he argues that several key constraints – including lack of a precedent, disinclination toward mass casualties, and a reluctance to experiment with new weapons – have eroded. For this reason, Purver concludes that the threat of CBW terrorism is real and growing. Anthony Fainberg states that the threat of CBW terrorism is real, and argues that the United States can (as of the time of the writing in 1997) expect such an attack within a few years. He sees the CBW terrorism threat, based on a review of recent events, as coming from right-wing, neo-fascist groups and religious cults. He argues that international terrorist will remain more inclined to use traditional terrorist methods. Jonathan Tucker sees CBW terrorism as a low-probability, high-consequence event that nevertheless requires government action. He sees groups with extremist ideologies or religious fanaticism as those most likely to turn to CBW weapons, and mentions Russia as a possible source for terrorists seeking such weapons. Frank Young agrees that the threat is real, but argues that the ability to predict CBW terrorism is low, and that with the spread of information on the Internet and other resources terrorists will be less reliant on state sponsorship. Young also makes the important point that “different weapons of mass destruction pose different problems.” In the conclusion, Brad Roberts examines whether or not 1995 was a watershed year with respect to the alleged taboo against the use of chemical or biological weapons. He argues that, in making this judgment, one must take into account differences between traditional terrorists (who might consider such a level of violence too risky or counterproductive) and new terrorists (who would not be as bound by such constraints). He concludes by stating that the CBW terrorist threat is real and will continue, but the likelihood of attacks might remain low (as

indicated by the relative lack of use of such weapons in the past). Nevertheless, the United States government should take steps to deal with evident vulnerabilities that exist.

**Rosenau, William. “Aum Shinrikyo’s Biological Weapons Program: Why Did it Fail?” Studies in Conflict and Terrorism 24, no. 4 (July 2001): 289-310.**

Rosenau examines Aum Shinrikyo’s extensive efforts to acquire and use biological weapons with the aim of identifying the reasons for the cult’s failures and to see if those reasons can be applied on a more general level. Rosenau briefly outlines Aum’s program, which was the most sophisticated ever established by a non-state entity, and covers the numerous attempts by cult members to deliver botulinum toxin and anthrax against a variety of targets. He then presents three arguments for why the cult’s program failed to achieve its ends: “1. the challenge of acquiring sufficiently lethal strains of botulinum toxin and anthrax bacilli; 2. the difficulty in preparing those agents for dissemination, and dispersing them; [and] 3. the limitations imposed on Aum’s biological weapons effort by the nature of the organization itself.” From these arguments, Rosenau hypothesizes that the difficulties in carrying out a bioterrorism attack may be greater than portrayed. He acknowledges that terrorists and other individuals have acquired biological agents, but argues that certain hurdles – such as dissemination – remain. He also argues that the Aum case can provide a profile of sorts for law enforcement and intelligence personnel to identify such groups. Yet he also suggests that the groups seen as most likely to consider using biological agents, “[c]ult-like terrorist organizations...may be least suited to meet the complex demands associated with a bioweapon program.”

**“Roundtable on the Implications of the September 11, 2001, Terrorist Attacks for Nonproliferation and Arms Control,” Nonproliferation Review 8, no. 3 (Fall-Winter 2001): 11-26.**

This article presents the discussions that took place during a roundtable following the September 11, 2001 attacks. The discussion covered a wide range of topics, including CBRN terrorism. According to Jonathan Tucker, the threat has been downplayed in the past because relatively few terrorist groups were interested in causing mass casualties and because of the technical hurdles that would have to be overcome. In the wake of the September 11 attacks, he believes that this perception has changed, and he cites two factors for that change. First, “the group that attacked on September 11 seemed to differ in its characteristics and methodology from other groups that we have seen in the past.” He points out the dedication and fanaticism of the attackers, as well as their methodical preparation and mastery of tradecraft. In his view, the latter suggests “they were receiving assistance from some state intelligence agency that has a good understanding of how the United States collects its information and can give them good advice on counterintelligence.” Second is “the possibility that the bin Laden group network may have, if not state sponsorship, then association with a state that can provide technical assistance.” He suggests that such assistance could allow a group such as bin Laden’s to overcome the technical hurdles that have been perceived as limiting the threat of CBRN terrorism. Tucker also points out “a clear congruence between a number of states that support terrorism and states that have WMD programs.”

**Roy, Olivier, Bruce Hoffman, Reuven Paz, Steve Simon, and Daniel Benjamin.**  
**“America and the New Terrorism: An Exchange,” Survival 42, no. 2**  
**(Summer 2000): 165-172.**

This article is a discussion on Steve Simon and Daniel Benjamin’s earlier article about the “New Terrorism.” Hoffman perceives that a new trend toward religiously motivated terrorism has fewer constraints on the use of violence, but does not believe that this trend will necessarily result in a large-scale shift toward use of CBRN weapons. Rather, “the gun and the bomb continue to be the terrorists’ main weapons of choice.” CBRN terrorism in the future, Hoffman believes, “may be far less certain” than Simon and Benjamin suggest. Hoffman points to Aum’s difficulties to argue that even well-developed organizations will face serious hurdles in the acquisition and employment of CBRN weapons; religious zeal and a desire to inflict mass casualties will not by themselves overcome the technical challenges of these weapons. Additionally, Hoffman suggests that fears of CBRN terrorism may be exaggerated given the resilience of the U.S. political and social fabric. Reuven Paz takes a different line, and focuses more on the motivational and ideological side of the new terrorism, discussing the roots of Muslim fanaticism and their relationship to increasingly deadly terrorism. Fundamentally, Paz sees the perception of “a state of constant war” against the infidel West as a key motivator for many Muslims that could be used as justification for the “new” terrorism. In their response, Simon and Benjamin find fault with Hoffman’s analysis, citing his apparently “heavy reliance on arguments based on historical inference at a time of dramatic change in the ideology of important terrorist groups and rapid technological advances.” They argue that CBRN terrorism cannot be dismissed just because of a lack of previous or contemporary attacks. The technical barriers are weakening, they suggest, and that means the U.S. must be ready to face this likely future threat. Furthermore, declarations such as bin Laden’s 1998 fatwa advocating the killing of Americans demonstrate a clear intent to cause mass casualties without restraint – for which CBRN weapons are well suited.

**Schmid, Alex P. “Terrorism and the Use of Weapons of Mass Destruction: From Where The Risk?” Terrorism and Political Violence 11, no. 4 (Winter 1999): 106-132.**

Schmid examines the threat of CBRN terrorism, attempts to determine whether the threat is growing, and suggests a possible course of action in response. The author argues that trying to assess the risk of CBRN terrorism is a difficult task, walking a fine line “between fear and paranoia on one hand and prudence and disbelief on the other.” But he points out that, apart from the efforts of Aum Shinrikyo in this area, “uses of nuclear, biological and chemical weapons by terrorists are still rare, with hoaxes outnumbering actual deployments by far.” Schmid seems to focus on the threat of nuclear terrorism over chemical and biological terrorism, discussing the proliferation/leakage threat in Russia following the collapse of the Soviet Union and citing some instances of terrorist and rogue state interest in Russian nuclear materials. More generally, he discusses inhibitors and facilitators of CBRN terrorism, concluding both that a number of traditional inhibiting factors are weakening even as the number of factors that might



facilitate this brand of terrorism appears to be increasing. (Yet he also cautions that “one must be aware that the current threat exaggeration is apparently being fuelled by an industrial-advisory complex in this area.”) The author raises what he concludes to be a principal cause for CBRN terrorism, desperation: “Desperate people and their leaders might indeed do desperate things. Desperation is certainly an issue towards which we must look above all else when trying to assess from where the threat of use of weapons of mass destruction is most likely to come.” From this premise, the author proposes a method for dealing with such threats: “Continuous constructive dialogue and pragmatic compromise with actual and potential political opponents at home and abroad.”

**Siegrist, David W. “The Threat of Biological Attack: Why Concern Now?” Emerging Infectious Diseases 5, no. 4 (Jul-Aug 1999): 505-508.**

Siegrist argues that three elements are necessary for a biological attack to occur: a vulnerable target, a group with the capability to launch an attack, and the intent to launch such an attack. He states that in spite of recent steps to improved preparedness, the United States is still vulnerable to a biological attack. The capability of terrorists to launch attacks is increasing as well, due to the widespread dissemination of biological and technical information. Technical challenges to terrorists with regard to acquisition, production, weaponization, and dissemination remain significant, but are not insurmountable. Siegrist briefly discusses the apparent shift in terrorist intentions as seen in post-modern terrorism, chiefly the desire for mass casualties and the rise of ethnic or religious motivations that could promote such desires. Biological weapons offer such terrorists the potential to inflict mass casualties, and the fear that would result from even a small attack would also make such weapons desirable. Siegrist concludes by arguing that two of the three elements in his opening – vulnerability and capability – are already in place, but can be managed through preparedness and other readiness measures. The third, intentions, is a much harder area to manage and thus reinforces the need to reduce vulnerability.

**Simon, Steven and Daniel Benjamin. “America and the New Terrorism,” Survival 42, no. 1 (Spring 2000): 59-75.**

This article considers the emergence of a “new form” of terrorism. According to Steve Simon and Daniel Benjamin, this new form is religiously motivated, more technologically proficient, seeks to cause mass casualties, and desires to obtain CBRN weapons. What is more, the authors seem to suggest that the current U.S. government view – that this prospective type of terrorism is here to stay – is accurate. The article emphasizes Middle Eastern terrorism generally, and state sponsorship in particular. Although a number of states and groups are discussed, the details of their organizations generally are not, although there is some discussion of the organizational setup of al-Qaeda’s loose network of groups. The authors suggest that state sponsorship is not a prerequisite for group acquisition of CBRN weapons; rather, the unique and destructive attributes of these weapons “will impel terrorists to overcome technical, organisational, and logistical obstacles to WMD use.” On the subject of CBW terrorism, specific agents and the unique properties of each category are not discussed. According to the authors,

these “new” religious terrorists “want a lot of people watching *and* a lot of people dead.” Therefore, use of CBRN weapons would “seem to be a natural next step for them.” What is more, crackdowns on such groups are likely to harden the resolve of remaining group members and perhaps even encourage recruitment and the perpetration of further, more destructive attacks.

**Simon, Steven and Daniel Benjamin. “The Terror,” Survival 43, no. 4 (Winter 2001-02): 5-18.**

This article focuses primarily on the al-Qaeda network and the reconsideration of perspectives on terrorism that have resulted from the September 11, 2001 attacks. Most relevant to the issue of CBRN terrorism is its brief discussion of al-Qaeda and WMD. The authors argue that al-Qaeda both sought chemical and radiological weapons – in line with bin Laden’s fatwa – and that one should not doubt that “if bin Laden had had a nuclear weapon he would have used it.” Simon and Benjamin believe that despite the technical obstacles inherent in CBRN terrorism, many groups, like al-Qaeda, must not be underestimated. They argue that “as a purely statistical inference, acquisition and use of WMD by a terrorist group is a near certainty.”

**Smithson, Amy E. and Leslie-Anne Levy. “Ataxia: The Chemical and Biological Threat and the US Response.” (Report no. 35) Henry L. Stimson Center, Oct 2000.**

Smithson and Levy’s monograph covers both the threat of chemical and biological terrorism from sub-national groups and the numerous programs that the U.S. government has undertaken to increase preparedness for that threat. The supposedly changing nature of terrorism in the 1990s is briefly examined, as is the growth of religion as a terrorist motivation. The possible motivations for terrorist use of CBW are examined briefly, including the desire to inflict mass casualties and the increased ability to remain anonymous. Religious/apocalyptic groups, extreme single-issue groups, right wing militias, and psychopaths are mentioned as groups or individuals most likely to use CBW. The authors then present an assessment of the technical feasibility of terrorist acquisition, production and delivery of CBW. The view of the authors is that the equipment for production of CBW is in many cases readily available, and that the technical hurdles are substantial but not necessarily insurmountable. Nevertheless, the authors point out in the concluding chapter that “despite assertions to the contrary to the contrary, acquiring and using chemical and biological weapons in a manner that causes mass casualties is not shake-n’-bake easy, which may partly explain why no terrorists have followed in Aum’s footsteps more than five years after the cult’s subway attacks.” Chapter 3 provides an in-depth overview of and the failures and limited successes of those efforts. The main point of this chapter is to attempt to clear up the many misconceptions that exist regarding Aum Shinrikyo’s efforts in these areas. Smithson and Levy also provide a detailed chronology of Aum Shinrikyo’s chemical and biological weapons efforts as well as the 1995 Tokyo subway attack and accompanying response efforts, with an eye toward learning lessons for U.S. responders and domestic preparedness efforts.

**Tucker, David. "What is New about the New Terrorism and How Dangerous is It?" Terrorism and Political Violence 13, no. 3 (Autumn 2001): 1-14.**

This article examines the theory that recent terrorism represents a "new" form of terrorism, different from that of earlier decades. Tucker compares the "new" and "old" terrorisms, focusing on the networks that supposedly characterize the new variant. The author concludes that there is in fact little that is new about the "new" terrorism. A brief mention is made of the prospect for CBRN terrorism: "It is possible that terrorists could get a hold of a CBRN weapon and devastate a city. Without minimizing the damage this would do, especially the possible political damage, we must conclude that this is not the greatest threat posed by terrorism."

**Tucker, Jonathan B., ed. Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons. Cambridge: MIT Press, 2000.**

An examination of twelve case studies of real CBW terrorist incidents and hoaxes from 1946 to 1998, Toxic Terror seeks to address the issue of likely future CBW terror threats by drawing upon the historical record. Cases examined in the volume include the Rajneeshees and R.I.S.E. (Seth Carus), Aum Shinrikyo (David Kaplan), and the Minnesota Patriots Council (Jonathan Tucker and Jason Pate). Particularly useful are the three case studies of "successful" CBW employment – the post-Holocaust Jewish group DIN, and the religious cults of the Rajneeshees and Aum Shinrikyo – although the abject failure or only limited success captured in the other nine cases is itself telling as to the traditional difficulties encountered by terrorists in acquiring, developing, producing, weaponizing, and effectively disseminating CBRN agents. Throughout the case studies, the motivations of individual groups are assessed, as are their technical proficiencies in the chemical and biological fields as well as their attempts to obtain necessary equipment, agents, and know-how. Tucker concludes that while CBW must not be ignored as a threat, "only a tiny minority of terrorists will seek to inflict indiscriminate casualties" with CBW and "few if any of them will succeed." (Although the editor also acknowledges the potential limitations on generalizability presented by just a dozen cases. In the introduction, the editor acknowledges that "others may object that the number of case studies in this volume constitutes far from comprehensive universe or even a statistically representative sample...") Groups that will make the attempt, however, tend to have certain traits that could be used to alert U.S. intelligence and law enforcement authorities to possible danger. These include: apocalyptic ideology, innovation in weapons and tactics, paranoia and grandiosity, charismatic leadership, defensive aggression, and other characteristics. Also, Tucker warns that "mass destruction" may not always be the goal of groups willing to employ CBW – specifically targeted, discriminate attacks could be a form of future CBW terrorism. Based on the case studies, the contributors generally conclude that CBW terrorism should not be ruled out as too hard to accomplish due to technological factors or scientific proficiency. Relevant information is widely available on the Internet and in open literature. Furthermore, improvements in and the increasing role of biotechnology in today's society increases the avenues for terrorist groups, or even skilled individuals, to acquire CBW. More than anything, it may be the difficulty in developing effective delivery systems that

is most limiting for well-funded and organized groups seeking to kill large number of people with CBW. As a result, says Tucker, “crude delivery methods are likely to remain the most common forms of CBW terrorism.” Yet all things considered, in the years ahead, terrorists will have greater opportunity to seek out, acquire, and employ those CBW agents which best suit their “needs.”

**Tucker, Jonathan B. “Historical Trends Related to Bioterrorism: An Empirical Analysis,” Emerging Infectious Diseases 5, no. 4 (Jul-Aug 1999): 498-504.**

In this article, Tucker presents a summary of an open-source database of publicly-known cases where international and domestic criminals or terrorists attempted to acquire or use CBRN materials during the period 1900 through 1999. The article presents some of the major findings relating to the motivations of such groups to attempt to acquire or use these types of weapons. He suggests four major motivations: “1) to promote nationalist or separatist objectives; 2) to retaliate or take revenge for a real or perceived injury; 3) to protest government policies; and 4) to defend animal rights.” He also argues that the motives of terrorists have shifted over time, with nationalist/separatist objectives and retaliation/revenge overtaking protesting against government policies as the predominant motivations. However, despite evident motivations, Tucker argues that most groups lack the requisite technical skill and resources to effectively create and use biological weapons. For this reason, and based on the historical record, Tucker suggests that future incidents of bioterrorism “will probably involve hoaxes and relatively small-scale attacks, such as food contamination.” Tucker concludes the article with a brief examination of seven selected bioterrorist incidents, summarizing the motivations, ideology, targets, agents, delivery means, and outcome of the incidents. These cases are covered in greater depth in the monograph Toxic Terror, also edited by Tucker.

**Tucker, Jonathan B. and Robert P. Kadlec. “Infectious Disease and National Security,” Strategic Review 29, no. 2 (Spring 2001): 12-20.**

This article primarily examines the emerging threat of biological agents and infectious diseases from the perspective of medical and government response efforts. The authors argue that both naturally-occurring and human-created diseases pose serious challenges to the national security of the United States, and suggest that bioterrorism is a lesser-included case. In their view, a small terrorist group probably will lack the necessary know-how, equipment, and agents to unleash a large-scale BW attack, except with the assistance of a state sponsor. Should one occur, however, a bioterrorist attack may go undetected for some time, particularly if it were a naturally-occurring pathogen and the vector was food-borne or via water contamination, rather than aerosol dissemination. Finally, the authors argue that much more needs to be done to strengthen government response efforts in the context of emerging infectious diseases.

**Vegar, Jose. "Terrorism's New Breed," Bulletin of the Atomic Scientists 54, no. 2 (Mar/Apr 1998): 50-55.**

Vegar's article is a compilation of interviews with a range of terrorism and CBRN specialists: Brian Jenkins, Bruce Hoffman, Ron Purver, Brad Roberts, Amy Smithson, Kyle Olson, and others. In this composite view, it is arguable that a "new breed" of terrorists has evolved that may be more willing to use CBRN weapons. Unlike previous, "traditional," terrorist groups these "new" terrorists are generally fundamentalist or extremist organizations, with religious or racist ideologies and lack a "constituency" among the broader public. According to the author, "these religious terrorists operate in a political vacuum. They do not seek converts or the favor of a sponsor nation." As a result, according to Bruce Hoffman, they "see themselves not as components of a system worth preserving, but as outsiders and therefore seek vast changes in the existing order." In order to achieve this change, terrorists are likely to become more willing to consider using CBRN weapons to carry out mass-casualty attacks. Those interviewed generally agree that because this new breed of terrorists is not responsible to a specific state, a particular external constituency, or constrained by widely accepted moral concerns about CBRN weaponry, they pose a unique and serious threat. However, they differ on whether or not groups will be able to acquire CBRN weapons, a likelihood that varies for chemical, nuclear, biological and radiological weapon acquisition. Similarly, those interviewed are divided over the prospect of sponsorship of CBRN terror by states. Ron Purver believes this is more likely, particularly if a state was seeking a way to deter or blackmail an adversary and lacked other means to do so. Jenkins is more skeptical because of the unpredictability and unreliability of independent terrorist groups. Says Jenkins, "One of the trends in state terrorism is that when they carry out big operations, they use their own people. For them, terrorists are not guided missiles." This article does not discuss specific agents that may be employed or specific weapons, though it does note security problems in the former Soviet Union.

**Watanabe, Manabu. "Religion and Violence in Japan Today: A Chronological and Doctrinal Analysis of Aum Shinrikyo," Terrorism and Political Violence 10, no. 4 (Winter 1998): 80-100.**

This article provides a summary of the various religious views that shaped the doctrine of the Aum Shinrikyo sect. The author also provides a chronological development of the group as it evolved towards an apocalyptic cult bent on mass murder of innocent civilians. The article provides an interesting insight and excursion into the group, but it does not seem to draw any general conclusions or present any general characteristics that can be useful in identifying those terrorist groups most likely to use CBRN weapons. Indeed, the author (writing in late 1998) states that it is possibly still too early to reach such conclusions about Aum.

**Zanders, Jean Pascal. "Assessing the Risk of Chemical and Biological Weapons Proliferation to Terrorists," Nonproliferation Review 6, no. 4 (Fall 1999): 17-34.**

Zanders examines the process of proliferation to terrorists and other sub-state actors, adapting the assimilation model to this situation. The assimilation models as Zanders applies it holds that there is a dual decision making track, with military political consideration and political consideration on the other. The interactions of these two tracks, combined with material, political and societal constraints, influence how the group will proceed in its attempts to develop CBW. Through out the article, he references the case of Aum Shinrikyo as an example of this process in action. Zanders concludes that terrorist acquisition of CBW (he makes a distinction between CB materials and CB weapons, the latter referring specifically to warfare agents developed for military purposes) is feasible, but that there are significant obstacles along the path that reduce the likelihood of such proliferation. He questions whether or not a future group will be able to replicate Aum's accomplishments, given that few terrorist organizations will have access to the resource that Aum possessed. Also, he argues that the technical hurdles to developing CBW make it unlikely that military-grade agents will constitute the main threat, suggesting that some groups may instead to focus on first generation chemical weapons that would be easier to manufacture or on lesser-known toxic compounds.