Chapter 2

Grounding the Threat in Reality

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Although the topic of terrorist acquisition and use of mass destruction weapons is fairly new to those not involved in national and international security affairs, the subject has long percolated among those who study terrorist behavior, weapons proliferation, and national and international security matters.[1] In 1989, terrorist scholar Robert H. Kupperman gave a foreboding assessment:

> Speculation about whether terrorist groups would ever dare to use extreme weaponry such as nuclear explosives or biological, chemical or radiological agents that can inflict mass destruction is often dismissed as sensationalist. It is argued that the lack of availability of nuclear materials and the universal horror surrounding the use of chemical or biological weapons would deter their use. The unfortunate reality is that the materials for such weapons have proliferated widely, that the expertise required is actually within their grasp, and that horror is the name of the terrorism game.[2]

The topic broke out of scholarly and closed government circles after Aum Shinrikyo's 1995 poison gas attack in Tokyo, when rapt media coverage ensured that policy makers and the public could hardly avoid it. Much of what was said had doomsday overtones. For example, terrorist expert Walter Laqueur stated that some terrorists "almost certainly will" use mass destruction weapons, and a Harvard study accentuated the country's vulnerability to unconventional terrorism attack, concluding that several thousand could perish in a chemical terrorist attack and tens of thousands could meet a similar fate if terrorists used even "unsophisticated" biological weapons.[3]

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[1] For instance, at a 1979 conference Robert Kupperman characterized the prospect of terrorists using chemical, biological, or nuclear weapons as a "high consequence, low probability event." Kupperman's presentation, entitled "Government Response to Mass-Destruction Threats by Terrorists," can be found in *On Terrorism and Combating Terrorism*, ed. Ariel Merari (Frederick, Md.: University Publications of America, 1985), 157. See also, Brian Jenkins, ed. *International Conference on Terrorism and Low-Level Conflict* (Santa Monica, Calif.: RAND, 1982); Jeffrey D. Simon, *Terrorists and the Potential Use of Biological Weapons,* Report R-3771-AFMIC (Santa Monica, Calif.: RAND, December 1989); Yonah Alexander, Phil Baum, and Raphael Danziger, "Terrorism: Future Threats and Responses," *Terrorism* 7, no. 4 (1985): 367–410; Bernard Stewart, ed. "State-Sponsored Terrorism: The Threat and Possible Countermeasures," *Terrorism* 8, no. 3 (1986): 253–313; Jeremiah Denton, "International Terrorism: The Nuclear Dimension," *Terrorism* 9, no.2 (1987): 113–124; D.V. Segre and J.H. Adler, "The Ecology of Terrorism," *Survival* XV, no. 4 (July/August 1973): 178–83; Paul Leventhal, Yonah Alexander, eds. *Preventing Nuclear Terrorism: Report of the International Task Force on Prevention of Nuclear Terrorism* (Lexington, Mass.: Lexington Books, 1987); Louis René Beres, *Terrorism and Global Security: The Nuclear Threat* (Boulder, Colo.: Westview Press, 1987).

[2] Robert Kupperman and Jeff Kamen, *Final Warning: Averting Disaster in the New Age of Terrorism* (New York: Doubleday, 1989), 92.

[3] Walter Laqueur, "Postmodern Terrorism," *Foreign Affairs* 75, no. 5 (September/October 1996): 34; Richard A. Falkenrath, Robert D. Newman, and Bradley A. Thayer, *America's Achilles' Heel: Nuclear, Biological, and Chemical Terrorism and Covert Attack* (Cambridge, Mass.: MIT Press, 1998), 5, 138–47.

Several factors inflamed the tenor of the US debate. The problem of terrorism truly began to crystallize for Americans when prominent buildings in New York City and Oklahoma City were bombed, sinking in even further with bombings of US targets in Saudi Arabia and Africa. The backdrop for these events was the revelation of frightening details about the extent of the bioweapons programs in Iraq and the former Soviet Union.[4] Adding to the tinder, international terrorist Osama bin Laden threatened to acquire mass destruction weapons specifically to use against Americans.[5] Other, more political factors, also fanned the debate, such as the vested interests of defense contractors and government offices in larger budgets,[6] not to mention the desire of elected officials to be perceived as "doing something" about the problem.

Remarkably few decried the state of the debate, particularly how melodrama and speculation dominated the discussion, influencing the resulting policies. A few scholars tried to frame the problem. Among them, Jonathan B. Tucker and Amy Sands observed: "[T]he Clinton administration, as well as many outside analysts, developed their threat assessments and response strategies in an empirical vacuum. Lacking solid data, they fell back on worst-case scenarios."[7] In certain instances, analysts and journalists got so

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[4] The terrorist attacks against US targets will be discussed later in the chapter. For information about Iraq's biological weapons program, which was tenaciously obtained by the United Nations Special Commission, see United Nations, *Report of the Executive Chairman on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9(b)(i) of Resolution 687 (1991)*, S/1998/920 (New York: United Nations, 6 October 1998); United Nations, *Report of the Executive Chairman on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9(b)(i) of Resolution 687 (1991)*, S/1998/332 (New York: United Nations, 16 April 1998); United Nations, *Report of the Executive Chairman on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9(b)(i) of Resolution 687 (1991)*, S/1997/774 (New York: United Nations, 6 October 1997); United Nations, *Report of the Executive Chairman on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9(b)(i) of Resolution 687 (1991)*, S/1997/301 (New York: United Nations, 11 April 1997); United Nations, *Report of the Secretary-General on the Status of the Implementation of the Special Commission's Plan For the Ongoing Monitoring and Verification of Iraq's Compliance With Relevant Parts of Section C of Security Council Resolution 687 (1991)*, S/1995/864 (New York: United Nations, 11 October 1995). The unprecedented scale of the USSR's germ weapons program was publicly unmasked by Ken Alibek with Stephen Handelman, *Biohazard* (New York: Random House, 1998).

[5] "We don't consider it a crime if we tried to have nuclear, chemical, biological weapons. Our holy land is occupied by Israeli and American forces. We have the right to defend ourselves and to liberate our holy land." Bin Laden also stated that any and all Americans are legitimate targets for terrorist attacks "because [they are] helping the American war machine against the Muslim nation." Osama bin Laden's Qaida organization is believed to be behind the 1998 bombings of two US embassies in Africa, as well as other terrorist plots. As quoted in Jamil Ismail, "I Am Not Afraid of Death," *Newsweek*, 11 January 1999, 37. See also, "Islamic Jihad Threatens Chemical Warfare" (19 April 1999). Internet: http://arabia.com/content/news/4_99/jihad19.shtml/. Downloaded 26 April 1999.

[6] According to Ehud Sprinzak, "The threat of superterrorism is likely to make a few defense contractors very rich, and a larger number of specialists famous and moderately rich." Sprinzak continues that various government offices are likely "to benefit from counterterrorism obsession and mega-budgets." Ehud Sprinzak, "On Not Overstating the Problem," in *Hype or Reality? The "New Terrorism" and Mass Casualty Attacks*, ed. Brad Roberts (Alexandria, Va.: Chemical and Biological Arms Control Institute, 2000), 10.

[7] Jonathan B. Tucker and Amy Sands, "An Unlikely Threat," *Bulletin of the Atomic Scientists* 44, no. 4 (July/August 1999): 47. On trying to remind the media and policy makers that the real biological threat is at the state level, see W. Seth Carus, "Biowarfare Threats in Perspective," Press Briefing, Biological Weapons and US Security (Washington, DC: Brookings Institution, 27 April 1998). Internet: http://www.brook.edu/fp/events/19980427_Carus.htm. Also, "Scholars and policy makers have indulged in extreme thinking about [nuclear, chemical, and biological] terrorism. Until recently, the threat was entirely ignored; now, it is attracting too much frenzied attention and too little careful analysis, inspired by a widespread conviction that

carried away that they attributed to terrorist groups unconventional weapons capabilities that didn't exist and acts that never took place.[8] With no lack of horrifying chemical and biological terrorism scenarios, what has been scarce in the debate is context. This chapter therefore endeavors to provide some context for a problem that otherwise appears boundless.

The pages that follow delve into the many variables of unconventional terrorism, beginning with a review of the history of terrorism and its newer trends. Then, the discussion moves to the reasons that would push terrorists toward or away from taking the chemical or biological path, including which types of terrorists would be most likely to consider these types of weapons. Next, the technical feasibility of terrorists being able to acquire and disseminate chemical and biological agents in a manner that would cause mass casualties is examined at length. Summaries of actual case histories are sprinkled throughout the chapter to provide insight into what terrorists have and have not been able to accomplish in that regard. A major case study in that category, Aum Shinrikyo, is presented separately in chapter 3. This chapter concludes with a survey of the databases that track terrorist activity pertaining to chemical and biological substances.

THE CHANGING NATURE OF TERRORISM

Terrorism is a blight that stretches back to Biblical times. While their fellow citizens quickly perceived terrorists as a frightening lot, scholars have only gradually come to reasonably understand terrorists' motives, tools, and tactics. Throughout history, terrorists have engaged in acts of violence to advance political causes, such as overthrowing a homegrown despot, ousting an invading government, displacing the political party in power, or trying to raise public consciousness about any number of social issues.[9] Beginning in the 1960s, terrorism rose to new prominence when outfits such as the Baader-Meinhof group, the Red Brigades, and the Black Panthers waged well-planned, complex campaigns of violence, consisting of literally thousands of individual terrorist acts. The tools that terrorists plied most frequently were guns, letter bombs, conventional explosives, kidnapping, and airline hijacking, all with the objective

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the Aum Shinrikyo case proves that [unconventional] attacks resulting in hundreds of thousands of deaths are all but inevitable. Both attitudes are dangerous. The first has led to the underfunding of programmes designed to prevent or mitigate the threat. The second is leading to overreaction and hasty decisions, some of which will harm international security." Jessica Stern, "Apocalypse Never, but the Threat Is Real," *Survival* 40, no. 4 (Winter 1998–99): 178. See also, International Institute for Strategic Studies, "The New Face of Terrorism?" in *Strategic Survey 1998/99* (Oxford: Oxford University Press, May 1999), 61–70.

[8] For two such cases, see John V. Parachini, "The Weather Underground (1970)" and "The World Trade Center Bombers (1993)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathan B. Tucker (Cambridge, Mass.: MIT Press, 2000), 43–54, 185–206.

[9] The US State Department defines terrorism in a manner consistent with a brief explanation of what is now often ascribed to "traditional" terrorist groups. According to 22 US C Section 2656f(d), terrorism is: "premeditated, politically motivated violence perpetrated against noncombatant targets by sub-national groups or clandestine agents, usually intended to influence an audience." US Department of State, Office of the Coordinator for Counterterrorism, *Patterns of Global Terrorism 1998* (Washington, DC: US Department of State, April 1999), vi.

of garnering sufficient publicity to further their aims. Throughout these crusades, terrorists were usually mindful not to kill in excess, for their success or lack thereof depended "on popular support, or at least support by a certain segment of society."[10]

In addition to their political motives, another defining characteristic of terrorism was that its perpetrators could have been much more violent than they were. Instead, they observed some moral boundaries, inflicting enough violence to jar the public, but not so much as to repulse society or cause authorities to put all other public safety concerns aside to prosecute them. "If murder and mayhem were their primary objective, terrorists would certainly have killed many more people. The record of terrorism indicates that most acts of terrorism involve only symbolic violence."[11] As Brian Jenkins' well-known saying goes, "[t]errorists want a lot of people *watching*, not a lot of people *dead*."[12] The need not to alienate potential supporters aside, terrorists could rationalize their use of violence because they perceived themselves as fighters for a just cause, holding the moral high ground over the targets of their acts.[13] Terrorists, it seemed, observed certain ethical boundaries. In the words of one student of terrorist behavior, "[t]errorism has traditionally used relatively unsophisticated weapons in a limited number of ways to inflict relatively little damage."[14] Another authority on terrorism offers the reminder that terrorism "is not about killing. It is a form of psychological warfare in which the killing of a small number of people convinces the rest of us that we are next in line."[15] Even though terrorists did some shocking things, scholars could ascribe an element of

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[10] For a succinct overview of the roots of terrorism, see Walter Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction* (Oxford: Oxford University Press, 1999), 8–48. Quoted passage from page 43. According to Laqueur's count, the Red Brigades alone committed approximately 14,000 terrorist acts within a ten year timespan. A more in-depth treatment of the topic can be found in Walter Reich, ed. *Origins of Terrorism: Psychologies, Ideologies, Theologies, States of Mind* (Washington, DC: Woodrow Wilson Center Press, 1998). According to one count, only twelve times in the twentieth century did terrorists cause more than one hundred casualties with a single event or related series of attacks. In 1993, for instance, ten bombings in less than three hours in Bombay caused 235 casualties. Richard A. Falkenrath, "Confronting Biological and Chemical Terrorism," *Survival* 40, no. 3 (Autumn 1998): 52.

[11] When the terrorist record is examined in its totality, it reveals that 20 percent of the incidents have involved fatalities and in most of those instances the death toll was one or two. Brian M. Jenkins, "Understanding the Link Between Motives and Methods" in *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses*, ed. Brad Roberts (Arlington, Va.: The Chemical and Biological Arms Control Institute, 1997), 45.

[12] Brian M. Jenkins, "Will Terrorists Go Nuclear?" *Orbis* 29, no. 3 (Autumn 1985): 511.

[13] Jenkins, "Understanding the Link," 46.

[14] Philip B. Heymann, *Terrorism and America: A Commonsense Strategy for a Democratic Society* (Cambridge, Mass.: MIT Press, 1998), 8. In contrast to many alarmist recommendations in the face of increasing terrorist violence, Heymann pleads for "calm common sense," including recognition that the terrorist threat cannot be eliminated but that it can be managed. Among other steps, Heymann suggests improvement of intelligence gathering, continuing refusal to bargain with terrorists, and retaliation against state sponsors of terrorism.

[15] Ehud Sprinzak, "The Great Superterrorism Scare," *Foreign Policy* (Fall 1998): 122.

predictability to terrorism. For these reasons, many experts argued that terrorists would not cross the violence threshold to weapons of mass destruction.[16]

As the 1990s began, the conventional wisdom that terrorists employed violence in discriminate and proportionate ways was called into question. A new, more ruthless breed of terrorists began to leave their mark on the world. The first sharp departure from their predecessors was that many terrorists that became active in this time period did not necessarily espouse political causes or aim to take power. The second distinguishing feature was that a fair share of 1990s terrorists were intent on harming a maximum number of people.[17] Instead of kidnapping an ambassador, the 1990s-vintage terrorists took a whole embassy hostage.[18] Rather than hijack an aircraft, terrorists plotted to blow planes out of the sky.[19] Terrorists upped the ante from pipe bombs to truck bombs capable of blowing up entire buildings, peppering the decade with headlines about the World Trade Center in 1993, the Murrah Federal Building in Oklahoma City in 1995, the Khobar Towers barracks in Saudi Arabia in 1997, and US embassies in Kenya and Tanzania in 1998.[20]

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[16] See, for example, Robert K. Mullen, "Mass Destruction and Terrorism," *Journal of International Affairs* 32, no. 1 (Spring/Summer 1978): 63–89; Roberta Wohlstetter, "Terror on a Grand Scale," *Survival* 18, no. 3 (1978): 98–104; Jenkins, "Will Terrorists Go Nuclear?" 507–15.

[17] These trends are explained briefly in "The New Terrorism: Coming Soon to a City Near You," *Economist,* 15 August 1998, 17–9. See also, Jose Vegar, "Terrorism's New Breed," *Bulletin of the Atomic Scientists* 54, no. 2 (March/April 1998): 50–5; Jonathan B. Tucker, "Bioterrorism: Threats and Responses," in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg (Cambridge, Mass.: MIT Press, 1999), 290–1.

[18] For information on the November 1979 takeover of the American Embassy in Teheran by Islamic militants, see Nicolas Cumming-Bruce, "Iranians Seize US Mission, Ask Shah's Return for Trial," *Washington Post*, 5 November 1979; John Kifner, "How a Sit-In Turned Into a Siege," *New York Times*, 17 May 1981. Nearly twenty years later and halfway around the world, members of the Tupac Amaru Revolutionary Movement disguised themselves as waiters and took roughly five hundred people hostage during a December 1996 party at the Japanese Ambassador's residence in Lima. Calvin Sims, "Peru Rebels Raid Envoy's Home and Seize Hundreds of Hostages," *New York Times*, 18 December 1996; Clifford Krauss, "Peru Troops Rescue Hostages; Rebels Slain as Standoff Ends," *New York Times*, 23 April 1997.

[19] Carrying nearly 260 people, Pan Am Flight 103 exploded over Lockerbie, Scotland, on 21 December 1988, killing all aboard. Years would pass before the two Libyans accused of blowing up the airplane were brought to trial. Edward Cody, "Pan Am Jet Crashes in Scotland, Killing at Least 273," *Washington Post*, 22 December 1988; Craig Whitney, "Jetliner Carrying 258 to US Crashes in Scottish Town," *New York Times*, 22 December 1988; "Not-Guilty Pleas in Pan Am Blast," *New York Times*, 3 February 2000. An unsuccessful 1995 plot masterminded by now convicted World Trade Center bomber Ramzi Ahmed Yousef sought to bring down eleven US airliners over the Pacific Ocean in a single day. James McKinley, Jr., "FBI Arrests Man in Far East, Charged in Plot to Bomb Planes," *New York Times*, 13 December 1995; Nancy Reckler, "Man Arrested in Malaysia Charged in NY With Plot to Bomb US Airliners," *Washington Post*, 14 December 1995.

[20] Six individuals were killed in the bombing of the World Trade Center on 26 February 1993. The four men—Ahmad M. Ajaj, Mahmud Abouhalima, Mohammed A. Salameh, and Nidal A. Ayyad—responsible for the bombing were convicted on 4 March 1994. Robin Wright and Ronald J. Ostrow, "Incident May Signal New Round of Terrorist Action," *Los Angeles Times*, 28 February 1993; Richard Bernstein, "Explosion at the Twin Towers," *New York Times*, 5 March 1994. For more detailed information on the Khobar Towers bombing, refer to US Congress, Senate Committee on Armed Services, *Bomb Attack in Saudi Arabia*, 104th Cong., 2nd sess., 9 July and 18 September 1996 (Washington, DC: US Government Printing Office, 1997). The bombing of US embassies in Nairobi, Kenya and Dar es Salaam, Tanzania killed 257 people, including twelve Americans, and wounded over 4,500. Karl Vick, "Assault on a US Embassy: A Plot Both Wide and Deep," *Washington Post*, 23 November 1998; testimony of Special Agent Daniel J. Coleman, *United States of America v. Mahdouh Mahmud Salim*, US District Court, Southern District of New York, 25 September 1998; indictment for *United States of America v. Usama bin Laden, Muhammad*

Although the overall number of terrorist incidents declined from 1991 to 1998, a casualty count provides a graphic record of the ascent in terrorist violence. In 1996, the RAND-St. Andrews database tracking international terrorist attacks recorded 250 incidents of terrorism—the lowest number of terrorist incidents since 1973. Yet, 1996 was the fourth most deadly year since the inception of this database in 1968.[21] Similarly, the State Department's database, kept since 1979, records a higher level of attacks in the mid- to late-1980s and a decline in the 1990s from a spike of 565 attacks in 1991.[22] From 1970 to 1983, the RAND-St. Andrews database shows the aggregate human toll of terrorism was 18,925 nonfatal casualties. This tally tripled between 1990 and 1996 to 69,833 nonfatal casualties.[23] The State Department's records reveal a whopping 19,217 worldwide casualties from international terrorist incidents from 1994 to 1999.[24] In the 1970s, an average of 17 percent of terrorist incidents each year involved at least one fatality. In the 1990 to 1996 time period, the lethality rate rose to 22.5 percent.[25]

Atef, Wahid El Hage, Fazul Abdullah Mohammed, Mohamed Sadeek Odeh, and Mohamed Rashed Daoud Al-'Owhali, US District Court, Southern District of New York, 4 November 1998; Benjamin Weiser, "Execution Sought in Embassy Blasts," *New York Times*, 15 March 2000. On the Oklahoma City attack, see John Kifner, "At Least 31 Are Dead, Scores Are Missing After Car Bomb Attack in Oklahoma City Wrecks 9-Story Federal Office Building," *New York Times*, 20 April 1995. In the end, the 19 April 1995 explosion of a rented Ryder truck containing homemade explosives in front of the Alfred P. Murrah Federal Building resulted in 167 deaths and over four hundred injured. On the psychology and rationality of suicide bombing, Ehud Sprinzak, "Rational Fanatics," *Foreign Policy* (September/October 2000): 66–73.

[21] The preceding two years were no walk in the park either. In 1995, 278 terrorist attacks resulted in 287 deaths, and 356 terrorist incidents ended in 419 fatalities in 1994. Respectively, 27 and 29 percent of the terrorist attacks in 1994 and 1995 involved one or more deaths. This joint database, maintained by RAND and St. Andrews University in Scotland, consists of terrorist incidents where a group executes acts of violence in another country, hits targets connected with another state (e.g., diplomats or foreign corporations), or attacks an international mode of transportation. The RAND-St. Andrews database excludes events where a terrorist group or government takes action against its own citizens. Bruce Hoffman, "Terrorism, Trends, and Prospects," in *Countering the New Terrorism*, ed. Brian M. Jenkins (Santa Monica, Calif.: RAND, 1999), 11–2, also fn. 9. On the omission of domestic terrorism from the RAND-St. Andrews database, it should be noted that "The vast bulk of terrorism worldwide is contained within state borders and is local in character. Factional terrorism in Algeria has probably claimed over 80,000 lives since 1992." Ian O. Lesser, "Countering the New Terrorism: Implications for Strategy," in *Countering the New Terrorism*, ed. Brian M. Jenkins (Santa Monica, Calif.: RAND, 1999), 93.

[22] The remainder of the State Department's statistics for the 1990s include 437 attacks in 1990, 363 attacks in 1992, 431 attacks in 1993, 322 attacks in 1994, 440 attacks in 1995, 296 attacks in 1996, 304 attacks in 1997, and 273 attacks in 1998, the last year for which such statistics are available. *Patterns of Global Terrorism: 1998*, 91.

[23] The annual average of nonfatal terrorist casualties increased more than sevenfold from 1,352 in the 1970 to 1983 time period to 9,976 from 1990 to 1996. *First Annual Report to the President and the Congress of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction: I. Assessing the Threat* (Washington, DC: 15 December 1999), 8. Hereafter referred to as the 1999 Gilmore panel report, so called for its chairman, Virginia Governor James Gilmore.

[24] By region, North America had the fewest number of terrorist casualties (7) for these years, followed by Eurasia (247), Latin America (608), and Western Europe (1354). US Department of State, Office of the Coordinator for Counterterrorism, *Patterns of Global Terrorism 1999* (Washington, DC: US Department of State, 2000), 129.

[25] Hoffman, "Terrorism, Trends, and Prospects," 12–3.

A common thread through much of the late twentieth century terrorist activity was religion. Religious wars long ago became a staple of history, and it has been commonplace as well for charismatic leaders to sweep thousands into religious cults, only to lead their followers seriously astray. Jim Jones, for instance, persuaded over nine hundred people at his Guyana outpost to swallow poisoned Kool Aid in 1978, and Marshall Applewhite of Heaven's Gate sent thirty-nine to their death hoping to ride a spaceship they believed was hiding behind the Hale-Bopp comet.[26] The 1990s wrinkle in the world of religion and cults was that some groups bound by religion began to bristle with weapons. Among the terrorists to become household names were the Islamic groups Hezbollah and Hamas. In the United States, Christian Patriotism was on the rise.[27]

The upswing in religious-motivated terrorism has been well-chronicled in both prose and statistics by one of the foremost scholars in the field, Bruce Hoffman. His analysis of trends in international terrorism dates back to a time at which no known terrorist groups attributed their actions to religion. One of the offshoots of the Iranian revolution was the creation of two Shi'a terrorist groups backed by Tehran. By 1994, Hoffman tagged sixteen of the forty-nine identifiable international terrorist groups as having a religious orientation. Just a year later, almost half of the fifty-six terrorist groups in operation were religiously motivated.[28]

On the surface, religion and a willingness to engage in wholesale killing appear incongruous, but there is strong evidence that religion was a causal factor in the 1990s surge in the level of terrorist violence. Although religious terrorists were responsible for only 25 percent of the terrorist acts in 1995, they caused

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[26] On 18 November 1978, Jim Jones instructed his followers to take a cyanide cocktail, resulting in the death of 909 children, women, and men. Heaven's Gate was led by Marshall Applewhite, who encouraged his followers to take a phenobarbital-laced concoction in late March 1997. In another example, Joseph Kibwetere of the Movement for the Restoration of the Ten Commandments of God in Uganda apparently commanded the massacre of over five hundred followers on 17 March 2000 on the basis that the Virgin Mary was coming to spirit them to heaven. Although officials at first thought the cult engaged in a mass suicide when fire swept through the cult compound, they later attributed some deaths to strangulation and other unknown causes. For more detail on these cult sagas, see Tom Mathews, "The Cult of Death," *Newsweek*, 4 December 1978, 38–43; Barry Bearak, "Eyes on Glory: Pied Pipers of Heaven's Gate," *New York Times*, 28 April 1997; Karl Vick, "Fire Kills Members of Cult in Uganda," *Washington Post*, 19 March 2000; Karl Vick, "Ugandan Cult Grave Yields 81 Corpses," *Washington Post*, 31 March 2000.

[27] The Christian Patriots are also sometimes called Christian White Supremacists or the militia movement. This militant movement, which grew out of the Aryan Nations organization in the mid-1970s, champions a mixed philosophy of anti-Semitism, survivalism, neo-Nazism, and extremism. For more on variants of Christian Patriot movement in the United States, see John George and Laird Wilcox, eds. *American Extremists: Militias, Supremacists, Klansmen, Communists, & Others*, (Amherst, NY: Prometheus Books, 1996), 197–206, 246–74, 275–82, and 323–53. Perhaps the most infamous armed camp in the United States was the Branch Davidian headquarters in Waco, Texas. Among other charges, the FBI asserted that the Davidians were illegally stockpiling weapons. The FBI's siege of the compound, which ended in a tragic firestorm and the deaths of 104 cult members on 19 April 1993, has since become a rallying event for other Christian militia groups that reject the legitimacy of the US government. Edward S.G. Dennis, Jr., *Evaluation of the Handling of the Branch Davidian Standoff in Waco, Texas: February 28 to April 19, 1993* (Washington, DC: US Department of Justice, 8 October 1993).

[28] In 1995, twenty-six terrorist organizations—46 percent of the total number—had religious roots. Bruce Hoffman, *Inside Terrorism* (New York: Columbia University Press, 1998), 90–1.

58 percent of all fatalities attributed to terrorism that year. Religious terrorists executed all of the attacks that killed eight or more people.[29] Jenkins explains this causal link by noting that when terrorists worship a god that "says that it is permissible to kill indiscriminately, then the constraints of conventional morality fall away."[30] For his part, Hoffman posits that because religious terrorists see violence as a "sacramental act or divine duty," religion serves as a "legitimizing force, specifically sanctioning wide-scale violence against an almost open-ended category of opponents (i.e., all people who are not members of the religious terrorists' religion or cult)."[31] Some of these religious groups adhere to apocalyptic and millenarian philosophies. Those in the first category concentrate on a preordained catastrophic event they believe will result in the end of mankind; those in the latter think that this horrible event will be their passage to a utopian-type afterlife. In the 1990s, Christian Identity groups asserted that the period of tribulation, the prelude to the apocalypse and the reign of Christ in the new millennium, was underway.[32]

Religion, however, was not the only driving force behind the boom in terrorist violence. The far Right of the political spectrum, which in addition to religion invokes nationalism, individualism, ethnic or racial chauvinism, and capitalism, also exhibited a penchant for large-scale violence.[33] Extremist groups dot the US countryside and circle the globe, each rallying around an ideology tailored to their particular circumstances. In general, extremist groups tend to embrace conspiracy theories and doomsday thinking, presume the moral superiority of their group over non-members, and characterize those who oppose their group as villainous and immoral.[34] In the United States, far Right extremists run the gamut from White supremacists and neo-Nazis to militias, ultra-nationalists, and Christian crusaders.[35]

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[29] Ibid., 93–4.

[30] Jenkins, "Understanding the Link," 48.

[31] The first quote is from page 95 of Hoffman's *Inside Terrorism*, the second from page 20 of his "Terrorism, Trends, and Prospects."

[32] Michael Barkun, "Introduction: Understanding Millennialism," *Terrorism and Political Violence* 7, no. 3 (Autumn 1995); and, in the same volume, Martha Lee, "Violence and the Environment: The Case of 'Earth First!'" One of the first apocalyptic movements was started by William Miller, a farmer who predicted the Second Coming in 1843, and then recalculated decades later when the year came and passed. This became known among his followers as the "Great Disappointment." Diane Jean Schemo, "More Christians Believe the Second Coming is Approaching," *New York Times*, 31 December 1999.

[33] Jenkins, "Understanding the Link," 48–9.

[34] For a detailing accounting of the traits and behavior of American extremist groups, see Lair Wilcox, "What is Extremism? Style and Tactics Matter More Than Goals," in *American Extremists*, 54–62. The remainder of this volume catalogues the activities of groups of the far right and far left.

[35] Although physical proximity used to significantly influence an individual's ability to participate in group activities, the Internet has fostered long-distance membership. In fact, extremist groups have taken to the Internet with zeal to advertise their particular beliefs. According to one count, the US militia movement currently operates over three hundred web sites. Jerrold M. Post, "Psychological and Motivational Factors in Terrorist Decision-Making: Implications for CBW Terrorism," in *Toxic Terror*, 285–6.

Even environmentalists, who have somewhat of a pacifist, tree-hugger image, sometimes fall into the extremist category.

In addition to motivational beliefs, several other reasons help to explain the growing terrorist carnage. First, with the public more inured to "ordinary" violence, terrorists are encouraged to stage ever more sensational attacks to grab the media spotlight. Second, some terrorists are becoming true masters of their craft—acquiring smaller and more effective weapons, honing their tactical skills, flexing their creative muscle, and getting better at evading capture. Next, some terrorists are the beneficiaries of an influx of resources from states and organized crime, amplifying the destructive capability of groups that otherwise might not have been as effective or active. Moreover, with the availability of weapons, weapons know-how, and assorted other tools of the trade, even relative amateurs can aspire to terrorist infamy. Finally, some terrorists no longer feel the need to claim credit for their handiwork. The veil of anonymity may liberate such individuals to engage in ever more deadly attacks.[36]

A final noteworthy trend in late twentieth century terrorism is that the United States is by far the favored target of international terrorists, followed by Israel, France, and Great Britain, according to the RAND-St. Andrews database.[37] The State Department's records also show that while international terrorists rarely struck within US borders, they frequently hit US targets abroad, as shown in tables 2.1, 2.2, and 2.3. From 1994 to 1999, most attacks that involved US citizens or assets took place in Latin America, and bombing was far and away the most prevalent form of attack. During this five year span, international terrorist attacks wounded 613 Americans and killed sixty-four. Globally, businesses were

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[36] These causal factors are listed by Hoffman in "Terrorism, Trends, and Prospects," 13–5, 20, 25, 27. See also, Bruce Hoffman, "Why Terrorists Don't Claim Credit," *Terrorism and Political Violence* 9, no. 1 (Spring 1997): 4–5. According to another student of unconventional terrorist behavior, "Terrorists or criminals who possess or use biological agents almost never advertise their intent. In only one case is it clear that perpetrators known to have possessed biological agents sent communiques or otherwise made known the fact of possession. In contrast, those who claimed to possess biological agents almost never did." W. Seth Carus, *Bioterrorism and Biocrimes: The Illicit Use of Biological Agents in the 20th Century*, Working Paper, Center for Counterproliferation Research (Washington, DC: National Defense University, July 1999), 34. For an elaboration of the point about the connection between the terrorist and drug cartel underworlds, see chapters 6 and 7 of Glenn E. Schweitzer with Carole C. Dorsch, *Super-Terrorism: Assassins, Mobsters, and Weapons of Mass Destruction* (New York: Plenum Trade, 1998), 165–221.

[37] In decreasing frequency, terrorists also hit targets in Germany, Russia, Turkey, Cuba, Spain, and Iran. Hoffman, "Terrorism, Trends, and Prospects," 35. In 1997, roughly 30 percent of international terrorist attacks were against US citizens and facilities, up from 25 percent in 1996. George J. Tenet, Director, Central Intelligence Agency, testimony before the Senate Select Committee on Intelligence, 105th Cong., 2nd sess., 28 January 1998.

Table 2.1: Total US Casualties from International Terrorist Attacks (1994-1999)

Year	Wounded	Killed
1994	5	6
1995	60	10
1996	510	25
1997	21	6
1998	11	12
1999	6	5
Total	613	64

Source: US Department of State, *Patterns of Global Terrorism 1999* (Washington, DC: US Government Printing Office, April 2000).

the favored terrorist target.[38] Several countries that sponsor terrorist groups—Iran, Iraq, Libya, North Korea, Sudan, and Syria—continue to clash with the US government, which perpetuates the attractiveness of US targets.[39] Enmity toward the United States could also be an outgrowth from US involvement overseas, for example as peacekeepers or as active supporters of one combatant over another. Those on the losing end of such conflicts may turn to terrorism as an equalizing strategy to exact revenge upon a country that otherwise far out-guns their military capability. Others may assault US targets out of resentment for America's comparative wealth or way of life.[40] Thus, without even considering the inclinations of homegrown terrorists, persistent international terrorist activities against US targets form a well-recognized pattern.

The Three "W's" of Chemical and Biological Terrorism

Aum Shinrikyo's sarin gas attack against Tokyo subway commuters led to significant concern that terrorists might use unconventional weapons on US soil. Terrorists, after all, are not known for being particularly innovative. If a tactic or incident is a real attention-getter, other terrorists usually imitate it.[41] Several questions have therefore been left hanging in the air, questions that can be grouped as the three "w's"of chemical and biological terrorism. The first concerns *why* terrorists would want to follow Aum Shinrikyo's path; the second *who*, along the spectrum of terrorists groups, would be the most likely copycats. The third question relates to *why* Aum Shinrikyo's attack has not been duplicated.

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[38] Businesses were targeted 1,589 times, diplomatic facilities 194 times, government sites 107 times, military locations 44 times, and a catch-all category of other facilities 584 times. This tendency bears out against US targets alone, with businesses hit 133 casualties in 1999, military and diplomatic sites nine casualties apiece, government facilities seven casualties, and other types of facilities twenty-six casualties. *Patterns of Global Terrorism 1999*, 130–2.

[39] In decreasing frequency, terrorists also hit targets in Germany, Russia, Turkey, Cuba, Spain, and Iran. Hoffman, "Terrorism, Trends, and Prospects," 35. In 1997, roughly 30 percent of international terrorist attacks were against US citizens and facilities, up from 25 percent in 1996. Tenet, *Hearing on Current and Projected National Security Threats*, 14.

[40] Lesser, "Countering the New Terrorism: Implications for Strategy," 110–1; Hoffman, "Terrorism, Trends, and Prospects," 35; Tenet, *Hearing on Current and Projected National Security Threats*, 14. On the asymmetrical threat problem, William S. Cohen, Secretary of Defense, Speech at the National Convention of Veterans of Foreign Wars and the Ladies Auxiliary, 23 August 2000, Milwaukee, Wisconsin.

[41] Jenkins, "Understanding the Link," 49.

Table 2.2: Anti-US International Terrorist Attacks By Region (1996-1999)

Region	1996	1997	1998	1999
Latin America	58	97	87	96
North America	0	4	0	1
Asia	1	6	0	6
Eurasia	1	3	3	9
Middle East	3	4	5	11
Africa	2	2	3	16
Western Europe	8	7	13	30
Total	73	123	111	169

Sources: US Department of State, *Patterns of Global Terrorism 1999* (Washington, DC: US Government Printing Office, April 2000); US Department of State, *Patterns of Global Terrorism 1998* (Washington, DC: US Government Printing Office, April 1999);US Department of State, *Patterns of Global Terrorism 1997* (Washington, DC: US Government Printing Office, April 1998); US Department of State, *Patterns of Global Terrorism 1996* (Washington, DC: US Government Printing Office, April 1997).

Table 2.3: Anti-US International Terrorist Attacks By Type (1996-1999)

Type	1996	1997	1998	1999	Total
Assault	1	0	0	0	1
Firebombing	1	0	5	12	18
Armed Attack	3	5	5	11	24
Kidnapping/hostage	6	8	4	21	39
Arson	7	2	1	6	16
Bombing	55	108	96	111	370
Occupation	0	0	0	2	2
Hijacking	0	0	0	3	3
Other	0	0	0	3	3

Sources: US Department of State, *Patterns of Global Terrorism 1999* (Washington, DC: US Government Printing Office, April 2000); US Department of State, *Patterns of Global Terrorism 1998* (Washington, DC: US Government Printing Office, April 1999);US Department of State, *Patterns of Global Terrorism 1997* (Washington, DC: US Government Printing Office, April 1998); US Department of State, *Patterns of Global Terrorism 1996* (Washington, DC: US Government Printing Office, April 1997).

A number of signs indicate that the new generation of terrorists is a nihilistic, apocalyptic, angry bunch—just the sort who would consider employing any instrument of violence. Unlike mundane attacks employing guns and bombs, a germ or gas attack is a guaranteed headline-grabber with a significant psychological impact.[42] Terrorists may resort to weapons of mass destruction for one or more reasons: 1) to massacre as many people as possible; 2) to incite the type of widespread panic that could bring down a government; 3) to establish a position of strength from which to negotiate their demands; 4) to enhance their ability to execute attacks anonymously; 5) to disrupt and significantly damage a society or an economy; 6) to copy state behavior; or, 7) to copy other terrorists.[43] The second, third, and fifth reasons have long been associated with terrorist behavior, and the first and fourth motivations came to the fore in several major bombings in the 1990s.

Another possible reason for terrorist use of chemical or biological weapons is that some terrorists may be engrossed with the luridness of death via toxic poisoning or disease and fancy the idea of using what they regard as spy tools.[44] Such enchantment with spy methods might have motivated the activities of the Minnesota Patriots Council, discussed in box 2.1. Terrorists might also select a biological or chemical agent to fulfill a biblical prophecy. Or, they might select an agent that would incapacitate, rather than kill, a large number of people, as the Rajneeshee cult did in September 1984.[45] Box 2.2 summarizes this sect's voyage into bioterrorism, culminating in the largest single biological attack in US history. Use of incapacitating agents offers the advantage of causing significant fear, but not crossing the line to mass killing. Finally, terrorists may seek out chemical or biological agents to try to contaminate and stigmatize a certain piece of property, such as an important landmark or business.

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[42] B. David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," in *On Terrorism and Combatting Terrorism*, 147.

[43] The use of biological agents to attack a country's livestock or agricultural sector is particularly useful for the final objective. Listing the first five reasons, the 1999 Gilmore panel report, 9–11. Mentioning the first two reasons, as well as the final two. Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 202–13.

[44] Tucker and Sands, "An Unlikely Threat," 49–50; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 202–13.

[45] One biological weapons expert, Jonathan B. Tucker, observed that "The prominent role of plagues (including anthrax) in the Bible suggests that millenarian groups could potentially resort to biological weapons to help bring about Armageddon." Tucker, "Bioterrorism: Threats and Responses," 298–9. On page 292 of this essay, Tucker also comments on the possible attractiveness of incapacitating biological agents. Terrorists might also find utility in incapacitating chemical agents, known generally as riot control agents. The most commonly known and used riot control agent is tear gas, but other such agents can cause vomiting, salivation, and burning pain in the eyes, skin, nose, and mouth, among other effects. See Frederick R. Sidell, "Riot Control Agents," in *Textbook of Military Medicine: Medical Aspects of Chemical and Biological Warfare*, *Part I: Warfare, Weaponry, and the Casualty*, ed. Frederick R. Sidell, Ernest T. Takafuji, and David R. Franz (Washington, DC: Office of the Surgeon General, US Department of the Army, 1997), 307–24.

Box 2.1: The Minnesota Patriots Council and "Maynard"

In 1970, Frank Nelson, a retired Air Force colonel who held strong anti-government beliefs, started the Minnesota Patriots Council. Joining him in vehement objection to taxes was Richard John Oelrich, a former Marine corporal with a penchant for filing lawsuits and liens against local and federal officials. Among the Council's other principal members were LeRoy Charles Wheeler, a handyman, and Dennis Brett Henderson, a sharpshooter and Marine veteran who worked as a carpet cleaner and janitor. In addition to its anti-government mindset, the Council's views were similar to the other militant groups of the Patriot movement, subscribing to conspiracy theories, racism, and anti-Semitism.[1]

An advertisement in the March 1991 issue of *The CBA Bulletin* caught the attention of Oelrich and Henderson. Maynard's Avenging Angel Supply in Ashland, Oregon was selling instructions for making ricin from castor beans, with the beans priced at $1 apiece. By early May 1991, the pair had their hands on a ricin production kit. Following the instructions, Oelrich and Henderson used the solvent dimethylsulfoxide to extract the ricin from twelve castor beans and put the toxin/solvent mixture in aloe vera to prevent evaporation. They deposited the resulting flaky white powder in a baby food jar, which was put into an empty Folgers coffee can that sat for several months in Wheeler's shed. Oelrich and Henderson referred to the ricin mixture by the code word, "Maynard." The Council members discussed killing various law enforcement and IRS officials by putting "Maynard" onto their doorknobs, into their shoes, or into their cars. A Council member frightened by such talk tipped law enforcement authorities to these assassination plots.[2]

When Henderson moved in with an acquaintance, Doug Baker, early in 1992, he brought the toxin-filled coffee can with him. Baker's wife took the suspicious coffee can to the county sheriff on 21 May 1992. Federal Bureau of Investigation laboratory analysis of the baby food jar's contents turned up 0.7 gram of powdered ricin, which the Army's top biodefense laboratory determined had a 5 percent strength. Theoretically, this amount of ricin could have killed 129 people. On 4 August 1994, Wheeler and Baker became the first Americans arrested under the 1989 Biological Weapons Anti-Terrorism Act. Exactly a year later, Henderson and Oelrich were indicted. Juries found all four men guilty, with the sentences ranging from thirty-three months for Baker to four years for Henderson.[4]

NOTES

1. Jonathan B. Tucker and Jason Pate, "Minnesota Patriots Council (1991)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathan B. Tucker (Cambridge, Mass: MIT Press, 2000), 159–60, 162–5.
2. Ibid., 167–172, 181.
3. This law, enacted on 22 May 1990, requires a maximum penalty of a life sentence for anyone who "knowingly develops, produces, stockpiles, transfers, acquires, retains, or possesses any biological agent, toxin, or delivery system for use as a weapon, or assists a foreign state or organization to do so." Lesser prison terms and fines can also be imposed. See 18 USC Section 175.
4. Tucker and Pate, "The Minnesota Patriots Council (1991)," 172–5, 177–8, 180–1.

Perhaps not surprising given recent terrorism trends, numerous experts assert that religious or apocalyptic groups head the list of terrorists thought to be most inclined to employ weapons of mass destruction. According to Hoffman, the conventional wisdom that terrorists do not know how to work with mass destruction weapons, that they will be held back by moral, political, or operational impediments, or that they do not want to kill large numbers of people is perhaps "dangerously anachronistic." He asserts that the

combination of religious terrorism and mass destruction weapons "could portend an even bloodier and destructive era of violence."[46] Next on the list are terrorists that might get a boost in their efforts to acquire weapons of mass destruction from their state sponsors.[47] The Pentagon, however, concluded that "[t]he likelihood of a state sponsor providing such weapons to a terrorist group is believed to be low."[48] States that collaborate with and fund terrorists for conventional attacks recognize that they lack airtight control over these groups, who could turn the weapons they receive back against the sponsor country. Also, state sponsors have some appreciation that if they were identified as the source of a mass casualty weapon used by terrorists, the retaliation would be particularly severe.[49] Therefore, state sponsors may shun terrorist groups that approach them for a shortcut to acquiring these weapons.[50]

Other categories of terrorists that might explore the weapons of mass destruction option include extreme single-issue groups, fanatical nationalists, right wing militias, and terrorists desperate to make their point.[51] A final category of terrorist that might be motivated to use a chemical or biological agent is the demented individual, the psychopath.[52] See box 2.3 for an account of one disturbed loner who came close to going down in history as a chemical terrorist. This category of terrorist—the unaffiliated

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[46] Hoffman, *Inside Terrorism*, 205. See also, Laqueur, *The New Terrorism*, 265–6; Jonathan B. Tucker, "Lessons from the Case Studies," in *Toxic Terror,* 371; 1999 Gilmore panel report, 12; Jenkins, "Understanding the Link," 50; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 208, 214–5. Religious and apocalyptic groups exhibit at least two important characteristics that Jeffrey Simon argues might propel a group to obtain and use biological agents, namely that they are not concerned that potential supporters might react negatively and that they have a previous track record of large-scale violence. The two other characteristics that might also apply to this type of terrorist are that they are willing to take risks and they have a proven capability with advanced weapons and tactics. Jeffrey D. Simon, *Terrorists and the Potential Use of Biological Weapons*, 17.

[47] 1999 Gilmore panel report, 12; Laqueur, *The New Terrorism*, 265–7; Raymond A. Zilinskas, "Aum Shinrikyo's Chemical/Biological Terrorism as a Paradigm?" *Politics and the Life Sciences* 15, no. 2 (September 1996): 239.

[48] US Secretary of Defense, *Proliferation: Threat and Response* (Washington, DC: US Department of Defense, 1997), 49.

[49] 1999 Gilmore panel report, 17.

[50] Purver, "Understanding Past Non-Use of CBW," in *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses*, ed. Brad Roberts (Arlington, Va.: Chemical and Biological Arms Control Institute, 1997), 70; David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons,"149.

[51] The Gilmore panel found the first category worthy of note, terrorism expert Laqueur made special mention of nationalists and desperate terrorists, and a Harvard study pointed out nationalists and right wing militias. 1999 Gilmore panel report, 12; Laqueur, *The New Terrorism*, 266; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 208, 214–5. Jenkins echoes the need to watch anti-government and racists groups closely. He also warns that isolated groups and those with charismatic leaders might consider weapons of mass destruction. Jenkins, "Understanding the Link," 50.

[52] Laqueur, *The New Terrorism*, 265–7; David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," 147.

lunatic—is the least likely to have the financial and technical wherewithal to mount a successful unconventional attack causing mass casualties.[53]

Although the newspapers, airwaves, bookshelves, and podiums were full of catastrophic predictions in the late 1990s, there are several reasons why terrorists have refrained from and may well continue to avoid poison gas and germ agents. Some terrorists may have moral objections to the potential scale and gruesome nature of the death that these weapons can cause.[54] Even though protective measures can be taken (e.g., vaccines, gas masks), some terrorists may worry that working with these materials could jeopardize their own health and safety. Another factor detracting from germ weapons is that publicity-hungry terrorists may have trouble claiming responsibility for a biological attack because the effects would be delayed.[55] As the next section of this chapter emphasizes, terrorists are likely to find it quite difficult to obtain and use biological and chemical weapons effectively. With both types of agent, operational constraints can defeat their effective distribution.[56] Traditional terrorist groups might be concerned that use of poison gas or germ agents would incense potential supporters and possibly offend group members. Finally, governments are likely to react with fury should terrorists release biological or chemical agents.[57] When combined with the fact that terrorists can still attempt to achieve their goals using conventional weapons, these reasons make biological or chemical attacks unattractive options.

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[53] Tucker and Sands, "An Unlikely Threat," 51; Karl Lowe, "Analyzing Technical Constraints on Bio-Terrorism: Are They Still Important?" in *Terrorism with Chemical and Biological Weapons*, 61; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 61. Most lone, rampage killers use guns, make threats before the event, target specific people, and remain at the scene of the crime. For additional profile data, see Ford Fessenden, "They Threaten, Seethe and Unhinge, Then Kill in Quantity," *New York Times*, 9 April 2000.

[54] Since so many could die in such a mass attack, one would have to wonder what kind of exorbitant demands terrorists might make. If terrorists threaten to use mass destruction weapons but do not ask for much, the public will urge the government to grant the demands. The larger the number of possible victims, the more vocal the public is likely to be. David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," 147, 149; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 53–4, 59; Purver, "Understanding Past Non-Use," 67–8.

[55] Purver, "Understanding Past Non-Use," 67–8.

[56] David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," 149; Purver, "Understanding Past Non-Use," 70.

[57] Tucker, "Lessons from the Case Studies," 266; Purver, "Understanding Past Non-Use," 66–9. The Gilmore panel is among several echoing Purver's point that old-fashioned bullets and bombs are suitable for terrorists to achieve their aims. "As fanatical and irrational as terrorists often appear, they remain remarkably conservative operationally, adhering to the same uncomplicated weapons and tactics on which they have relied for more than a century." 1999 Gilmore panel report, 36. On the issue of strong retaliation, see also, David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," 149. On strong government reaction, ability to achieve goals with conventional weapons, and potential to cause internal strife, Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 51–2, 54–5.

Box 2.2: The Rajneeshee Cult Redefines Dirty Politics

As the summer of 1984 waned, a cult led by the Bhagwan Shri Rajneesh near the town of The Dalles, Oregon, used a biological agent to sicken hundreds in an apparent dress rehearsal to sway the outcome of a local election. The Bhagwan brought followers with him from India when he immigrated in 1981. The hardworking Rajneeshees were vehemently isolationist, with some 150 toting guns to keep outsiders away from their ranch. When the Bhagwan decided to enlarge his ranch and his flock, he took over the small town of Antelope, christening the new town Rajneesheepuram. Oregon's attorney general, however, stated that the municipality was unconstitutional because it did not separate church and state. To outmaneuver the attorney general, the cult's hierarchy hatched a plan to make the Wasco county residents too sick to vote in November, enabling the Rajneeshees to seat their favored candidate on the county court. The cult's nurse was the scientific brains behind attempts to put this plan into action. Although the cultists considered other organisms (e.g., AIDS and *Salmonella typhi*, which causes hepatitis and typhoid fever, among other illnesses), the Rajneeshees decided upon *Salmonella typhimurium*, which results in food poisoning. The cult bought bactrol disks from a Seattle medical supply company under false pretenses. A trio of cult members worked in a laboratory equipped with an incubator and freeze dryer to brew what they called a "salsa." Several more Rajneeshees were involved in distributing the agent on various occasions.[1]

Starting on 29 August, the Rajneeshees began sprinkling their *Salmonella typhimurium* in personal drinking glasses, on doorknobs and urinal handles, on produce at the local supermarket, and on salad bars in eleven restaurants. Soon, a steady stream of patients were reporting to local physicians and hospitals with symptoms ranging from nausea and diarrhea to headache and fever. In total, 751 fell ill. Wasco county commissioners and ordinary citizens were among the victims. Within four days, local health care providers were able to identify the *Salmonella typhimurium* as the culprit, but over a year passed before there was confirmation that a single strain caused all of the illnesses and the Centers for Disease Control filed its report. No one died in this test to see if a ballot box could be fixed, but the Bhagwan reportedly observed that one should not worry if a few perished. Law enforcement authorities thought that the Rajneeshees were practicing to poison the water system of The Dalles. Cult members had already put dead rodents and perhaps raw sewage and salmonella salsa into The Dalles' water supply.[2]

Several cult members were involved in the planning and execution of the salmonella attacks, but only two of the Baghwan's chief lieutenants were prosecuted. This pair received multiple concurrent twenty-year sentences, among other penalties. According to one analyst who studied the Rajneeshees carefully, the cult did not work its way up the ladder of violence to bioterrorism. Rather, the Rajneeshees appear to have abruptly embarked on their salmonella spree as a means to a specific end.[3]

NOTES

1. W. Seth Carus, "The Rajneeshees (1984)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathon B. Tucker (Cambridge, Mass.: MIT Press, 2000), 116–9, 122–8.
2. Ibid., 126, 128, 130, 131–4. For a thorough epidemiological account of the Rajneeshee incident, see Thomas J. Torok et al., "A Large Community Outbreak of Salmonellosis Cause by Intentional Contamination of Restaurant Salad Bars," in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg (Cambridge, Mass.: MIT Press, 1999), 167–84.
3. Carus, "The Rajneeshees (1984)," 136–7.

Box 2.3: A Killer on the Brink of Chemical Terrorism

In 1974, a Yugoslav immigrant by the name of Muharem Kubergovic broke ignominious ground, becoming the first person to acquire and threaten to use chemical agents against US officials and anyone else who happened to be in the wrong place at the wrong time. Kubergovic's metamorphosis into a terrorist began with the shame of a March 1971 arrest for lewd conduct. Acting as his own lawyer, Kubergovic won acquittal but soon had additional grievance against local authorities who disapproved his application to open a dance hall. He retaliated by setting fires at the homes of those he held responsible.[1]

Kubergovic then hatched a scheme of truly ambitious proportions. On 5 July 1974, the *Los Angeles Times* found a cassette tape at its office from someone professing to be Isaiak Rasim, the chief military officer of an organization called the Aliens of America. Rasim claimed to be in possession of four nerve gases. Already, the tape said that small disks of the nerve agent designated AA4S had been placed on postcards sent to the entire Supreme Court bench. Time-release devices filled with AA4S were also in cities from Moscow and Paris to Tokyo and Ottawa. Unless the governments concerned heeded Rasim's ultimatum to surrender, the killing would begin. Authorities had already intercepted postcards to the Supreme Court justices, unmasking the poison threat against them to be a hoax. However, a month later, the Aliens of America struck for real, claiming credit for a bomb that killed three and injured thirty-five at the Los Angeles International Airport.[2]

Three days after this attack, the local CBS affiliate received instructions to retrieve another tape cassette, which was found with the key to the airport locker in which the bomb had been placed. Rasim directed that all immigration, naturalization, and sex laws, which he described as unconstitutional, be overturned. He also stated that since his likely punishment for the first bombing would be the death penalty, he had no reason not to escalate the violence. The Aliens of America intended to spell their name through the placement of bombs. The first location was "A" for airport, the second would be associated with "L," and so on, the tape threatened, until their "name [was] written on the face of this nation in blood."[3] Thus, Rasim was tagged the Alphabet Bomber.

On 15 August 1974, Rasim sent a warning to the *Herald-Examiner* that within three months, his organization would fire two tons of sarin-filled shells at Capitol Hill. Rasim also bragged of having obtained the plans for the ventilation systems of thirty major skyscrapers. The next day, Rasim revealed in another tape that violent spelling campaign would continue with the locker in the Greyhound Bus Depot in downtown Los Angeles as the "L" location. Authorities evacuated the station before a twenty-five pound bomb detonated. Police, who had identified Kubergovic as a prime suspect, arrested him on August 20th.[4]

When police searched Kubergovic's one-bedroom apartment, they found a large cache of chemical weapons ingredients, equipment, and data in addition to over 100 pounds of explosives. Among Kubergovic's stash was more than 20 pounds of sodium cyanide, a chemical used to make the nerve agent tabun or release hydrogen cyanide gas. Kubergovic bought the chemicals and equipment from ordinary supply houses. Given the array of chemical supplies he had on hand, Kugergovic may have been dabbling with several chemical agents, including phosgene. Kubergovic acquired the materials, and he may well have had the technical skills to pull off poison gas attacks. Employed in the aerospace industry, he claimed to have undergraduate and master's degrees in engineering. His knowledge of chemical weaponry apparently came from numerous books and articles and from asking technical questions on the job.[5]

(continued, next page)

Box 2.3, Kubergovic (continued)

Kubergovic, who was found guilty on twenty-five counts of murder, arson, and other assorted felonies, is serving his life sentence at California's highest security prison. Since being imprisoned, he has attempted to escape, set fires, and kill other inmates, and he continues to issue threats to government officials. Kubergovic's desire to kill apparently goes unquenched.[6]

NOTES
1. Jeffrey D. Simon, "The Alphabet Bomber (1974)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathon B. Tucker (Cambridge, Mass.: MIT Press, 2000), 73–4.
2. Ibid., 75–8.
3. Ibid., 78.
4. Kubergovic was arrested in the restroom of a restaurant where he was leaving another cassette tape. Ibid., 81–2, 83–5.
5. Kubergovic's library included *Guide to Chemical and Gas Warfare, Poisons as Weapons of War,* and *Guide to Germ Warfare*. Ibid., 72, 86–7, 90.
6. Ibid., 91–3.

THE TECHNICAL FEASIBILITY DEBATE

Other than motivations and objectives, the major question that hangs over the subject of unconventional terrorism is whether terrorists have the technical and operational wherewithall to acquire and use this type of weapon effectively. The US government indicates that these weapons are well within the reach of terrorists. According to the Central Intelligence Agency, "Terrorist interest in chemical and biological weapons is not surprising, given the relative ease with which some of these weapons can be produced in simple laboratories. . . Although popular fiction and national attention have focused on terrorist use of nuclear weapons, chemical and biological weapons are more likely choices for such groups."[58] This segment of the chapter will first address chemical, then biological weapons. Each phase of acquisition and use will be dealt with in turn—from the procurement of ingredients and weapons know-how to the skills needed to manufacture and disseminate the agents effectively. On some of the technical aspects of chemical and bioterrorism, expert opinion varies widely.

The experts readily concur, however, that biological agents are "hundreds to thousands of times" more deadly than chemical agents, making germ agents "true weapons of mass destruction with a potential for lethal mayhem that can exceed that of nuclear weapons."[59] This point is made another way in table 2.4, which presents a calculation of the comparative quantities of material that would be required to incur an

[58] Central Intelligence Agency, *The Chemical and Biological Weapons Threat* (Washington, DC: Nonproliferation Center, March 1996), 6.

[59] US Congress, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, OTA-BP-ISC-115 (Washington, DC: US Government Printing Office, December 1993), 73. Other studies to this effect are *Chemical and Bacteriological (Biological) Weapons and the Effects of Their Possible Use*, Report E.69.1.24 (New York: United Nations, 1969); *Health Aspects of Chemical and Biological Weapons* (Geneva: World Health Organization, 1970); Steve Fetter, "Ballistic Missiles and Weapons of Mass Destruction: What is the Threat? What Should Be Done?" *International Security* 16, no. 1 (1991): 5–42.

equivalent number of deaths within a specified area. The two biological agents rank by orders of magnitude as the deadliest of the alternatives.

Technical Aspects of Chemical Terrorism

Chemical weapons are highly toxic liquid and gaseous substances that can be dispersed in bombs, rockets, missiles, artillery, mines, grenades, or spray tanks. If inhaled or absorbed through the skin, these man-made substances can incapacitate for short periods of time or kill with just a few microscopic drops, depending on the agent. Effects can immediately follow exposure or develop after a period of time. Chemical weapons fall into four basic categories: blister agents that destroy exposed skin tissue (e.g., mustard gas and lewisite); blood agents that, when inhaled, block oxygen circulation within the body (e.g., hydrogen cyanide and cyanogen chloride); choking agents that inflame the bronchial tubes and lungs, possibly causing asphyxiation (e.g., phosgene and chlorine); and nerve agents that short circuit the nervous system, resulting in respiratory failure and death within minutes (e.g., tabun, sarin, soman, and VX). The physical characteristics of chemical agents range from colorless, odorless liquids to pungent, oily fluids. Most chemical agents dissipate quickly when released into the atmosphere, while others, including VX and mustard gas, are much more persistent and raise another set of long-term health and environmental concerns.[60] Of the four poison gas categories, the nerve agents are the deadliest, as they are one hundred to one thousand times more lethal than pesticides made with organophosphorous chemicals.[61]

The Physical Ingredients of a Chemical Weapons Program

Since chemicals are integral to countless consumer products, the chemical industry can be found in virtually every corner of the globe. The United States has a robust chemical industry, the world's largest. The chemicals and equipment used by this industry for commercial products can be employed to produce warfare agents. Of particular relevance to poison gas production are the chemicals and equipment used to make pesticides, fertilizers, and pharmaceuticals. These commodities can be purchased on the open market, including by sub-national actors, from commercial traders, equipment manufacturers, and laboratory supply houses. Chemicals can also be bought by mail order.[62]

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[60] Some antidotes are available for some chemical agents, including nerve and blood families, but they must be administered rapidly to reverse damaging health effects. See Frederick R. Sidell, *Management of Chemical Warfare Agent Casualties: A Handbook for Emergency Medical Services* (Bel Air, Md.: HB Publishing, 1995).

[61] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 23.

[62] For instance, some of the chemical ingredients used to make nerve agents are made by dozens of companies worldwide. A key mustard agent precursor, thiodiglycol, is produced by over a dozen companies in the United States and overseas. Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 19, 23, 29. See also, Mullen, "Mass Destruction and Terrorism," 72; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 103.

Table 2.4: Comparative Lethality of Various Weapons

Type of Weapon	Number of Grams Required to Produce Same Number of Deaths Within a Square Mile Area
Fragmentation Cluster Bomb Material	32,000,000
Mustard Gas	3,200,000*
Nerve Gas	800,000*
Crude Nuclear Fission Weapon Material	5,000
Botulinal Toxin, Type A	80*
Anthrax spores	8*

***** Note that these calculations assume the maximum possible effectiveness of agent distribution.
Source: Louis Guiffrida, "Dealing with the Consequences of Terrorism—We Are Not Yet Where We Must Be," *Terrorism, An International Journal* 10, no. 1 (1987): 73. See also Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, OTA-BP-ISC-115 (Washington, DC: US Government Printing Office, December 1993), 78, 80.

Table 2.5 underscores the dual-purpose nature of chemicals, showing the commercial uses for the chemical ingredients of the principal warfare agents. Through an entity known as the Australia Group, thirty nations enforce uniform export controls on chemical precursors and manufacturing equipment to frustrate the progress of aspiring proliferators. If a member country denies an export license out of concern for possible weapons use or diversion, the rest of the Australia Group is informed of the decision, including the items requested. An approach to additional Australia Group countries for the same equipment or by the same end-user will generate a discussion of the case to gain a better understanding of the specifics of the original rejection and determine whether approval poses a proliferation risk. Member countries are free to disagree, but the sharing of information enables the Australia Group countries to work from the same sheet of music.[63] Should foreign sub-national actors apply to buy precursor chemicals on the control list, the US licensing review process would presumably catch and reject their applications. For domestic sales, however, these licensing procedures do not apply, thus a US terrorist group could purchase modest quantities of the requisite chemicals from a US firm or even in local stores without arousing suspicion. For that matter, beneath kitchen sinks and in garden sheds, one can find the chemical components of "some of the most dangerous chemical weapons," as one of the US Senate's principal investigators of Aum Shinrikyo observed.[64]

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[63] Established in 1985, the Australia Group originally took a two-tier approach, developing a "core list" of eight chemicals that members would formally control and a "warning list" of thirty-five that was circulated to producers for voluntary restriction on a case by case basis. Companies that sold chemicals on the core group to countries suspected of proliferating poison gas would face legal penalties. In 1991, the two lists were melded into one comprehensive list of over fifty chemicals under formal export controls. For more on this export control regime, see Amy E. Smithson, *Separating Fact from Fiction: The Australia Group and the Chemical Weapons Convention* (Washington, DC: Henry L. Stimson Center, 1997).

[64] John F. Sopko, "The Changing Proliferation Threat," *Foreign Policy* 105 (December 1996): 9.

Table 2.5: Commercial Applications of Chemical Weapons Precursors

Type of Chemical Agent	Commercial Uses of the Chemical Ingredients
Mustard Agents	* lubricant additives * ballpoint pen ink * manufacture of plastics, paper, and rubber * chlorinating agents * photographic developing solutions * textile dyes * pesticides * engineering plastics * cosmetics * detergents * metal refining * dye manufacture * pharmaceuticals * insecticides * waxes and polishes * toiletries * cement additives * synthetic resin
Tabun	* plasticizers * gasoline additives * hydraulic fluids * insecticides * flame retardants * pharmaceuticals * detergents * pesticides * missile fuels * vulcanization of rubber * extraction of gold and silver from ores
Sarin	* flame retardants * gasoline additives * plasticizers * paint solvents * ceramics * antiseptics
Soman	* lubricant additives * surfactants * cleaning and disinfectant for brewery, dairy and other food processing equipment
VX	* organic synthesis * insecticide * lubricant oil additives * pyrotechnics

Sources: Central Intelligence Agency, *The Chemical and Biological Weapons Threat* (Washington, DC: Central Intelligence Agency, March 1996), 9–16; on mustard and tabun ingredients, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, OTA-BP-ISC-115 (Washington, DC: US Government Printing Office, December 1993), 23–4.

Just as with the chemical ingredients, the equipment needed to make chemical warfare agents is commercially available just about anywhere.[65] The congruence between pesticide plants and a facility that makes warfare agents is especially striking. To set up a poison gas production line, terrorists would need reactors and agitators; chemical storage tanks, containers, and receivers; heat exchangers or condensers for temperature control; distillation or absorption columns to separate the chemical compounds; valves, multi-walled piping, and pumps to move chemicals between reactors and other containers. A top-of-the-line facility would have safety equipment such as toxic gas monitors, as well as incinerators and filling equipment. Ideally, the equipment would be corrosion resistant (e.g., lined with nickel or glass, Hastelloy). In addition to the manufacture of pesticides and other products, such equipment is used to treat sewage, industrial wastes, and potable water.[66] For a full-scale mustard production facility, complete with air-

[65] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 18; Mullen, "Mass Destruction and Terrorism," 67–8.

[66] Specially designed items such as double-seal pumps might also be used. Reactors, storage tanks, and containers can be purchased in at least a dozen countries, heat exchangers and distillation columns in at least eight, and condensers almost anywhere. Corrosion resistant equipment can be obtained worldwide. More specifically, glass-lined reactors and pumps are made by about a dozen companies. Central Intelligence Agency, *The Chemical and Biological Warfare Threat* (Washington, DC: Central Intelligence Agency, 1995), 5, 6, 15, 17, 19, 20–2.

handling capacity, the price tag would be between $5 and $10 million. Without extras such as waste handling, roughly $20 million would be needed for a full-up plant to make sarin, soman, or tabun.[67]

Terrorists, however, can be assumed to be willing to forgo the scale and probably some of the safety precautions that most governments would consider essential for a weapons program. Corrosion resistant equipment is crucial only if terrorists intend to manufacture tons of agent over a long period of time.[68] In fact, standard process equipment or even a laboratory setup of beakers and tubes would be adequate to make smaller quantities of poison gas. The possibility of producing agent in a laboratory setting has led some to assert that chemical warfare agents "can quite literally be manufactured in a kitchen or basement in quantities sufficient for mass-casualty attacks."[69] Therefore, the costs for a small-scale terrorist operation could be significantly less than $5 million. One estimate places the budget for supplies and equipment at "tens of thousands of dollars, perhaps even less."[70]

Scientific Training, Formulas, and Production Know-How

According to some accounts, any individual who excelled in high school chemistry class has enough knowledge to make poison gas. All chemical reactions are not alike, however, and introductory chemistry classes rarely work with the extremely toxic chemicals involved in the synthesis of warfare agents. Some advanced knowledge is needed to produce such agents without incident and with minimal personal risk. Expert opinion therefore weighs in heavily in favor of graduate-level chemistry skills being a prerequisite for chemical weapons work. For instance, appreciable experience as an organic chemist or a graduate degree in organic chemistry would be essential to make sarin or nerve agents in the "V" class, such as VX.[71] US,

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[67] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 27.

[68] For the manufacture of mustard, use of corrosion resistant equipment is "advisable—but not essential." Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 22–3.

[69] Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 98. See also, page 107: "Some simple but still highly toxic chemical agents can be synthesized in kilogram quantities in laboratory glassware." In addition, David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," 146.

[70] Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 102. As chapter 3 discusses, Aum Shinrikyo spent $30 million on its poison gas plant.

[71] One compendium cited five experts arguing for graduate-level training, others stipulating only that a "moderately competent chemist" or even "any competent scientist" would be able to produce chemical agents. See Ron Purver, *Chemical and Biological Terrorism: The Threat According to the Open Literature* (Ottawa: Canadian Security Intelligence Service, June 1995): 69. The assessment on sarin comes from 1999 Gilmore panel report, 27; on VX, from Mullen, "Mass Destruction and Terrorism," 72. Another study describes the manpower in one instance as "chemistry knowledge at the college level or sometimes less," in another as "at least one smart, technically educated person, preferably with practical experience in chemistry or chemical engineering" plus "at least one technician able to build simple devices for agent dissemination." Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 102, 106. Finally, one expert stated that a high school chemist could produce gram-level quantities of sarin, but going to larger quantities would demand higher skill levels. Interview with author: PhD Chemist/Chemical Weapons Expert (14 July 2000).

European, and Russian universities provide instruction in applied chemistry and chemical engineering to thousands each year.[72] On-the-job training in the chemical industry can also acquaint individuals with some of the requisite skills because the commercial industry uses similar processes and essentially the same equipment.

Individuals with basic scientific and technical training also know where to locate the formulas for chemical warfare agents. Mustard agents came of age during World War I, and nerve agents were discovered in the mid-1930s. The production processes used over seventy years ago are still viable. "Indeed, few military technologies have evolved *as little* as chemical weapons over the past half-century."[73] The synthesis of the various chemical agents has been a frequent topic of books, professional papers, and patent literature.[74]

As to which particular warfare agent(s) terrorists might choose, experts disagree. One panel argued that terrorists would bypass choking agents because they would have to make too big a quantity for an attack, and blister agents because they harm, but do not necessarily kill, large numbers of people. Terrorists, this panel concluded, would most likely aim for sarin, a highly toxic agent described as relatively easy to manufacture.[75] Another expert group noted that while high concentrations of mustard gas would be necessary for an attack, mustard was easier to make than nerve agents. Among the nerve agents, this second group of experts rated tabun as easier to manufacture than sarin or soman because tabun production does not involve a chemical reaction that could pose a considerable technical challenge to the untutored.[76] Finally, the Central Intelligence Agency classified choking, blood, and blister agents as "relatively easy to produce" and nerve agents as "somewhat more difficult to produce."[77]

The technical challenges of making nerve agent are noteworthy, but not insurmountable. The temperature of the reactor needs to be controlled attentively. Water reacts explosively with some of the chemicals employed, so the appropriate heat exchangers must be used. More specifically during the

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[72] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 19.

[73] Ibid., 18.

[74] Tens of thousands of citations describe how to make choking, blister, mustard, and nerve agents, providing such details as the operating parameters, catalysts, and the chemical reactions. Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 18; Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 15; Mullen, "Mass Destruction and Terrorism," 67–8, 72; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 106. Even as long ago as the early 1970s, for example, the open literature already contained over fifteen formulas for the "V" class of nerve agents. Stockholm International Peace Research Institute, *The Rise of CB Weapons: The Problem of Chemical and Biological Warfare*, Vol. I (Stockholm: Almqvist & Wiksell, 1971), 76; David, "The Capability and Motivation of Terrorist Organizations to Use Mass-Destruction Weapons," 146.

[75] 1999 Gilmore panel report, 26.

[76] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 21, 24–5.

[77] Central Intelligence Agency, *The Chemical and Biological Weapons Threat (1996)*, 15.

manufacture of tabun, the highly toxic reagent hydrogen cyanide, has to be contained. Lack of proper safety procedures during this cyanation reaction could be hazardous. Making sarin, soman, and VX involves highly corrosive chemicals (e.g., hydrogen fluoride, hot hydrochloric acid) and a technically demanding alkylation reaction not often used in industry. Moreover, the distillation process needed to obtain very pure agent is very hazardous. Some technical shortcuts can be taken if those involved do not place priority on safety, long shelf life, high quality agent, and protection of the environment.[78] However, if they venture down this path, terrorists may be surprised to find the extent to which readily available industrial chemicals (e.g., chlorine, hydrogen cyanide) are "exceedingly volatile" and the "[t]rue war gases. . . .[are] nasty, awful substances."[79] On that point, a chemical weapons expert explained that the one thing that chemistry books do not have is the crucial detailed instructions about how to work with these extremely volatile materials, namely what precautions to take when. Without such production knowledge, this individual noted that any rookie trying to make a significant amount of chemical agent would probably be scared out of their wits, if they had any.[80]

Depending on whether large reactors or laboratory beakers are employed, the time required to make chemical agent will vary. Chemicals are usually processed in batches, with clean-up between each production run. With a small laboratory setup, an individual could make quantities on the order of tens of kilograms each year.[81] According to another estimate, "hours or days" would be needed to make a few kilograms of agent from direct precursor chemicals, "weeks or months" if the process started from building block chemicals.[82]

If the objective was to poison a big crowd, terrorists would have to manufacture a large amount of agent. This point is accentuated by a Pentagon estimate for the open air disbursement of sarin, wherein 22 pounds of this agent would be required to kill about fifty people, 220 pounds to kill five hundred, and 2,200 pounds to cause casualties on the order of ten thousand.[83] The quantity requirements would not be as stiff if the agent were released indoors, where air currents would not dissipate the gas as quickly.

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[78] Distillation also enables a long shelf life, an attribute that may not be important to terrorists. Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 16, 26–7, 133.

[79] Zilinskas, "Aum Shinrikyo's Chemical/Biological Terrorism as a Paradigm?" 238.

[80] Interview with author: PhD Chemist/Chemical Weapons Expert (14 July 2000).

[81] As cited in Purver, *Chemical and Biological Terrorism*, 68–9. B.J. Berkowitz et al. *Superviolence: The Civil Threat of Mass Destruction Weapons*, Report A72-034-10, (Santa Barbara, Calif.: Advanced Concepts Research Corporation, 29 September 1972), VIII–20; R.W. Mengel, "Terrorism and New Technologies of Destruction: An Overview of the Potential Risk," Appendix 2, in *Disorders and Terrorism: Report of the Task Force on Disorders and Terrorism* (Washington, DC: National Advisory Committee on Criminal Justice Standards and Goals, 1976), 455.

[82] Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 102, 106.

[83] 1999 Gilmore panel report, 27–8.

Delivery of a Chemical Agent

The options for delivering poison gas range from high to low tech. Super toxic chemicals can be employed to foul food or water supplies, put into munitions, or distributed by an aerosol or spray method. Box 2.4 describes one group that considered attacking municipal water supplies. As for explosive dispersal, chemical agents can be the payload of any number of specially designed or modified conventional munitions, from bombs and grenades to artillery shells and mines.[84] Sub-national actors could approach any number of manufacturers worldwide to buy such weapons or even fashion the munitions themselves, since the design specifications are in open sources.[85] An explosive device generates liquid droplets of agent that fall through the air and coat surfaces below. The droplets of agent falling to the ground and the evaporation of the surface coating of agent produce vapor.[86] The agent droplets constitute a skin exposure hazard, and vapor is ideal for inhalation, the quickest, deadliest exposure route. Designing munitions that reliably produce vapor and liquid droplets requires a certain amount of engineering skill. Terrorists that fashion their own devices may misjudge how much combustible material to employ, inserting either a slight charge that does not disseminate the agent effectively or such a large blast that most of the agent is destroyed.

Spraying a chemical agent can produce an aerosol in a controlled and reliable manner. Sprayers can be mounted on aircraft, trucks, or boats. Crop dusters could also be employed, or ground-based sprayers placed in close proximity to a building's ventilation system.[87] Particularly when dispersing a chemical agent outdoors, "at a minimum, it may be assumed that 90 percent of the dispersed agent will not reach the

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[84] For a description of various bursting, burning, spraying munitions, Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare: CB Weapons Today*, Vol. II, (New York: Humanities Press, 1973), 72–90. Also, Central Intelligence Agency, *The Chemical and Biological Weapons Threat (1996)*, 15.

[85] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 33–4. Chemical agents can also be delivered through more sophisticated military methods, namely a base-ejection system on longer-range missiles systems and a bulk release system that effuses agent into the slipstream of the munition. Ernest T. Takafuji and Allart B. Kok, "The Chemical Warfare Threat and the Military Healthcare Provider," in *Textbook of Military Medicine*, 120–1. Outside of the prospect that terrorists would steal chemical munitions of these types, missile and base-ejection delivery would severely stretch the technical capability of terrorist groups.

[86] Takafuji and Kok, "The Chemical Warfare Threat and the Military Healthcare Provider," 120–1.

[87] Ibid. Also Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 4; Central Intelligence Agency, *The Chemical and Biological Weapons Threat (1996),* 15; Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 33–4.

Box 2.4: A Right-wing Cult Targets Reservoirs

The Covenant, the Sword, and the Arm of the Lord was a cult led by a fundamentalist preacher, Jason Ellison, whose sermons were a mix of anti-Semitic, white supremacist, survivalist, and anti-government rhetoric. Ellison's faithful lived in a compound in Arkansas' Ozark Mountains, complete with a "silhouette city" shooting range, where for $500 outsiders could train in the "Christian martial arts" as taught by the Endtime Overcomer Survival Training School. Elsewhere on the compound were factories for making firearm accessories, grenades, and gun silencers, which the cult sold, along with inflammatory literature about race wars and assorted millennial themes. Late in 1978, Ellison instructed his followers to prepare for the coming apocalypse by stowing food, weapons, and other supplies.[1]

The July 1983 Aryan Nations Congress decided that the government, which they believed was controlled by Jews, had to be toppled. To do so, extreme-right leaders colluded to urge their flocks to assassinate federal officials and politicians, disable power sources, bomb federal buildings, and contaminate reservoirs with cyanide. In November of that year, Ellison's more violent followers, called The Order, blew up a natural gas pipeline. The following month, Ellison's crew initiated a string of crimes, including robberies that pulled in over $4 million. On 20 April 1984, federal authorities attempted to enter Ellison's camp. The Covenant, the Sword, and the Arm of the Lord surrendered after three tense days. Afterwards, law enforcement officials found a panoply of weapons, including an armored car under construction. The cult also had 30 gallons of potassium cyanide, intended perhaps to poison the water systems of Washington, Chicago, and New York City. Cult members were under the ludicrous impression that the poison would somehow find its way only to the evil people they thought deserved to die. Moreover, the water in a large city reservoir would quickly attenuate that amount of poison.[2]

For his role, Ellison was sentenced to twenty years in prison, a term cut to five years. One of Ellison's chief henchmen, however, received a death sentence for killing a pawnbroker and an Arkansas state trooper. On 19 April 1995, the same day that this individual was executed, the Oklahoma City bombing occurred. The Federal Bureau of Investigation has uncovered the plans of right-wing extremists to bomb, assassinate, and contaminate water supplies to fulfill the mandate of the 1985 Aryan Nations Congress. The Order and the Covenant, the Sword, and the Arm of the Lord may provide a model for others intent on carrying out plots.[3]

NOTES

1. Jessica Eve Stern, "The Covenant, the Sword, and the Arm of the Lord (1986)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathon B. Tucker (Cambridge, Mass.: MIT Press, 2000), 140–1, 143, 146.
2. Ibid., 148–9, 150–1, 154–5.
3. Ibid., 152–4, 157.

intended target in doses sufficient to cause casualties."[88] In other words, effective delivery, which entails getting the right concentration of agent and maintaining it long enough for inhalation to occur, is quite difficult to achieve because chemical agents are highly susceptible to weather conditions. Among the factors

[88] Mullen, "Mass Destruction and Terrorism," 77.

influencing chemical agent dissemination are temperature, sunlight, wind action, and rainfall.[89] In an urban setting, buildings and trees would also interfere with effective dissemination, lowering casualties from the typical battlefield casualty projections.[90] The oft-cited scenario of gassing all of the occupants of a high-rise building by pumping chemical agent into the air handling system, likewise has been overstated. According to a hazardous materials expert, effectively attacking the ventilation systems of modern buildings is not a simple, drop-it-in-the-chute-and-run type of task.[91] Given the operational challenges of dissemination, one analyst concluded that while a single person might be able to execute a chemical attack against a building or a small group of people, it would be "doubtful that an adversary could under any conditions, with a high probability effectively target a group of people larger than a few hundred with any kind of chemical attack."[92]

Technical Aspects of Bioterrorism

A biological weapon disperses organisms to produce disease in humans, plants, and animals. Biological weapons break out into five general categories. First, bacteria are single-cell organisms that cause a range of diseases, from the rarely deadly brucellosis to the more dangerous plague and anthrax. Hundreds of times smaller than bacteria, a second category is composed of viruses, which are tiny parasitic organisms that must be grown in living tissue. Viruses cause smallpox, Venezuelan equine encephalitis, and hemorrhagic fevers like Ebola. Another group of organisms that require live tissue for cultivation are rickettsiae, which can spark illnesses such as Q fever. Fourth, fungi are parasitic plants that include smuts, yeasts, and molds. Fungal diseases, including stem and leaf rusts and rice blast, can decimate crops. Finally, toxins are poisons that, while not actually living themselves, are produced by plants and animals. Toxins, such as ricin, botulinum toxin, and saxitoxin, can also be synthesized chemically.[93] Mortality rates vary among diseases, as do incubation periods and length of the illnesses. Numerous diseases are not contagious (e.g., anthrax, ricin), but some pose even more frightening prospects for weapons use because they are

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[89] "Making chemical agents isn't that hard, but delivery and especially effective delivery is not as easy as it sounds." Interview with author: PhD Chemist/Chemical Weapons Expert (14 July 2000). Also, Takafuji and Kok, "The Chemical Warfare Threat and the Military Healthcare Provider," 122.

[90] US projections for casualty rates are derived largely from old, open air tests at Dugway Proving Ground, Utah, which is a large, flat testing area with no structures to disrupt agent dispersal. The kill ratio per ton of chemical agent—not that high to begin with—would be further reduced as agent settles on buildings and objects as opposed to people. Interview with author: PhD Chemist/Chemical Weapons Expert (14 July 2000).

[91] A ventilation system attack would probably injure, perhaps even kill some people on some floors, but by no means the entire building's occupants unless the attacker was intimately familiar with certain aspects of the air handling system *and* used a sufficient amount of agent to obtain the right concentration throughout the building. Interview with author: Hazmat Coordinator/Instructor (8 September 2000).

[92] Mullen, "Mass Destruction and Terrorism," 77.

[93] Toxins straddle the line between chemical and biological weapons in that they are produced by living organisms, but are themselves chemicals. Toxins fall within the purview of both the 1972 Biological and Toxin Weapons Convention and the 1993 Chemical Weapons Convention. For example, ricin and saxitoxin appear on Schedule 1 of the Chemical Weapons Convention, the treaty's control list of military chemical agents and extremely toxic chemicals with little commercial use.

communicable (e.g., smallpox, Marburg). Symptoms of those exposed to these microorganisms are often non-specific and overlap with common flu-like malaise—aches, fever, coughing, fatigue. Although some vaccines and post-exposure treatments are available, they generally need to be administered quickly to maximize effectiveness. In the case of anthrax, for example, by the time the disease's symptoms have emerged full-force, it is too late for treatment.[94]

To employ a disease—a natural killer—as a weapon of war is theoretically an alarmingly straightforward concept. However, effectively harnessing Mother Nature's killing capacity is, according to many an expert, easier said than done. In the mid-twentieth century, several nations were humbled and frustrated in their attempts to establish viable biological weapons programs.[95] Likewise, terrorists will find several barriers on the road to an effective biological attack, including difficulty in obtaining a lethal strain or "seed" culture of a biological agent; the complexities of establishing a stable manufacturing process; the challenge of purifying the agent and keeping it alive during dissemination; and the selection of the appropriate dissemination means for the target and agent. Some would also add biosafety to this list, although presumably terrorists might be willing to cut safety corners.[96]

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[94] Col. Edward Eitzen et al., eds. *Medical Management of Biological Casualties* (Fort Detrick, Md.: US Army Medical Research Institute of Infectious Diseases, March 1998), 18.

[95] During its infant years in the 1940s, the US biological warfare program borrowed heavily from Great Britain's parallel effort, relying on British technical advances in production systems, open-air testing techniques, and biological bomb models. With considerable effort, the US scientists built upon the British achievements to develop effective bomb designs and a mass production capability, which was mothballed before it was activated. The USSR also had a sizable World War II biowarfare program, but the Japanese mounted by far the most significant effort of that era, involving approximately five thousand workers and even human experimentation. By 1940, Canada had a small, mostly privately financed germ warfare effort as well. Allied victory in World War II brought the Japanese program to an end. The British curtailed their program in the late 1950s, the Canadians at the end of World War II, and United States in 1969, by order of President Richard Nixon. Only the Soviets persisted, expanding the frontiers of biological warfare in numerous ways. For more information on these programs, see *US Army Activity in the US Biological Warfare Programs: 1942-1977*, Vol. 1 (Washington, DC: Department of the Army, 24 February 1977); "Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945," in *SIPRI Chemical and Biological Warfare Studies*, no. 18, ed. Erhard Geissler and John Ellis van Courtland Moon (Oxford: Oxford University Press, 1999); Ed Regis, *The Biology of Doom: The History of America's Secret Germ Warfare Project* (New York: Henry Holt, 1999), 22–4, 54, 69–70; Sheldon H. Harris, *Factories of Death: Japanese Biological Warfare 1932–45 and the American Cover-up* (New York: Routledge, 1994); Alibek, with Handelman, *Biohazard*; Malcolm Dando, *Biological Warfare in the 21st Century* (London: Brassey's, 1994), 46–50.

[96] This list was compiled from two sources: Lowe, "Analyzing Technical Constraints," 63; 1999 Gilmore panel report, 22–4. The Gilmore panel included biosafety as a technical hurdle.

Pathogenic Seed Cultures

According to a veteran of the long-defunct US biowarfare program, "getting the most infectious and virulent culture for the seed stock is the greatest hurdle" to establishing a biological weapons capability.[97] Four avenues to the acquisition of a pathogenic seed culture exist: 1) natural sources; 2) culture collections; 3) various research laboratories and public health facilities; and 4) state sponsors or discontented employees of countries that maintain a biowarfare capability.[98] Each of these routes has its advantages and drawbacks.

First, nature abounds in microscopic killers. Around the world, *Bacillus anthracis* can be found in the hides and carcasses of infected wild or domesticated animals, such as sheep. Some of the natural reservoirs for plague are prairie dogs, chipmunks, black rats, deer mouse, certain species of ground squirrels, and coyotes. Ticks carry tularemia and Crimean-Congo hemorrhagic fever; livestock, Q fever (*Coxiella burnetii*); mosquitos, yellow and dengue hemorrhagic fevers; and rodents, five South American hemorrhagic fevers, including Lassa and Machupo. Donkeys, monkeys, mosquitos, and, of course, horses carry Venezuelan equine encephalitis.[99] Furthermore, scholarly texts and other open literature sources have long contained meticulous procedures for how to sample, screen, identify, isolate, culture, and test various disease species.[100] Since a particular disease can have dozens or even hundreds of sub-species, the difficulty lies in isolating a strain that is particularly virulent to man, livestock, or plants, depending on the intended target population. Roughly 675 variants of *Clostridium botulinum* have been identified, which makes it not altogether surprising that the scientists of Aum Shinrikyo, as described in chapter 3, proved unequal to the task of isolating a highly virulent strain.[101] Similarly, isolating the right strain of anthrax is a time-consuming process, even though cattle can be found globally.[102]

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[97] Mr. William C. Patrick III, as quoted in Sheryl WuDunn, Judith Miller, and William J. Broad, "Sowing Death: How Japan Germ Terror Alerted World," *New York Times*, 26 May 1998. The anonymous author of the terrorist cookbook *Silent Death*, "Uncle Fester," who claims to have a degree in both chemistry and biology, agrees on this point. Uncle Fester, *Silent Death* (Green Bay, Wis.: Festering Publications, 1997), 100.

[98] 1999 Gilmore panel report, 22; Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 30–31; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 115–7.

[99] Sidell, Takafuji, and Franz, eds., *Textbook of Military Medicine*, 469, 488, 504, 524, 566, 593.

[100] Mullen, "Mass Destruction and Terrorism," 74–6.

[101] Dr. Milton Leitenberg, Remarks made at Association of Politics and the Life Sciences Conference, 1 September 2000, Washington, DC.

[102] "Finding the right strain of anthrax can be tough. Just looking for dead cattle and start culturing from there, would maybe take a year." Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

The second route to lethal seed cultures is via one of the roughly five hundred registered culture collections in fifty-nine countries operated by governments, universities, industry, and private companies.[103] A fair number of these collections contain lethal strains, which outside researchers can obtain through standard ordering procedures.[104] In the mid-1990s, the charges for anthrax, Q fever, and Venezuelan equine encephalomyelitus cultures from a leading US culture collection were $45, $80, and $81, respectively.[105] White supremacist Larry Wayne Harris obtained plague from this culture collection, as box 2.5 describes. Harris' actions prompted Congress to pass a 24 April 1996 law to tighten the safeguards regulating the shipment of lethal pathogens from US culture collections, which number about two hundred. Only two other countries, the United Kingdom and Germany, have adopted similar restrictions, and seed cultures can still be transferred informally.[106] The only active international controls involving seed cultures are those of the aforementioned Australia Group, the export control cooperative that focuses its activities on states attempting to proliferate biological and chemical weapons, not on sub-national actors.[107]

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[103] According to the World Federation of Culture Collections, there were 495 registered culture collections in fifty-nine countries as of mid-November 1999. Internet: http://wdcm.nig.ac.jp/statistics.html. Downloaded 10 March 2000. Note that several other sources state there are approximately 1,500 culture collections globally. WuDunn, Miller, and Broad, "Sowing Death;" International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" in *Strategic Survey 1996/97* (London: Oxford University Press, 1997), 33; Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 30–1.

[104] For example, fifty-five collections in twenty-eight countries have *Bacillus anthracis*; twenty-nine collections in seventeen countries have *Clostridium botulinum*; eighteen collections in fourteen countries have *Yersinia pestis,* and four collections in four countries have *Coxiella burnetti.* Frank P. Simione, "Global Issues in Shipping of Biological Agents" (Manassas, Va.: American Type Culture Collection, n.d.). Simione is the director of Safety and Regulatory Affairs at the American Type Culture Collection.

[105] *ATCC Bacteria and Bacteriophages: 1996 Ordering Catalog* (Rockville, Md.: American Type Culture Collection, 1996), 14, 165; *ATCC Animal Viruses & Antisera, Chlamydiae & Rickettsiae: 1995 Sales Catalog* (Rockville, Md.: American Type Culture Collection, 1995), 28–9, 42.

[106] In August 1996, the American Type Culture Collection began pushing for global adoption of these safeguards via the World Federation for Culture Collections. "They ignored it. The international community has failed to address this issue in a meaningful way." John S. MacKenzie, an Australian biologist at the University of Queensland, who started a global network of germ banks, predicted that governments and groups would eventually follow the US lead. WuDunn, Miller, and Broad, "Sowing Death." The British control measures are similar to the US regulations, and the German rules govern the import, distribution, storage, and handling of pathogenic materials. David Smith, Christine Rohde, and Barry Holmes, "The Safe Handling and Distribution of Micro-organisms under the Law," *Microbiology Today* 26 (February 1999). Internet: http://www.socgenmicriobiol.org.uk/QUA/mtfeb99.htm. Downloaded 14 September 2000. The International Bureau of the Universal Postal Union maintains a catalogue of regulations governing the shipment on biological materials, as does the German Collection of Microorganisms and Cell Cultures, which publishes *Shipping of Infectious, Non-Infectious and Genetically Modified Materials: International Regulations* (Braunschweig, Germany: Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH, 1999). According to an unpublished 1996 study by the American Type Culture Collection, about 80 percent of the instances where *Y. pestis* was transferred from one US laboratory to another between 1993 and 1996 were informal and undocumented. Simione, "Global Issues in Shipping of Biological Agents."

[107] In 1990, the Australia Group widened its portfolio to cover dozens of viruses, bacteria, and rickettsiae with potential as anti-human, anti-plant, or anti-animal biological weapons. Dual-use equipment for both chemical and biological manufacturers, including fermenters, aerosol inhalation chambers, freeze-drying equipment, reaction vessels, storage tanks, and certain types of valves and piping, also fall under the Australia Group's export control umbrella. Smithson, *Separating Fact from Fiction: The Australia Group and the Chemical Weapons Convention*.

Box 2.5: The Biological Misadventures of Larry Wayne Harris

Twice within three years, an Aryan Nations' lieutenant with apocalyptic visions made national headlines when federal authorities arrested him for suspected possession of biological agents. Larry Wayne Harris, a recipient of an associate degree in biophysics from Ohio State University, was an Army-trained vehicle mechanic prior to his employment at Superior Laboratories in Columbus, Ohio. Harris' duties were to inspect septic systems and test potable water samples. Although Harris spent only two months detailed to an Army microbiology laboratory while in the service, he claimed to have isolated anthrax, brucellosis, cholera, and tularemia from natural sources. However, his assertion that he isolated the bacteria that causes plague from cow dung belied his lack of technical prowess. *Yersinia pestis*, the plague-causing bacteria, cannot be cultured from this source.[1]

Harris, a member of the Identity Christian Church who was convinced that Iraqi women were smuggling biowarfare agents into the United States in preparation for an attack, founded his own consulting firm to teach biodefense methods.[2] To establish his *bona fides* to conduct research, on 4 May 1995 Harris sent the American Type Culture Collection fake letterhead for a non-existent organization, the Small Animal Microbiology Laboratory. He poached the Environmental Protection Agency identification number of Superior Laboratories. A day later, he knocked on the culture collection's door again, requesting three vials of *Y. pestis*. On May 9th, the culture repository shipped the order, but Harris aroused the misgivings of an American Type Culture Collection employee when he called the next day to see why it had not arrived. This technician tipped off the Centers for Disease Control and Prevention (CDC), which called Harris to inquire about his research. Harris described a research program intended to thwart supergerm-infected rats, which he believed Iraq would soon smuggle into the United States. On May12th, two police officers awakened Harris to execute a search warrant at his home. Harris told them that the vials of freeze-dried plague bacteria were in the glove compartment of his Subaru. Police also found explosives and weapons. Eleven months later, Harris pled to one count of wire fraud and was sentenced to eighteen months probation, a $50 fee, and two hundred hours of community service.[3]

Harris' stunt prompted reform of the regulations governing the shipment of microbial pathogens that present a significant human health risk. Congress ordered the Secretary of Health and Human Services to enforce stricter regulations on the registration of shippers and receivers of twenty-four infectious agents and twelve toxins, including anthrax, bubonic plague, brucellosis, and tularemia. Organizations seeking to obtain one of these agents must first register with the CDC to receive a unique registration code to ensure the organization's authenticity when placing a transfer request and also identify an employee responsible for signature validation of each transfer request. Registration entails a two-month waiting period. Also, at least once over the three-year period in which the registration is valid, the laboratory must pass a safety inspection to ensure that it meets the appropriate biosafety standards to support and safely dispose of the agent. Another series of checks is run whenever an organization orders another select agent from a culture collection.[4]

In mid-February 1998, Harris was once again in police custody, this time under suspicion of possessing anthrax. Harris was arrested in Las Vegas on February 18th when police found eight bags labeled "biological" in the back of his car. Harris had boasted to an informant that he had sufficient quantities of "military grade anthrax" to kill the entire Las Vegas population. He said that he needed the anthrax to test an invention that purported to destroy bacteria and viruses. Harris' sidekick in this gambit was another white supremacist, William Leavitt. Subsequent tests revealed that Harris had a nonlethal anthrax vaccine strain.[5] Law enforcement authorities were therefore unable to prosecute him for possession of a biological agent for use as a weapon. On 24 March 1998, Harris received a five-month probation extension and an additional fifty hours of community service.[6] *(continued, next page)*

Box 2.5: Larry Wayne Harris (continued)

One analyst who interviewed Harris and studied his behavior concluded that this mechanic is more of a publicity seeker than a genuine terrorist threat. Harris maintains he is a bioweapons expert, but the fact that he hired a promotional agent to get him media interviews and Hollywood deals may belie his true agenda. However, Harris is not harmless. He deems some races sub-human and has inflated views of himself and his biowarfare expertise. Thus, he is circulating racist ideas, threats, and erroneous information about biological weapons and defense that other malcontents might decide to put into action.[7]

NOTES

1. Jessica Eve Stern, "Larry Wayne Harris (1998)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapon ,* ed. Jonathan B. Tucker (Cambridge, Mass.: MIT Press, 2000), 228–30, 232. Jim Woods and Jill Riepenhoff, "Plague Vials Found in Car," *Columbus Dispatch*, 13 May 1995; Karl Vick, "Man Gets Hands On Bubonic Plague Germ, But That's No Crime," *Washington Post*, 30 December 1995; Karl Vick, "Ohio Man Gets Probation in Bubonic Plague Case," *Washington Post*, 23 April 1997.
2. Harris' instruction materials come in audio, visual, and written form. See, for example, Harris' 1995 treatise entitled, "Bacteriological Warfare. A Major Threat to North America. What You and Your Family Can Do Defensively, Before and After: A Civil Defense Manual." Therein, among other gross errors, Harris describes the HIV virus as a "race specific organism" designed only to kill blacks.
3. Stern, "Larry Wayne Harris (1998)," 232–8, 246.
4. As of May 1999, 123 facilities had registered with the CDC. The CDC suspended transfer activities at one site because of a mis-declaration that the facility was capable of working a higher level of biosafety than was actually the case. Fifty-one of the registered sites are academic facilities; twenty-eight are governmental; and forty-four are as of private or commercial facilities. About seven hundred transfers from these facilities have occurred without incident. However, only fifteen facilities out of the 123 had actually been inspected. According to Stephen Ostroff, associate director for Epidemiologic Sciences at the CDC's National Center for Infectious Diseases, more inspectors were being hired to increase the capacity to conduct of facility inspections. The regulations are contained in 18 USC, Sections 175–178 and 2332; 42 CFR 72. See also, Antiterrorism and Effective Death Penalty Act, Public Law 104-132, 24 April 1996; testimony of Stephen M. Ostroff, US Congress, House Committee on Commerce, Oversight and Investigations Subcommittee, *The Threat of Bioterrorism in America: Assessing the Adequacy of the Federal Law Relating to Dangerous Biological Agents*, 106th Cong., 1st sess., 20 May 1999 (Washington, DC: US Government Printing Office, 1999), 23, 33.
5. This invention was called the AZ-58 ray tube. Tom Gorman, "Suspect Cleared in Anthrax Scare Held on Ohio Charges," *Los Angeles Times*, 25 February 1998; Roberto Suro and William Claiborne, "Precautions Slowed Verdict on Anthrax; Public Tensely Awaited Word on Possible Threat," *Washington Post*, 24 February 1998; Lynda Gorov, "Seized Anthrax Called Benign," *Boston Globe*, 22 February 1998; Todd Purdum, "Tests Indicate Seized Material Is Nonlethal Form of Anthrax," *New York Times*, 22 February 1998; Stern, "Larry Wayne Harris (1998)," 227.
6. Robert Ruth, "Harris Pleads Guilty, Is Free," *Columbus Dispatch*, 25 March 1998; "Figure in Anthrax Scare Sentenced for Probation Violation," *Associated Press*, 24 March 1998; Stern, "Larry Wayne Harris (1998)," 243. US Congress, House Committee on Commerce, Oversight and Investigations Subcommittee, *The Threat of Bioterrorism in America: Assessing the Adequacy of the Federal Law Relating to Dangerous Biological Agents*, 106th Cong., 1st sess., 20 May 1999 (Washington, DC: US Government Printing Office, 1999), 23, 33.
7. Stern, "Larry Wayne Harris (1998)," 243, 245–6.

Instead of approaching the culture collections themselves, terrorists might turn to the organizations that order strains from culture repositories for legitimate scientific and medical research. These organizations include university, public health, hospital, veterinary, pharmaceutical, and biotechnology research laboratories and clinics. Terrorists could steal starter cultures from these locations or pose as

scientific colleagues seeking seed cultures for authentic research.[108] The eco-terrorist group R.I.S.E., discussed in box 2.6, obtained seed cultures through insider access to a hospital laboratory.

Finally, terrorists could get seed cultures from a state sponsor or from a discontented worker in a government-run bioweapons research laboratory or production facility.[109] The US government has categorized about a dozen countries as having a biological weapons capability. Table 2.6 provides this roster of countries, as well as a brief description of their biological weapons capability and a cross-reference with the State Department's terrorist sponsor list. By far, the former Soviet biological weapons program was the world's most sophisticated.

Should terrorists make inroads at these facilities, where many of the weaponeers have been under-employed or unemployed for years, they could encounter scientists willing to hand over seed cultures or weapons know-how for a price.[110] Such cooperation would be particularly worrisome because the Soviets successfully weaponized so many diseases, made significant advances in hardening warfare strains against vaccines and medical treatments, and may have also married deadly diseases to create super weapons.[111]

Although nations are known to have weaponized several extremely lethal and contagious diseases (e.g., anthrax, smallpox, plague), one analyst notes that difficulty in accessing such seed cultures could deter terrorists from working with such agents. The challenges of spreading these agents, discussed below, could also stymie terrorists. Instead, this expert argues that terrorists might elect to use the much less harmful agents that governments have not weaponized (e.g., *Giardia lamblia*, HIV).[112]

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[108] Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 30–31; Mullen, "Mass Destruction and Terrorism," 75–6; Sopko, "The Changing Proliferation Threat," 9.

[109] 1999 Gilmore panel report, 22; Lowe, "Analyzing Technical Constraints," 57.

[110] This problem is explored in much more detail in Amy E. Smithson, *Toxic Archipelago: Preventing Proliferation from the Former Soviet Chemical and Biological Weapons Complexes*, report no. 32 (Washington, DC: Henry L. Stimson Center, December 1999). On the point of weapons expertise for hire: "[I]nvestigation has revealed that some domestic extremists are trained in the advanced sciences, while some international terrorists are simply procuring scientific expertise to meet their demands." Federal Bureau of Investigation, National Security Division, *Terrorism in the United States: 1998* (Washington, DC: US Department of Justice, n.d.), 14. For the argument that Western biodefense facilities are unlikely to be fruitful hunting grounds for terrorists, Lowe, "Analyzing Technical Constraints," 57.

[111] For more, see the detailed account of the former deputy director of Biopreparat, Alibek, with Handelman, *Biohazard*.

[112] Other agents that might fall into this category *Salmonella typhimurium*, *Shigella* species, *Yersinia enterocolitica*, Cholera endotoxin, Diptheria toxin, and Tetrodotoxin. Another factor influencing the selection of a less harmful agent is the fact that a terrorist group may not want to inflict heavy casualties. According to Carus, "Many of the alternative agents are unlikely to result in mass fatalities, even if they affect large numbers of people." Carus, *Bioterrorism and Biocrimes*, 18.

Box 2.6: The Poison Plot of an Ecoterrorist Group

In the early 1970s, two Chicago-area teenagers put into motion one of the most bizarre schemes in the annals of US terrorism. In November 1971, Charles Schwander and Stephen K. Pera founded R.I.S.E., an acronym of unknown meaning. R.I.S.E. was an ecoterrorist group that initially planned to overfly the world's major cities spreading an aerosol of infectious diseases that would kill all humans except vaccinated R.I.S.E. members. Their goal was to save the environment by wiping out the human population and subsequently repopulating the planet, presumably with more ecologically aware humans.[1]

Pera was R.I.S.E.'s scientific mastermind, but all that he had going for him was meager experience in the laboratory at Presbyterian St. Luke's Hospital. Pera, who apparently dropped a collegiate-level biology course, scoured the open literature for data on how to grow lethal microbes. The Microbiology Department chief at University of Illinois Hospital granted Pera's request for seed cultures of typhoid fever and *Neisseria meningitis*, the microorganism that causes bacterial meningitis, which is fatal in 50 percent of cases. Pera also had cultures for the microorganisms that cause typhoid, diptheria, and dysentery. He may have also had *Clostridium botulinum*. Asking advice of doctors and other technicians, Pera began cultivating at least two agents in the St. Luke's laboratory, describing his work as a school project. R.I.S.E. was contemplating whether to use aerial dispersal, to inject aerosols into large buildings and supermarkets, to taint water supplies, or perhaps to contaminate foodstuffs.[2]

In mid-January, R.I.S.E. began inoculating members against typhoid fever, an indication that the two leaders may have felt they were ready to act. However, the group suffered serious setbacks. First, the hospital ordered the destruction of Pera's cultures, which forced R.I.S.E. to scale down its scheme from the elimination of the global population to attacks against five Midwestern states. When Schwandner attempted to expand the group's membership above ten, four new recruits contacted law enforcement authorities, who then gathered evidence on the hatching biological plot. On January 17th, police arrested Pera and Schwander and seized their remaining cultures.[3]

Law enforcement authorities never uncovered how much biological agent R.I.S.E. produced, but in Schwandner's bedroom they found maps of the locations targeted for attack, including one of the Chicago water supply system at Fort Sheridan, with the spot marked where they planned to put the typhoid bacteria into the water. Handicapped by lack of expertise, R.I.S.E. members had no inkling of this plot's technical shortcomings, not to mention the implausibility of their other bioterrorism blueprints. Before trial, the two teenagers fled to Jamaica, a way station on the way to Cuba. Schwandner died in Cuba in 1974, and Pera returned to the United States a year later. After a guilty plea, Pera received five years of probation.[4]

NOTES

1. W. Seth Carus, "R.I.S.E. (1972)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathon B. Tucker (Cambridge, Mass.: MIT Press, 2000), 58–60.
2. Pera's other microorganisms were cause *Salmonella typhi* (typhoid), *Corynebacterium dipheriae* (diptheria), and *Shigella sonnei* (dysentery). Ibid., 56–7, 60–4.
3. Ibid., 64–9.
4. Ibid., 59–60, 64–5, 67–70.

The Other Physical Ingredients of a Bioweapons Program

Of all the aspects of acquiring a bioweapons capability, obtaining growth media and laboratory and production equipment would pose the least difficulty for terrorists. The Central Intelligence Agency bluntly declares these items "easily attainable and relatively cheap."[113] Growth media, as the name implies, supports the replication of seed cultures. Different microbes prosper in different growth media. Some organisms flourish in peptone, glucose, milk products, phosphates, augmented animal feeds, or a protein source such as beef bouillon or casein, while others require more complicated growth media, such as that based on blood serum from cows. Several countries (e.g.,Germany, Great Britain, Cuba, Russia) produce growth media.[114]

Likewise, terrorists can buy the same equipment that commercial enterprises use to make beer, yogurt, vaccines, and antibiotics.[115] A top-of-the-line biological production facility would include fermenters, centrifuges, freeze or spray driers, milling equipment, and such safety features as class II or III hoods and high-efficiency particulate air filters. These items are widely available. As many as 150 companies may manufacture fermenters, over eighty-five firms centrifugal separators, and over forty companies freeze driers.[116] Costs for commercial facilities range from $50 million for a fully equipped vaccine plant to $10 million for a generic, no-frills fermentation plant.[117] Equipment requirements would not be even that steep if terrorists opt for a small-scale operation and disregard standard safety precautions. "Virtually any type flask or useful container can be sterilized in an everyday pressure cooker and used to grow the organism." The Central Intelligence Agency further explains, "[a] 20-liter fermenter combined with a filling port can be obtained from a home brewing supplier for under $50."[118] To illustrate the simplicity point, the Iraqis grew agents in ordinary laboratory glassware.[119] Such a basic set-up would

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[113] Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 30. Also, Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 117–8; Zilinskas, "Aum Shinrikyo's Chemical/Biological Terrorism as a Paradigm?" 239.

[114] Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 28, 31–2, 41; Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 86, 89.

[115] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 86; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 33; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 117–8.

[116] The Central Intelligence Agency lists forty-nine companies in twenty-nine countries as makers of fermenters, another 107 companies in twenty-two countries as possible manufacturers of fermenters. Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 28, 37–4.

[117] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 86.

[118] The quote is from page 31–2; other data from pages 6 and 26–8. Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 6, 28, 31–2.

[119] International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 33; Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 88.

Table 2.6: Possible Government Sources of Biological Seed Cultures and Weapons Expertise

Country	Status as a State Sponsor of Terrorism*	Overview of Biowarfare Capabilities
China	No	• Suspected offensive weapons program involving acquisition, development, production, stockpiling of biological agents • Possesses infrastructure necessary for biological warfare program
Egypt	No	• Military-applied research program • National research center investigating agent production and refinement techniques • Research centers engaged in cooperative biological research with US civilian and military laboratories • No evidence of significant or widespread research or activity
India	No	• Five military centers thought to be involved in biological program • Research and development efforts geared mainly to defense • Possesses biotechnology infrastructure
Iran	Yes	• Military-applied research program, including possible possession of small stocks of biological agent • Documented attempts to acquire dual-use equipment and materials • Mycotoxins received initial research attention; research subsequently expanded to other biological agents • Program anchored in biotechnology and pharmaceutical industries, an infrastructure sufficient to mask and support a significant program; medical, education and scientific research organizations also used for agent procurement, research, and production
Iraq	Yes	• Five key sites affiliated with research, development, and production • United Nations Special Commission monitored five vaccine or pharmaceutical facilities; thirty-five research or university sites with relevant equipment; thirteen breweries, distilleries or dairies; eight diagnostic labs; five acquisition and distribution sites for biological supplies; four facilities associated with biological equipment development; and four product development organizations • Worked with anthrax, botulinum toxin, aflatoxin, ricin, Clostridium perfringens, trichothecene mycotoxin, wheat cover smut • Declared production of 19,000 liters of botulinum toxin; 8,500 liters of anthrax; and 2,200 liters of aflatoxin; all quantities declared destroyed but not verified • Filled bombs and missile warheads with anthrax, botulinum toxin, and aflatoxin; spray tanks also developed as delivery mechanism
Israel	No	• Conducting biological defense research • Robust civilian biotechnology sector • Program likely to mimic former US and Soviet programs

Country	Status as a State Sponsor of Terrorism*	Overview of Biowarfare Capabilities
Libya	Yes	• Engaged in initial testing and research; trying to develop agent weaponization capacity • Possible production of laboratory quantities of agent • Interested in funding joint biological ventures with international partners • Program slowed by inadequate biotechnology infrastructure • Has capacity to produce small quantities of biological equipment
North Korea	Yes	• Conducting military-applied research at universities, medical and specialized institutes • Research involves anthrax, cholera, bubonic plague • Possible testing on island territories • Likely able to produce limited quantities of biological warfare agents • Wide means of delivery available
Pakistan	No	• Infrastructure might be able to support a limited biological program • Conducting research and development with potential application for a biological warfare program • Research at scientific centers includes work in microbiology
Russia	No	• Over seventy research, testing, and production facilities • Roughly 65,000 weapons scientists and technicians; at least seven thousand deemed critical weaponeers • Weaponization of smallpox, Marburg, anthrax, plague, and many other diseases • Genetic engineering of diseases to strengthen them against medical treatments, vaccines • Crossing of diseases to create new, more deadly weapons • Advanced dissemination and weapons delivery capabilities
Syria	Yes	• Sufficient biotechnology infrastructure to support small program • Robust program would require foreign assistance
Taiwan	No	• Significant biotechnology capabilities, and sophisticated equipment from abroad • Possible military-applied research in biology

***** The State Department's 1999 report *Patterns of Global Terrorism* lists Cuba and Sudan as state sponsors of terrorism, but neither country is widely believed to be seeking a biological weapons capacity.
Sources: On terrorist sponsor status, *Patterns of Global Terrorism* (Washington, DC: US Department of State, April 2000). On capabilities of weapons programs, US Arms Control and Disarmament Agency, *Adherence to and Compliance with Arms Control Agreements, 1998*; US Congress, Senate Committee on Governmental Affairs, Proliferation Threats of the 1990's, 103rd Cong., 1st sess., 24 February 1993 (Washington, DC: Government Printing Office, 1995); US Department of Defense, Office of the Secretary of Defense, *Proliferation: Threat and Response* (Washington, DC: US Department of Defense, 1997); United Nations, *Report of the Secretary-General on the Status of the Implementation of the Special Commission's Plan For the Ongoing Monitoring and Verification of Iraq's Compliance With Relevant Parts of Section C of Security Council Resolution 687* (1991), S/1995/864 (New York: United Nations, 11 October 1995). On the Soviet program, Ken Alibek with Stephen Handelman, *Biohazard* (New York : Random House, 1999), 155–7, 160–7. On the number of proliferation risk bioweaponeers, Amy E. Smithson, *Toxic Archipelago: Preventing Proliferation from the Former Soviet Chemical and Biological Weapons Complexes,* report no. 32 (Washington, DC: Henry L. Stimson Center, 1999), 47.

suffice to produce a small amount of agent for dissemination in a wet slurry, a technique discussed below in more detail. The cost estimates for a bioterrorism facility vary quite widely, from $2 million to $200,000.[120] For a truly small-scale operation, the price could be even lower.

Scientific Training, Formulas, and Production Know-How

Aside from seed cultures and equipment, terrorists will also have to secure the technical know-how for producing biological agents. Microbiologists, biologists, and those in the medical profession have the requisite basic skill sets. The type of training needed to pilot a biological weapons program is taught at universities and on the job in pharmaceutical and biotechnology industries, which continue to expand worldwide. Scientific meetings and courses run by equipment suppliers can provide additional training.[121] Tens of thousands of people receive university and industrial training each year in various applicable disciplines. Some university programs of particular concern are those that combine several key previously separated skill sets to teach students more effective agricultural production methods.[122] Some experts assert that a team of individuals with advanced degrees are necessary to pull off a bioterrorist attack, while others suggest that basic training or a background in microbiology or a related discipline would be adequate.[123] The important factor is not the level of schooling, according to a couple of biological weapons experts, but rather the type of training and technical aptitude.[124]

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[120] 1999 Gilmore panel report, 23. According to one study, a modest research, testing, production, and weaponization shop could be set up in a large apartment for "less than a few hundred thousand dollars." Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 112.

[121] Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 25; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 33; Zilinskas, "Aum Shinrikyo's Chemical/Biological Terrorism as a Paradigm?" 239.

[122] Interview with author: former State Epidemiologist (18 August 2000).

[123] Those suggesting a successful effort requires a higher skill level include Zachary Selden, "Assessing the Biological Weapons Threat," Special Report (Washington, DC: Business Executives for National Security, February 1997); Carus, *Bioterrorism and Biocrimes*, 15. Those indicating that basic training or just a background in microbiology are satisfactory include the Central Intelligence Agency, *The Chemical and Biological Warfare Threat (1995)*, 25; Mullen, "Mass Destruction and Terrorism," 75–6. In a survey of professional opinion on this matter, most indicated higher skill levels are needed. Purver, *Chemical and Biological Terrorism*, 9–12. On middle ground, with college-level training, Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 98. On page 112, they state: "The minimum desirable group would have one competent microbiologist (undergraduate-level training or higher), one experimental physicist or mechanical engineer able to work with aerosol technology."

[124] To that effect, some with graduate degrees simply do not have the touch for this type of work. The level of degree is not as important as the applied knowledge. Interview with author: Dr. Jeff Mohr, Chief, Life Sciences, Dugway Proving Ground (18 September 2000); former Military Officer/Biodefense Expert (7 July 2000).

Instructions for how to mass produce, purify, and concentrate microbes can be found in textbooks and scientific journals.[125] Cookbooks for some biological agents, such as botulinum toxin and ricin, are known to be popular within terrorist circles. These publications include *The Poisoner's Handbook, Silent Death*, and the *Catalogue of Silent Tools of Justice*.[126] Most instructions in these cookbooks, however, are geared toward assassination rather than mass casualties.[127] Moreover, the recipes for some agents reportedly do not produce very strong results.[128]

The first production step is to inject the seed culture into a flask or fermenter that contains a suitable growth media. If the correct temperature, acidity, and other conditions are maintained, the seed culture will multiply. Those running the fermentation process must guard against genetic mutations and contaminants that would weaken or kill the biological agent.[129] Biowarfare agents, note a trio of experts, are notoriously "persnickety" to produce, such that slight mistakes with growth media, temperature, or other control parameters can result in failure.[130] When harvesting many agents, purity from 60 to 70 percent, which would be suitable for weapons purposes, can be "easy to obtain."[131] However, often there is a trade-off between

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[125] Commercial industry uses similar procedures for a wide variety of products. Center for Counterproliferation Research, *The NBC Threat in 2025: Concepts and Strategies for Adversarial Use of Nuclear, biological and Chemical Weapons* (Washington, DC: National Defense University, September 1996), iii; Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 73, 84; Mullen, "Mass Destruction and Terrorism," 74; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 33; Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 98, 114.

[126] The Minnesota Patriot's Council consulted instructions in the latter book, which is out of print, to make ricin. Carus, *Bioterrorism and Biocrimes*, 16.

[127] For example, *Silent Death*'s chapter on delivery focuses on such tactics as poisoning a target's food and mailing the poison to the target. When discussing a mass casualty attack with Botulinum toxin, the author turns to tainting water reservoirs, concedes the disadvantages of that strategy, and then recommends contamination of a well or a specific water pipeline without providing further details. A well and pipeline serve limited numbers of people. Uncle Fester also discusses the technically questionable strategy of using Roman candle fireworks as a dispersion device for nerve gas. Uncle Fester, *Silent Death*, 44–5, 105–6, 119–21. On the exaggerated utility and availability of cookbooks on the web, Marie Isabelle Chevrier, "The Aftermath of Aum Shinrikyo: A New Paradigm for Terror?" *Politics and the Life Sciences* 15, no. 2 (September 1996): 195.

[128] Apparently, analysis of ricin made using these cookbook recipes has shown results of between 4 to 6 percent agent purity, which is only a half-step above the ricin strength in the original castor beans. Interview with author: Biodefense Expert/PhD, International Relations (8 August 2000).

[129] US bioweaponeers trying to devise systems that would manufacture large quantities of agent were hindered by contamination problems. Regis, *The Biology of Doom*, 55–8.

[130] Interview with author: Biodefense Expert/PhD, International Relations (8 August 2000); former Military Officer/Biodefense Expert (7 July 2000). To underscore this point, Dr. Milton Leitenberg recalled witnessing another country's most senior scientist in their defense program, a noted *Clostridium botulinum* expert who had spent *over thirty-five years* working on solely that microorganism, approach colleagues to ask how their country had managed to produce this agent reliably. Remarks at the Association of Politics and the Life Sciences Conference, 1 September 2000, Washington, DC.

[131] Quote from page 88. See also page 91 in Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*. According to one panel, purity as high as 95 percent is needed for weapons effectiveness. See 1999 Gilmore panel report, 23.

high purity and agent stability.[132] The agent can be left in liquid form, but, as noted below, disseminating a wet slurry has its own set of complications.

The additional procedures to create a dry agent are technically advanced, extremely challenging, and hazardous. Producing a dry agent can boost the likelihood that infection will be induced in humans. The process centers on spray- or freeze-drying and milling the agent into particles in the 1 to 5 micron range. Since these featherweight particles can easily become airborne, milling is advisable only under high-level containment precautions.[133] The manufacturing techniques that lend stability and predictability to the agent have been described as "the real weapon" by a high-ranking veteran of the former Soviet biowarfare program.[134] The microbes can be coated with a thin layer of protective material to enhance their stability and survivability following dispersal.[135] Because of the complexity of the process, most experts conclude that terrorists are unlikely to have the technical finesse to produce dry agents. Moreover, observed one analyst, these technically sophisticated procedures are not likely to be featured in terrorist cookbooks.[136]

Forgoing dry agent, pathogens can be produced within a short timeframe. From inoculation of the fermenter to harvesting, botulinal toxin can be generated within several days, as can several kilograms of anthrax. Or, castor beans could be concentrated in a relatively simple process that results in ricin.[137]

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[132] Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

[133] Interview with author: Dr. Jeff Mohr, Chief, Life Sciences, Dugway Proving Ground (18 September 2000). Note that the pharmaceutical industry uses freeze drying, or lyophilization. Safety precautions range from ordinary face masks, goggles, and clothing to negative pressure biosafety cabinets, high-efficiency particulate air filters, and airlock containment rooms with work done in full containment "moonsuits." Ideally, workers are inoculated against the agent they are working with, but vaccinations are not available for all agents. During the 1940s, the Japanese made significant quantities of liquid agent with only rudimentary precautions. Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 91–3. On the need for safety precautions with the down-stream, post-production processes, International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 34–5; Jonathan B. Tucker, "Chemical/Biological Terrorism: Coping with a New Threat," *Politics and the Life Sciences* 15, no. 2 (September 1996): 174.

[134] One of the hallmarks of Alibek's career was to devise production techniques that enabled the more effective dissemination of anthrax. Alibek, with Handelman, *Biohazard*, 97.

[135] This process, called microencapsulation, involves such protective coatings as cellulose and gelatin. Colloidal silica, ultraviolet-resistant pigments, and other compounds can also be added to the agent to improve stability and dissemination effectiveness. Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 93–4.

[136] Lowe, "Analyzing Technical Constraints," 55. See also, Carus, *Bioterrorism and Biocrimes*, 24; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 34–5; Selden, "Assessing the Biological Weapons Threat," 15; William C. Patrick, III, "Biological Terrorism and Aerosol Dissemination," *Politics and the Life Sciences* 15, no. 2 (September 1996): 208. Agreeing that dry, microencapsulated agent is "probably beyond the reach of most non-state actors" but then arguing that such sophistication is not "necessary for effective attacks." Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 122.

[137] Listing the production time of botulinal toxin as three days, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 87, 91. On the ability to make several kilograms of a concentrated anthrax slurry in ninety-six hours or less, Tucker, "Chemical/Biological Terrorism," 174. According to another expert, about five days would be needed for botulinal toxin. The ability to produce anthrax within four days would depend on the quality of equipment and

Delivery of the Agent

The delivery of a biological agent can be accomplished with advanced technologies or much cruder devices. Nothing fits the definition of crude better than a bomb, a tool with which terrorists are quite familiar. The blast of standard bombs, however, would kill most of the agent and not disperse the remainder effectively. US bioweaponeers discovered decades ago that their first simple weapons dispensed as little as 1 to 2 percent of the agent in the ideal particle size range.[138] Both liquid and dried agents can be delivered as an aerosol. Other means of dispersal include the contamination of water and food, as demonstrated by the cases in boxes 2.2, 2.6, and 2.7. In addition, infected insects can be used as tiny delivery systems, and individual victims can be felled through the topical application of an agent or its injection.[139] Each particular agent performs more effectively when delivered in some ways rather than others.[140]

One of the most enduring fears is that terrorists will poison a community's water supply. The Chicago area terrorist group R.I.S.E plotted to do just that, as box 2.6 recapitulates. What would work in favor of a reservoir-poisoning attempt is that such locations ordinarily are not well guarded, and several biowarfare agents are relatively stable in water. What works against this delivery approach is the truly enormous quantity of agent that would have to be dumped into a city's water supply to cause any adverse

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technical skill. Finally, since only a tiny quantity of ricin can be extracted from each castor bean, a huge cache of beans would be required to derive a large quantity of ricin. Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

[138] Patrick, "Biological Terrorism and Aerosol Dissemination," 208. Accounts of early US biological bomb testing and the challenges of minimizing particle size can be found in Regis, *The Biology of Doom*, 51–4.

[139] Carus, *Bioterrorism and Biocrimes*, 21. In 1978, the Bulgarian government assassinated exiled novelist Georgi Markov in London using the toxin ricin and a creative delivery means supplied by the Soviet Union. With a faux umbrella, a Bulgarian operative fired a ricin-filled pellet into Markov's leg. The fill holes drilled in the pellet had been sealed with a waxy substance, designed to melt at body temperature and release the poison directly into the bloodstream. Markov died several days later. Sidell, Takafuji, and Franz, eds. *Textbook of Military Medicine*, 420–421; David Wise, "Was Oswald a Spy, and Other Cold War Mysteries," *New York Times,* 6 December 1992; R.W. Apple, Jr., "Pope Case Reminds Britons of Unsolved Bulgarian Crime," *New York Times*, 30 December 1982; Glenn Frankel, "Bulgaria to Probe Poison-Pellet Murder of Exile Who Criticized Zhivkov," *Washington Post*, 11 January 1990. That same year, a different tack was taken by an extremist Palestinian group that spiked oranges grown in Israel with mercury in an effort to sabotage the Israeli economy. The contaminated fruit was unknowingly distributed in Europe, causing a dozen or so individuals in the Netherlands and West Germany to fall ill. Dusko Doder, "Terrorists Poison in Israeli Oranges," *Washington Post*, 2 February 1978; "Most Orange Sales Halted in Europe as More Poisoned Fruit Discovered," *Washington Post*, 3 February 1978; "Dirtywork Orange" *Economist*, 4 February 1978, 62. The Japanese biological warfare program in the 1930s used plague-infected fleas to spread disease in China. One report estimated that breeding facilities in Harbin could yield 135 million fleas every three to four months. SIPRI, *The Problem of Chemical and Biological Warfare*, Vol. I, 114–5. On several occasions, Japanese aircraft dropped mixed payloads of wheat, rice, and plague-infected fleas onto Chinese towns, instigating plague outbreaks. Regis, *The Biology of Doom*, 17–9.

[140] For example, a very large amount of botulinum toxin would be needed to achieve a lethal dosage via aerosol dissemination. If food were tainted with this agent, however, the lethal dosage is much smaller and people will fall ill more rapidly. Lowe, "Analyzing Technical Constraints," 56.

health effects.[141] A couple of gallons of biological agent would be quickly diluted. Moreover, before water reaches the tap it is often purified with chemicals, such as chlorine, which "would destroy all but the hardiest [biological] agents."[142] Chemicals commonly used to purify water, such as gaseous chlorine and sodium hypochlorite, kill the microbes that cause glanders, plague, Q fever, epidemic typhus, encephalomyelitis, viral hemorrhagic fevers, smallpox, typhoid, and cholera, the most lethal water-borne agent.[143] On its way to the spigot, some of the agent would also bind, nonspecifically, to the pipes.[144] Consequently, one seasoned water safety manager stated that even though contemporary monitoring and treatment systems would not necessarily detect or inactivate all biological agents, successful water contamination was "a very unlikely event, very low probability."[145] Thus, the one feasible water-borne route of attack would be to inject agent into a trunk line somewhere with a city's water system.[146] In that event, only the portion of the population served by the trunk line would be at risk, and the number of possible casualties could be further reduced if the agent used were temperature sensitive and consumers used additional water filtration systems (e.g.,

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[141] W. Dickinson Burrows and Sara E. Renner, "Biological Warfare Agents as Threats to Potable Water," *Environmental Health Perspectives* 107, no. 12 (December 1999): 982. Moreover, ingestion is often not the most harmful route of exposure for most biowarfare agents. Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

[142] Quote from International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 34. Steve Clark, "Remarks of the Chief, Drinking Water Policy Technical Branch, Environmental Protection Agency," in *Proceedings of the Seminar of Responding to the Consequences of Chemical and Biological Terrorism*, Office of Emergency Preparedness (Washington, DC: US Public Health Service, Department of Health and Human Services, 11–14 July 1995), page 1–127. Clarke stated that Los Angeles authorities did take the precaution of guarding their reservoir during the 1984 Olympics, but most of the nation's water system is not monitored around the clock. See also, W. Seth Carus, "The Threat of Bioterrorism," *Strategic Forum* 127 (September 1997): 1–2.

[143] Burrows and Renner, "Biological Warfare Agents as Threats to Potable Water," 977–9. Many water purification plants in the United States are switching from using gaseous chlorine to sodium hypochlorite. Interview with author: Waste water treatment specialist (14 August 2000). For data on the chemicals used to purify municipal water supplies, consult the American Waterworks Association and the Waste Water Environment Association. If those exposed do not receive proper treatment, cholera can be lethal for up to 60 percent of those infected. Sunlight also quickly kills cholera. Lowe, "Analyzing Technical Constraints," 54; Burrows and Renner, "Biological Warfare Agents as Threats to Potable Water," 977–8.

[144] Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

[145] Clark, "Remarks of the Chief, Drinking Water Policy Technical Branch," 1–127.

[146] *Health Aspects of Chemical and Biological Weapons* (Geneva: World Health Organization, 1970), 114; Burrows and Renner, "Biological Warfare Agents as Threats to Potable Water," 982. Also, interview with author: former Military Officer/Biodefense Expert (7 July 2000).

Box 2.7: Portrait of a Revenge Poisoning

The 1984 contamination of The Dalles, Oregon salad bars by the Rajneeshee cult, discussed in box 2.2, was not the first instance where terrorists sought to distribute biological agents on food. Almost four decades earlier, a group of Jewish concentration camps survivors set out to poison the very Nazis who had killed millions of Jews with cyanide. Abba Kovner, the leader of a group called DIN, a Hebrew acronym for Avenging Israel's Blood, vowed "six million for six million." Since Kovner and his followers felt that any German—man, woman, or child—was a legitimate target for revenge, they at first planned to poison the water supplies of several German cities and prisoner camps where elite Nazi Gestapo and SS troops were being held. Kovner's arrest and the confiscation of DIN's supplies of poison forced the group to set its sights on Stalag 13, where captured Nazi SS soldiers were being held near Nuremberg, Germany.[1]

Through contacts in the leather-making industry, DIN obtained 40 pounds of arsenic, which they secreted into Germany. Knowing that the German troops almost exclusively ate black rye bread, DIN planned to coat the bottom of black rye loaves with an arsenic and glue mixture. The three DIN members who infiltrated the Stalag 13 bakery on 13 April 1946 apparently shielded themselves during this operation by wearing gloves and protective glasses and using brushes to paint the bottom of the bread loaves. They set out to poison fourteen thousand loaves of bread, but succeeded in contaminating less than three thousand. Only two of the six arsenic-filled bottles that DIN members smuggled into the camp were emptied. The outcome of the poisoning has not been firmly established, but records show that 207 inmates were admitted to the hospital and in all 2,283 were sickened. DIN members give a drastically different account of the mission's results, claiming that 4,300 fell ill, one thousand were hospitalized, and at least seven hundred died or were paralyzed.[2]

DIN's poisoning plots materialized from the human devastation that it sought to avenge. Two analysts who closely examined DIN's activities believe that this group may not have expected to survive its missions. Furthermore, they do not rule out the possibility of another DIN-type group since atrocities of ethnic cleansing and genocide persist.[3]

NOTES

1. Ehud Sprinzak and Idith Zertal, "Avenging Israel's Blood (1946)," in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons,* ed. Jonathon B. Tucker (Cambridge, Mass: MIT Press, 2000), 17, 25–7, 29–30, 32–3.
2. Ibid., 33–6.
3. Ibid., 40–1.

charcoal filters).[147] Terrorists would also have to contend with the operational challenge of how to tap into a trunk line without arousing suspicion.

One of the reasons biological agents may be so attractive for state and non-state actors alike is that relatively unsophisticated delivery systems can purportedly do the job just as well as, or better than, high-tech delivery methods. In fact, some have argued that "there is no need to create high-quality aerosols," that

[147] To illustrate the point, individual water purifiers could remove anthrax spores, and water heated for cooking purposes could inactivate plague. Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

"improvised sprayers or bursting charges" will suffice for agent dissemination.[148] Others point out that if the microscopic particle size is not achieved, mass casualties will not result. "If it is not the right particle size, it is just not going to work," said one dispersal expert.[149] Hand-held or truck-mounted sprayers are among the rudimentary options often mentioned. Others include flying a crop duster upwind from the target or placing an aerosol generator on an offshore ship. Such tactics will generate what is known as a "line source," which will carry agent downwind, possibly infecting those living in a large area.[150]

For these delivery modes to result in mass infection, terrorists would need to have prepared the agent properly and worked through several technical calculations. Facets that must be deciphered include the concentration of agent in the delivery system, the degradation effect of the delivery system on the agent, and the requisite dosage to incapacitate or kill human or animal targets. For open air delivery, the meteorological conditions and the effectiveness of the agent under those conditions must be taken into account.[151] In short, terrorists cannot count on just filling the delivery system with agent, pointing the device, and flipping the switch to activate it. Those with epidemiological or aerosol testing skills would contend more successfully with the necessary computations.[152]

The solution to terrorists' dispersal woes might appear to be a quick stop at a local hardware or other supply store to purchase one of several industrial, agricultural, or even medical aerosol generators or sprayers. However, most off-the-shelf sprayers either do not generate sufficiently small particle aerosols or have low throughput rates. Therefore, purchased equipment would have to be modified or a sprayer built from scratch.[153] Such technical modifications may not appear to be complicated, but turn out to be quite

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[148] Quote in text from page 108. Elsewhere, this trio of authors describes effective dissemination of a respirable aerosol as "[t]he most significant technical challenge" for terrorists, noting that the most advanced systems that "could produce extremely high casualties over wide areas . . . remain beyond the reach of most states and most conceivable non-state actors." Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 98–9.

[149] Interview with author: Dr. Jeff Mohr, Chief, Life Sciences, Dugway Proving Ground (18 September 2000). Among other sources on particle size, Jonathan B. Tucker, "Measures to Fight Chemical/Biological Terrorism: How Little Is Enough?" *Politics and the Life Sciences* 15, no. 2 (September 1996): 241.

[150] The high-tech options, which terrorists probably could not manufacture and may not be able to afford, include cruise missiles and ballistic missiles with cluster warheads. Central Intelligence Agency, *The Chemical and Biological Weapons Threat (1996)*, 17; Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 73, 94, 96; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 35; Center for Counterproliferation Research, *The NBC Threat in 2025*, iii.

[151] Lowe, "Analyzing Technical Constraints," 61–2; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 36–7.

[152] Lowe, "Analyzing Technical Constraints," 61–2. Arguing that "aerosol dissemination of biological agents may be beyond the capabilities of groups developing their own dissemination technology," Carus, *Bioterrorism and Biocrimes*, 31.

[153] In a day or so, according to one study, an engineer with electrical and mechanical skills and knowledge of aerosol dispersal could scratch-build a sprayer or burster. Falkenrath, Newman, and Thayer, *America's Achilles' Heel*, 108, 121–2. Note that while home vaporizers and pocket-sized aerosolizers are also mentioned as dissemination options, these devices lack the

significant and delicate because of the need to keep the microorganisms alive. When very fine nozzles are affixed to an aerosol sprayer, the majority of the sprayer's contents can be transformed into microscopic droplets of the appropriate size,[154] but extensive testing can be required to confirm the results. Otherwise, the dispersal is literally a shot in the dark. Another difficulty with sprayers is that a liquid slurry can clog the nozzles of even specially designed sprayers.[155] Spraying also involves mechanical stresses that can inactivate large numbers of microorganisms. This cell death rate is particularly acute with liquid slurry, where a sprayer can kill 95 percent or more of the microorganisms.[156] Also, a liquid aerosol usually does not remain suspended in the air for long distances, resulting in limited downwind coverage.[157]

When an aerosol is released into the open air, other factors combine to reduce the number of live microbes that reach the intended targets. Biological agents have extreme sensitivity to sunlight, humidity, pollutants in the atmosphere, temperature, and even exposure to oxygen, all of which can kill the microbes. Once released, some agents lose their virulence at rates of 10 to 30 percent per minute, others at a slower rate of 2 percent per minute.[158] Cell death will not be as severe if a microencapsulated dry agent is dispersed.

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capacity to cause mass infections. Interview with author: Dr. Jeff Mohr, Chief, Life Sciences, Dugway Proving Ground (18 September 2000).

[154] Stating that 85 percent of the material would be reduced to the appropriate particle size, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 95. Estimating that closer to 60 percent of the agent would be of the right particle size, interview with author: former Military Officer/Biodefense Expert (7 July 2000).

[155] Tests are important not only to authenticate particle size, but to ascertain how the particular agent is reacting to the environmental stresses of dispersal. Interviews with author: Dr. Jeff Mohr, Chief, Life Sciences, Dugway Proving Ground (18 September 2000); former Military Officer/Biodefense Expert (7 July 2000). Also, Carus, *Bioterrorism and Biocrimes*, 24; Patrick, "Biological Terrorism and Aerosol Dissemination," 209; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 34–5.

[156] On a 99 percent kill rate, Carus, *Bioterrorism and Biocrimes*, 24. Another source puts the cell death kill rate as high as 95 percent. If microencapsulated, fewer microbes in a dry agent are likely to die in the spray process because their spore-like coating protects the organisms from the mechanical forces of dissemination. Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 94, 96. See also, Mullen, "Mass Destruction and Terrorism," 82. On the susceptibility of *Francisella tularensis*, which causes tularemia, to mechanical stress, SIPRI, *The Problem of Chemical and Biological Warfare*, Vol. II, 64.

[157] Tucker, "Measures to Fight Chemical/Biological Terrorism: How Little Is Enough?" 241. The trade-offs between liquid and dry agents are well-expressed by Patrick: "Procedures and equipment for producing liquid biological agents are simple, but the resulting product is relatively difficult to disseminate into small particle, infectious aerosols. Conversely, procedures for producing dried biological agents are more complex and require more sophisticated equipment; yet, this product is readily disseminated and by any number of crude devices." Patrick, "Biological Terrorism and Aerosol Dissemination," 208.

[158] Decay rates for Venezuelan equine encephalitis, tick-borne encephalitis, yellow fever, influenza are estimated at 30 percent; for epidemic typhus, Rocky Mountain spotted fever, Q fever, at 10 percent; for brucellosis, plague, tularemia, at 2 percent; and for anthrax at 0.1 percent. *Health Aspects of Chemical and Biological Weapons*, 93–4. Also on this point, see Carus, *Bioterrorism and Biocrimes*, 25; Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 82, 96; Mullen, "Mass Destruction and Terrorism," 78; International Institute for Strategic Studies, "Biological Weapons: New Threats or Old News?" 36; Lowe, "Analyzing Technical Constraints," 55. On cold, dark nights, decay rates will approach zero for many agents. Interview with author: former Military Officer/Biodefense Expert (7 July 2000).

Some aerosol particles can last several hours, but decay will continue following the very rapid degradation that occurs in the first seconds and minutes after the release.[159]

Although releasing agent into the air handling system of a building will keep the agent from being exposed to sunlight, this delivery approach is often oversimplified. Other environmental forces, such as humidity, heat, and the mechanical stresses of forcing the agent through the air handling system, will take their toll on the agent. Also, the terrorist will need to know technical information about the building (e.g., cubic foot space, the ventilation system's rate of air exchange) to figure out how much agent needs to be dispersed to infect the building's occupants. Without such data, the outcome of an assault via air ducts has been likened to "blind luck."[160]

Another low-tech delivery option that circumvents the sunlight problem is to release agent in a subway system. In this scenario, an open container of agent is placed in the subway, allowing the passage of trains to push the agent through the tunnels. In mid-1966, the US Army conducted a test in the New York City subway system using the anthrax simulant *Bacillus globigii.* Had actual *Bacillus anthracis* been employed, the Army estimated a considerable death toll would have resulted. Other Army tests showed the feasibility of another low-tech delivery scheme—disseminating agent from the deck of a ship cruising slowly off the coastline.[161]

STATISTICAL TRENDS IN CHEMICAL AND BIOLOGICAL TERRORISM

Historical analysis can provide a much sounder understanding of what terrorists have and have not done with chemical and biological agents than what-if speculation. For instance, the database kept since 1968 by St. Andrews and RAND, which tallies international as opposed to domestic terrorist events, shows over nine thousand terrorist incidents. Terrorists crossed paths with weapons of mass destruction on less

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[159] Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, 94, 96.

[160] Lowe, "Analyzing Technical Constraints," 55.

[161] In 1950, the Army conducted two sea trials using the simulants *Bacillus globigii* and *Serratia marcescens*. In the first, winds took agents off the two ships on the Virginia coast and bathed the cities of Norfolk, Hampton, and Newport News. Similar tests followed near San Francisco, where the same two simulants and fluorescent particles of zinc cadmium sulfide were released from ships. In that demonstration, the simulants blanketed the bay city and spread twenty-three miles inland. An estimated 800,000 people inhaled a minimum of five thousand fluorescent particles. For more information, see Regis, *The Biology of Doom*, 116–9; Leonard Cole, *Clouds of Secrecy: The Army's Germ Warfare Tests Over Populated Areas* (Totowa, NJ: Rowman & Littlefield, 1988). See also *US Army Activity in the US Biological Warfare Programs: 1942–1977*, Vol. 2 (Washington, DC: Department of the Army, 24 February 1977), IV-E-1-1 and 2.

than one hundred occasions in this database's time span—inclusive of attempts to acquire or make their own devices, threats to use such weapons, or cases of actual use.[162]

The Center for Nonproliferation Studies at the Monterey Institute of International Studies maintains a database of public-source information tracking sub-national actors' activities with chemical and biological substances.[163] While this database does not contain any classified records that might be even more illuminating, it nonetheless provides insight into how far and how frequently terrorists have progressed toward acquisition and use of chemical and biological warfare agents. Monterey does not send field investigators out to confirm the exact circumstances of cases, but extensive identification and screening procedures are employed to govern which are added to the database.[164]

For the period from 1975 through 4 August 2000, the database shows 139 US cases wherein politically or ideologically motivated groups or individuals were in some fashion connected to chemical or biological substances. Biological cases constituted almost double the number of chemical cases. Internationally, the total number of cases was much higher, standing at 203, and chemical cases were almost four times as prevalent as biological cases. The largest percentage of these cases, as table 2.7 shows, involved chemical substances overseas.

The Monterey database bears out the view that certain types of groups would be more inclined than others to get involved with chemical and biological substances. Taking into account both domestic and international cases, which total 342 for the time period in question, the database traces just over 18 percent

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[162] 1999 Gilmore panel report, 37. In another database focusing on sub-national actors and chemical and biological agents between World War I and 1994, there were 168 incidents involving chemical agents, thirty-three involving biological agents, and forty-three involving unidentified materials. Some 75 percent of the cases involved actors like criminals, psychotics, and disgruntled employees, leaving just 25 percent of the incidents attributed to political motives. The activities took place in twenty-six countries. Sixty percent involved the actual use of agents, 10 percent the acquisition of agents, and 30 percent only the threat to use. This study, completed in 1994, is based on a very broad definition of terrorism that includes toxic tampering with medicine and food. Brad Roberts, "Has the Taboo Been Broken?" in *Terrorism with Chemical and Biological Weapons*, 123–124; Jonathan B. Tucker, "Introduction," in *Toxic Terror*, 1–2, fn. 1.

[163] The Monterey staff separates database cases into two broad categories, one of which is composed of individuals or groups with criminal motivations. In 1999, for instance, roughly half of the cases entered into the database involved criminal motivations. Since this report pertains to chemical and biological terrorism, neither criminally motivated cases nor cases involving nuclear and radiological incidents will be discussed. The entire database includes over 850 cases worldwide dating back to 1900. The Stimson Center is particularly grateful to Jason Pate and Lindsay DeFazio for their assistance with the data runs presented in this report. For an analysis of the criminal and terrorist cases in 1999 alone, see Gavin Cameron, Jason Pate, Diana McCauley, and Lindsay DeFazio, "1999 WMD Terrorism Chronology: Incidents Involving Sub-National Actors and Chemical, Biological, Radiological, and Nuclear Materials," *The Nonproliferation Review* 7, no. 2 (Summer 2000): 157–74. For an analysis of the biological components of the database, see Jonathan B. Tucker, "Historical Trends Related to Bioterrorism: An Empirical Analysis," *Emerging Infectious Diseases* 5, no. 4 (July/August 1999): 498–504.

[164] Strings of key words are used to search open-source materials to identify candidate cases, followed by additional research once a case is flagged. According to Jason Pate of Monterey, a case is added to the chemical and biological terrorism section of the database when reports indicate that a perpetrator with political or ideological motives is deliberately involved with a chemical or biological substance.

Table 2.7: Overall Numbers of Terrorist Cases Involving Chemical and Biological Substances (1975 to 4 August 2000)

Type of Terrorist Cases	Number of Domestic Cases (Percentage of Worldwide Total)	Number of International Cases (Percentage of Worldwide Total)	Total Number of Cases Worldwide
Involving Chemical Substances	46 (22.2%)	161 (77.8%)	207
Involving Biological Substances	93 (68.9%)	42 (31.1%)	135
Total	139 (40.6%)	203 (59.4%)	342

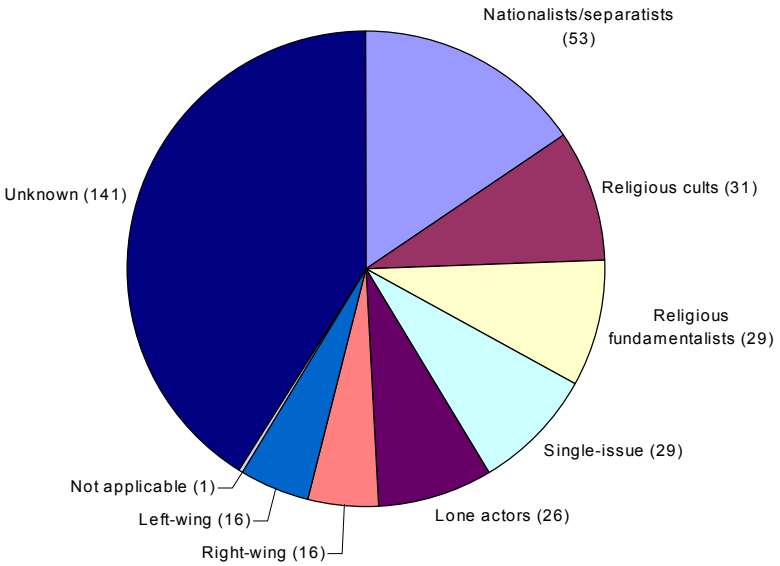
of the cases to religious groups, including thirty-one cult cases and twenty-nine cases attributed to fundamentalist religious organizations. A high number of cases are connected to nationalist and separatist groups, as figure 2.1 shows. Cases appertaining to right-wing groups, mentioned by experts as likely candidates for involvement with this sort of weaponry, appeared much less frequently. For its part, the FBI has expressed concern about lone offenders, right-wing extremist groups, and religious/apocalyptic sects.[165]

Figure 2.2 shows the motivations that groups or individuals professed for their actions. Some linkages can be established between group types and motivations, but there is no consistent or direct correspondence between the most prevalent type of group and the motivations that recur most frequently. Of the links that can be made with reasonable confidence, nationalist and separatist groups were most often acting to establish sovereignty. Many of the single-issue group cases were associated with the protest of abortion or of the treatment of animals. Ideology or belief systems were a prime reason behind many of the religious fundamentalist cases, but the lone actors were motivated by several of the causes listed.[166] Although Monterey does not list as a motivational factor the intent to cause mass casualties, that goal is specified in a biological incident database that National Defense University scholar Seth Carus oversees. This database contains twenty-three confirmed terrorist cases involving biological materials from 1910 to

[165] Louis J. Freeh, FBI, testimony before the Senate Appropriations Committee, Subcommittee on Commerce, Justice, State and the Judiciary, 106th Cong., 1st sess., 4 February 1999.

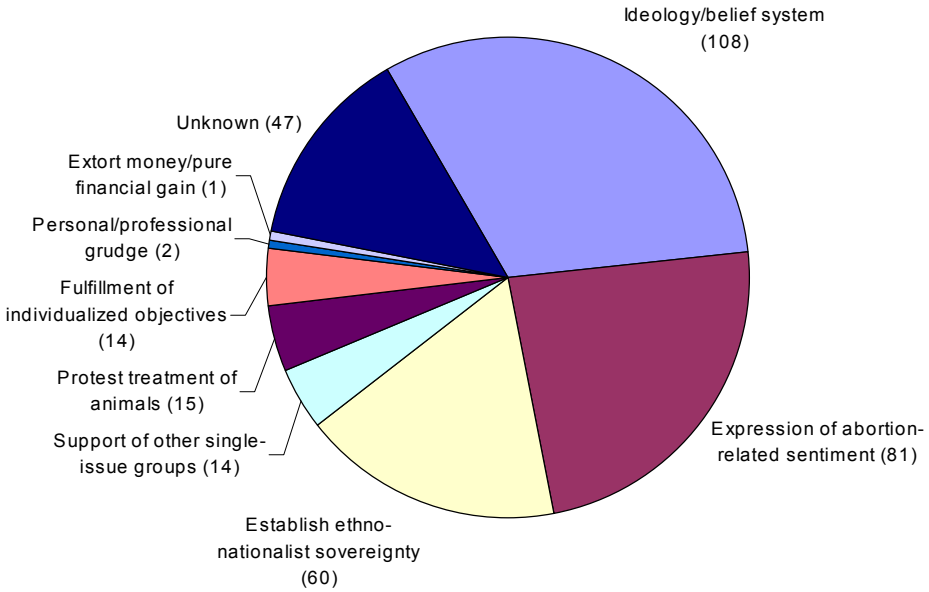
[166] Linkages between group types and motivations are, of course, case specific. The author received assistance in understanding these linkages on 24 July 2000 from the individual who oversees maintenance of the database, Jason Pate of the Center for Nonproliferation Studies at Monterey.

Figure 2.1: Affiliations of Groups with Chemical and Biological Substances*



*Definitions: A single-issue group is one backing a sole cause (e.g., animal rights). The non-applicable case fit none of the other definitions because it concerned a group of students with possible political affiliations who obtained tear gas on 28 February 2000, in Bethlehem, Israel.

Figure 2.2: Motivations for Groups with Chemical and Biological Substances



1999. In descending order of frequency, the motives are indexed as: to terrorize (5 cases); to murder specific individuals (4 cases); for unknown reasons (4 cases); to commit mass murder (3 cases); to damage livestock and/or crops (2 cases); to incapacitate (2 cases); and to make a political statement (1 case).[167]

Next, insight into the gravity of the unconventional terrorism threat can be gained by examining the frequency of different types of terrorist activities. Any time that a terrorist group contemplates involvement with chemical or biological substances, it should at least be a matter of note. For analytical purposes, a line can be drawn between activities of lesser and possibly greater concern. Sometimes a prank is just a prank, and talk of a plot is idle. Accordingly, when terrorists move past pranks and plots to acquisition, possession, threats with possession, and/or use, the latter activities signify a more serious and purposeful terrorist association with these substances. Table 2.8 shows that the most frequent activity in the United States falls under the heading of threats, pranks, or hoaxes. Overseas, the most recurrent activity is at the opposite end of the spectrum, cases of use.

The range of terrorist activities connected with chemical and biological substances can be further subdivided into those meriting possible serious and grave concern. In the former category, one can reasonably place activities such as attempted acquisition, possession, and threat with possession. Crossing the threshold to actual use of a chemical or biological substance could be weighted as an act of possible grave concern. Domestically, 8 percent of the cases fell into the possible serious concern category and use cases tallied 26 percent of the total activities. Internationally, 28 percent of the cases were of possible serious concern and a hefty 44 percent of possible grave concern. The double lines in table 2.8 illustrate these groupings; the pie charts in figure 2.3 also depict these different levels of concern.

Gross characterizations can sometimes give misleading impressions, however, so it is important to parse the data further by considering what substances were involved in the cases of possibly serious and grave concern. Should the bulk of these cases involve extremely lethal substances and large numbers of injuries, the data would lend credence to forecasts that terrorists are leaning toward escalation to mass casualty attacks with poison gas and germ agents. Conversely, if the casualty tally runs low and the biological and chemical substances involved are what might be termed low-end materials—incapacitating or somewhat toxic substances as opposed to lethal agents—then the data would support an argument that terrorists are neither as inclined nor as capable of launching mass casualty attacks with these weapons as some have posited.

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[167] This database presents five cases of confirmed use, three additional cases of confirmed possession, and six cases where terrorists showed interest in biological agents. In nine other instances, terrorists engaged in threat or hoax activities with bioagents. A one-to-one correlation between the number of motives and of cases does not exist. Carus, *Bioterrorism and Biocrimes*, 8–10.

Table 2.8: Comparison of Terrorist Activities with Chemical and Biological Substances (1975 through 4 August 2000)

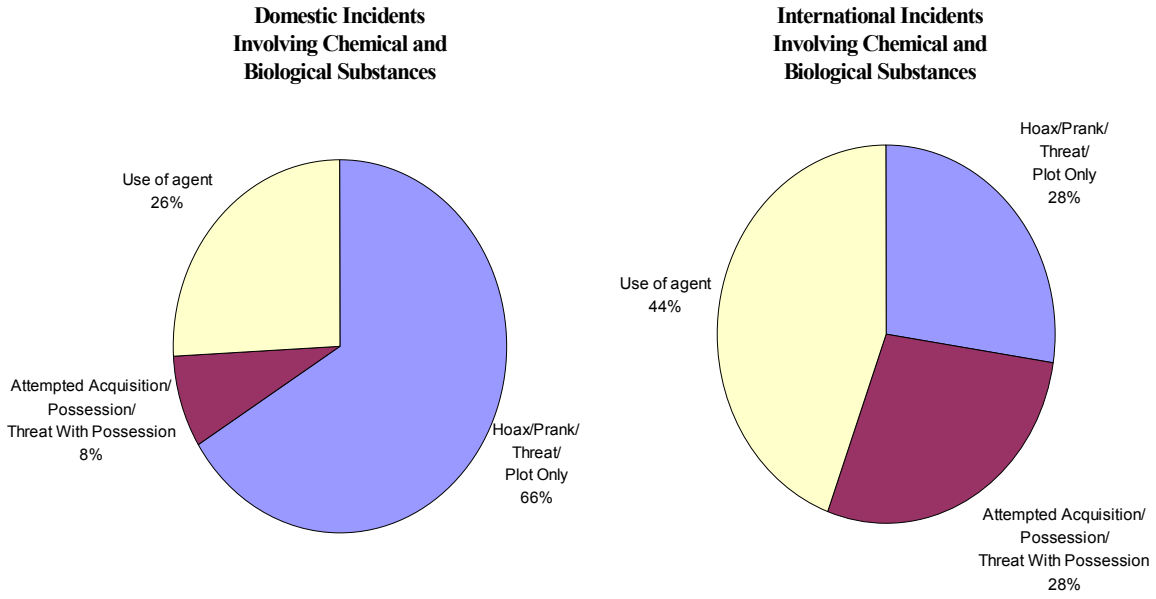
Type of Activity*	Number of Domestic Incidents	Number of International Incidents
Hoax/prank/threat	83	37
Plot only	9	19
Attempted acquisition	1	8
Possession	6	42
Threat with possession	4	7
Use of agent	36	90

* Definitions for case classification: A hoax is a non-credible, empty threat. In a plot case, the group or individual considered, planned, or threatened to use a substance but did not possess it. An attempted acquisition case involved perpetrators that tried to obtain materials and were interdicted after doing so or failed to acquire the substance. In a possession case, the perpetrator had the material, but did not use or threaten to use it. Threat with possession cases involve perpetrators that had the substance and issued threats that were not fulfilled. Use cases are self-explanatory.

In the years surveyed, terrorists attempted to acquire, possessed, or possessed and threatened to use over sixty types of chemical and biological substances. In descending order of frequency, the substances involved in these categories of activity were anthrax (85 cases), various types of cyanide (45 cases), unspecified chemical agents or poison gases (40 cases), tear gas (24 cases), butyric acid (22 cases), unspecified biological agents (19 cases), sarin (9 cases), rat poison (9 cases), botulinum toxin (8 cases), insecticides and pesticides (7 cases). The nerve agent VX and ricin were each involved in six cases, and five cases apiece related to acid and unspecified poisons. The remaining cases involved substances that were mentioned three or fewer times. Some of the more noteworthy substances that infrequently appeared in the Monterey database were Ebola, Legionnaires Disease, snake venom, smallpox, malaria, yellow fever, arsenic, foot and mouth disease, plague, chlorine, and weed killer.

While it is hard to know what to make of unspecified poisons and biological agents, a few observations can be made about the other items listed. With two obvious exceptions, these substances have ample killing potential for individuals and in several instances for mass casualties. The exceptions are the forty-six cases concerned with tear gas and butyric acid. This roster of substances contained some of the household or hardware store variety (e.g., rat poison, insecticides, weed killer), a few quite exotic substances (e.g., snake venom), as well as others known to have been weaponized by governments. Several of these warfare and exotic substances, however, do not turn up in the use cases. The Carus database provides some insight into the routes terrorists took to obtain biological agents, working from eight confirmed cases of acquisition. In one case apiece, terrorists obtained the agent from a legitimate supplier, stole it, or

Figure 2.3: Comparison of Domestic and International Incidents Involving Chemical and Biological Substances



manufactured it by themselves. Terrorists isolated agent from natural sources in two cases, and the origins of the agent are unknown in three cases.[168]

The three substances that terrorists used most prevalently were all chemicals: butyric acid (22 cases), cyanide (20 cases), and tear gas (14 cases). The second item on that list, cyanide, immediately draws attention because of its lethality and battlefield use during World War I. The database attributes twelve deaths and seventy-three injuries to terrorist use of cyanide.[169] The other two preferred-use substances, however, were irritants, not super-toxic chemicals.[170] The foul-smelling butyric acid was employed in attacks on abortion clinics in Florida, Louisiana, and Texas in the summer of 1998. These attacks nauseated people

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[168] Carus, *Bioterrorism and Biocrimes*, 15–6.

[169] The database lists fifteen cases under the generic heading of cyanide, one case apiece as potassium cyanide and cyanide sodium, and one case as involving cyanide and barium nitrate. Aum Shinrikyo also attempted to release hydrogen cyanide on two occasions, injuring four.

[170] Butyric acid is approved by the Food and Drug Administration for use as a food additive and is used in artificial flavorings, perfumes, and disinfectants. The National Fire Protection Association rates butyric acid as a moderately flammable material that can produce poisonous gases in the event of a fire. If skin contact occurs, butyric acid can cause irritation and burns of the eyes and skin. If fumes are inhaled irritation, nausea, coughing, and shortness of breath can result. New Jersey Department of Health and Senior Services, *Hazardous Substance Fact Sheet: Butyric Acid* (Trenton, NJ: New Jersey Department of Health and Senior Services, August 1998).

and caused some brief hospitalizations, but no serious injuries resulted.[171] Tear gas is a well-known incapacitating agent, used by law enforcement authorities for riot and crowd control purposes. The database attributes just over seventy injuries to the terrorist use of tear gas.[172]

Unspecified chemical agents and poison gases featured in another thirteen cases. By far the largest incident in that category occurred on 27 March 1983 in the West Bank, when an unknown gas nauseated 694 school girls.[173] Insecticides and pesticides were the chosen substances in six cases, the most notable of which is a 1987 case in Mindanao, where an unknown group contaminated drinking water and caused nineteen fatalities and 140 injuries. Aum Shinrikyo accounts for multiple use cases. Nine of the database cases pertain to the cult's use of the chemical warfare agents sarin, VX, and hydrogen cyanide, which are credited with causing forty deaths and 1,453 injuries from the Tokyo and Matsumoto attacks, assassinations of enemies, and murders of its own members. On several occasions, the cult also tried to disperse the biological agents anthrax and botulinum toxin, as chapter 3 discusses, but no injuries resulted. No other group or individual registers among the Monterey use cases involving warfare agents. Otherwise, there were no real clusters of use activity around a specific chemical or biological agent, with the bulk of the use cases involving one incident only.[174] The most notable case in this category dates back to the spring and summer of 1995, when a woman and her son in the Guangdong province of China, bent on righting wrongs as perceived by their own ideology, used rat poison on several occasions to kill eighteen and injure 160.

The Monterey database records 154 chemical fatalities due to chemical terrorism, all outside of the United States. The sole US fatality that can be attributed to chemical or biological terrorism in the last one hundred years predates this twenty-five-year survey of activity.[175] Hands down, the largest US incident is the case discussed in box 2.2, when 751 fell ill due to the Rajneeshee cult salmonella taintings in 1984. Overseas, the aggregate numbers for injuries and deaths are much higher, as noted in table 2.9. A point reemphasized in this table is the terrorist preference abroad for chemical, not biological substances. Worldwide, the Monterey database attributes two deaths to bioterrorism from 1975 to mid-2000. According

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[171] Michael J. Sniffen, "US Posts $500,000 Reward for Slayer of Abortion Doctor," *Associated Press*, 10 November 1998; Pauline Arrillaga, "Acid Spilled at Abortion Clinics," *Associated Press*, 9 July 1998; Judith Havemann, "Texas Abortion Clinics Are Sprayed With Acid; Chemical Attacks Probed in 2 Other States," *Washington Post*, 9 July 1998.

[172] If those exposed to tear gas leave the vicinity of the agent cloud, symptoms (e.g., tearing, burning sensation on the skin) dissipate within fifteen minutes to thirty minutes, or sooner. Sidell, "Riot Control Agents," 307–24.

[173] The other twelve cases in this category involved one death, and injuries in these cases ranged from eight to zero.

[174] The lengthy list of single-use substances includes barium nitrate, arsenic, blue methylene, carbamate, toxic waste, chlorine gas, hepatitis, an unspecified household product, influenza, medfly, an unspecified nerve gas, pesticide, phosgene gas, an unspecified poison, salmonella, salmonella Typhimurium, sewer water, sulfuric acid, battery acid, and weed killer.

[175] In 1973, the Symbionese Liberation Army assassinated a school superintendent in Oakland, California with a cyanide-tipped bullet. Tucker and Sands, "An Unlikely Threat," 49.

Table 2.9: Casualties Attributed to Chemical and Biological Terrorist Incidents (1975 through July 2000)

Location of Incident	Chemical Injuries	Biological Injuries	Chemical Fatalities	Biological Fatalities
Domestic	83	752	0	0
International	2409*	0	150	2
Total	2492	752	150	2

* Given the frequently cited statistic of over 5,500 injured in the 20 March 1995 Aum Shinrikyo terrorist subway attack alone, this number may be lower than some expect. As noted in chapter 3, medical authorities categorized a total of 1,038 patients who reported to hospitals that day as suffering the symptoms of sarin gas exposure. Eventually, twelve of the subway commuters died.

to Carus' database covering the 1910 to 1999 time period, the confirmed bioterrorism death toll is zero, and only one case produced injuries, the Rajneeshee salad bar poisonings.[176]

Another cut at the Monterey data reveals the scale of harm that terrorist groups or individuals precipitated when they used chemical and biological substances. Out of the 126 use cases, five terrorist attacks caused ten or more deaths. Each of these cases involved chemical substances, as did two attacks that resulted in seven deaths apiece.[177] Three of the cases resulted in ten or more dead or injured. Aum's subway sarin attack injured over one thousand, the Rajneeshee over 750, and the unattributed attack on the West Bank school girls almost seven hundred. Over one hundred were injured in three additional chemical cases, and in two instances of tear gas use, fifty or more were harmed. Finally, four other cases involved more than ten injuries. Injuries and deaths occurred on a smaller scale in the remainder of the cases, with seventy-five resulting in neither fatalities nor injuries. Terrorists have certainly employed some lethal substances in their

[176] In 1952, advocates of Mau Mau liberation are thought to have used a plant toxin, possibly African milk bush, to poison several dozen livestock in present day Kenya. In October 1981, a group called Dark Harvest protesting the British testing of anthrax on Gruinard Island during World War II took contaminated soil from the island to the United Kingdom's chemical and biological defense facility at Porton Down. A fifth case listed as probable or possible use involves the Polish resistance, which claims to have used typhus baccilli to kill a few hundred Germans during December 1942. The Polish underground also claims to have sent anthrax-laced letters to the Gestapo. The Aum Shinrikyo case is discussed in chapter 3. This database contains 142 total cases, including three additional confirmed cases where terrorists acquired biological substances, six where they showed interest, and nine involving a threat or hoax. One confirmed case of possession involves Thomas Leahy, who pled guilty to possessing ricin and intent to use it as a weapon on 28 October 1997. The two other confirmed cases of possession are discussed in boxes 2.1 and 2.4. For more detail, see Carus, *Bioterrorism and Biocrimes*, 7–10, 23, 66–7, 73–4, 102–3, 109–13.

[177] The greatest death tally in the database is twenty killed as a result of VX by Aum Shinrikyo. A cult member testified that twenty followers had disappeared, and that VX had been used to murder them. As the trials of Aum members progress, more information may become available to clarify this particular case.

attacks, so this outcome could be the result of a specific intent to limit harm (i.e., assassination as opposed to indiscriminate killing) or technical incompetence.[178]

Another clue to the absence of more mass casualty cases may lie in the terrorists' choice of delivery methods. The Monterey database shows that terrorists employed at least ten different types of delivery methods, all of which can be characterized as low technology. The most frequently used delivery "system," as indicated in table 2.10, was direct or casual contact with the intended victim, a technique much better suited to assassination than to causing mass casualties. Other preferred methods—consumer product tampering, mail delivery, or placement of the substance in a jar or jug—do not provide a ready route to harming large numbers of people at a single time. The second most prevalent dispersal method, via an aerosol or spray, does have the potential to cause mass casualties if the substance involved is potent and certain technical hurdles are conquered. Eleven of the cases in the aerosol/spray category, however, involved use of the incapacitating agent tear gas. The other seventeen cases in this category were Aum's successful and failed attempts to disseminate chemical and biological agents. The Japanese cult's briefcase dissemination devices are listed in this table as "reaction devices." A delivery method that terrorists have ignored to date, according to the Carus compilation of bioterrorist activities, is the use of insects. This database also shows terrorist preferences for direct contact, food and water contamination, and aerosol dissemination.[179] What neither the Monterey nor Carus data reveal is whether terrorists selected these delivery methods because they could do no better or because their intended targets were an individual or small group as opposed to a large crowd.

When the Monterey data is examined in different ways, some of the daunting impressions from the aggregate numbers fall by the wayside. From 342 cases, plots and pranks account for a fairly high concentration of the terrorist activities—66 percent domestically and 28 percent overseas. These cases of hoaxes and plots should not be ignored, for they may be a "tip-of-the-iceberg" signal that the groups or individuals involved might escalate to more serious activities.[180] On the other hand, these cases appear to reflect the willingness of terrorists to capitalize on the popular fascination with, and government concern about, terrorist use of unconventional weapons—an easy way to get a big reaction from the press and

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[178] Note that Carus' bioterrorism compendium shows four cases where the bioterrorists had some scientific or medical expertise to facilitate a weapons program. For instance, Aum Shinrikyo recruited numerous scientists, and a nurse in the Rajneeshee cult directed that group's efforts to grow and spread *Salmonella typhimurium*. In nineteen other cases, the level of scientific expertise was unknown or apparently nonexistent. Carus, *Bioterrorism and Biocrimes*, 29.

[179] Terrorists planned, threatened, or attempted to harm others through direct contact most frequently—four times. They selected the food contamination option once, aerosol dissemination twice, and water contamination three times. The method of delivery was unspecified in nine cases and unknown in six others. No deaths resulted from any of the attacks. Carus, *Bioterrorism and Biocrimes*, 21, 23.

[180] Tucker, "Lessons from the Case Studies,"353–4.

Table 2.10: Methods Employed By Terrorists to Deliver Chemical and Biological Substances (1975 through mid-2000)

Delivery Method	Number of Events Used With Chemical Substances	Number of Events Used With Biological Substances	Total Number of Events Used
Casual/Personal/Direct Contact	33	1	34
Aerosol/Spray	21	7	28
Food/Drink	13	3	16
Unknown	12	1	13
Consumer Product Tampering	10	1	11
Explosive Device	6	0	6
Water Supply	5	1	6
Jug/Jar/Canister*	1	3	4
Mail/Letter/Package	4	0	4
Reaction Device**	3	0	3
Injection/Projectile***	1	0	1

* Jug/Jar/Canister is a delivery method that does not involve a fan or other dissemination device; the agent was simply in this type of container.
**A reaction device is defined as a fan triggered to disperse the agent.
***An injection is a hypodermic needle delivery; a projectile, a bullet.

government alike.[181] FBI statistics denote a steady rise in the number of investigations opened in the late 1990s related to possible terrorist activity with weapons of mass destruction, but the huge majority of those

[181] On this point, see the FBI, *Terrorism in the United States: 1998*, 13. The upsurge in anthrax hoaxes began in October 1998. Local California rescue crews that had received Defense Department training responded to the initial anthrax hoaxes by rolling out in full force, decontaminating hundreds of people, and beginning prophylaxis. The average cost to respond to nine hoaxes that occurred between the 17th and 28th of December 1998 was $500,000. During this timeframe, an anthrax hoax took place in Fremont, California. Unlike other locations victimized by these hoaxes, Fremont rescuers had not been through the Pentagon training program and did not overreact. Jason Pate of the Center for Nonproliferation Studies in Monterey, "Anthrax Hoaxes in the United States," unpublished paper, forthcoming 2001. Andrew Blankstein and Solomon Moore, "Anthrax Threat Forces Evacuation," *Los Angeles Times*, 24 December 1998; Scott Glover,"Man Held in Anthrax Threat to Courthouse," *Los Angeles Times*, 31 December 1998; Amanda Covarrubias, "Anthrax Hoaxes Are Bomb Scares of '90s," *Associated Press*, 30 December 1998; Rene Sanchez, "California Anthrax Threats Spawn Costly Wave of Fear," *Washington Post*, 11 January 1999. These types of costs are particularly striking when one notes that the FBI reported that it had logged 118 anthrax threats by the end of May 1999—almost equal to the cumulative number of threats received in the two years prior. Elizabeth Neus, "Bioterrorism Danger Low, But Recorded Threats Rising," *Gannet News Service*, 31 May 1999.

cases were hoaxes.[182] For example, all but twelve of the 225 cases that the FBI opened in 1999 were determined to be non-credible threats.[183]

A few other observations emerge from the Monterey cases that could indicate more serious threats. Terrorists certainly tried to acquire, possessed, or possessed and threatened to use a larger array of lethal substances than they actually employed, leaning more toward chemical than biological substances. What does not surface from the data are the reasons that terrorists did not cross the threshold to use, which may be as individual as the cases themselves. The inhibiting factors could range from interdiction by law enforcement authorities prior to action, to moral qualms, fear for personal safety, and inability to overcome the technical challenges of dispersing these substances.

Another trend that jumps out of the Monterey data is that roughly 29 percent of the use cases involved low-end materials (e.g., tear gas, butyric acid). Another 16 percent of the use cases pertain to Aum Shinrikyo alone. Next, given the widely expressed concerns about the likelihood that terrorists will cause mass casualties with chemical or biological agents, the statistics about the frequency and scale of harm that terrorists have inflicted with these substances over the past twenty-five years is instructive. The definition for a mass casualty event varies, but when discussing an unconventional terrorism attack the figure often employed is one thousand or more injuries or deaths.[184] Working from that definition, Aum's subway gas attack is the only case in the Monterey database that qualifies as a mass casualty event. If a one hundred or more casualty definition is used, six of the 126 use cases were mass casualty incidents. By the latter, more lenient definition, the overwhelming number of cases—roughly 95 percent—do not qualify as mass casualty events.

So, while unconventional terrorism attacks of catastrophic proportions have been much discussed, perhaps an equally telling statistic that falls out of the database is that in 96 percent of the use cases, three

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[182] The FBI's statistics do not distinguish between activities with chemical, biological, or nuclear weapons. The FBI opened thirty-seven investigations in 1996, seventy-four in 1997, 181 in 1998, 225 in 1999, and 155 by mid-August 2000. Judy Packer-Tursman, "FBI Briefed on District's Terror Curbs," *Pittsburgh Post-Gazette,* 5 May 1999; David A. Vise, "Area is Top Terrorist Target, FBI Says," *Washington Post,* 22 October 1999; InterAgency Board for Equipment Standardization and InterOperability, *1999 Annual Report* (Washington, DC: Department of the Army, n.d.), 5; 2000 statistics provided by the Weapons of Mass Destruction Operations Unit in a telephone conversation on 7 September 2000). Nine out of ten of the 125 cases that the FBI was investigating at the start of 1999 consisted of anthrax threats determined not to be credible. Some 80 percent of the FBI's cases in mid-March 2000 involved anthrax threats. Packer-Tursman, "FBI Briefed on District's Terror Curbs;" Robert Burnham, statement before the Senate Committee on Government Reform,106th Cong., 2nd sess., 22 March 2000.

[183] Interview with author: FBI Special Agent (16 May 2000).

[184] The term "mass casualty" means any incident—manmade or natural—where the number of patients outstrips the capabilities of the local emergency medical system to manage the crisis effectively. In larger metropolitan areas, this number may be in the double figures; in smaller towns, three patients could be deemed a mass casualty event. In Ohio state statutes, for example, mass casualty is defined as ten or more persons injured, incapacitated, made ill, or killed. Ohio Rev. Code, Tit. 47 § 4766.01 (1998). When federal personnel discuss chemical and biological mass casualty events, they use figures ranging from one hundred to ten thousand or more casualties.

or fewer people were injured or killed. Furthermore, in 60 percent of the use cases, no death or injury resulted. Again, these latter two figures could be the result of terrorists' limited intentions, second thoughts, poor execution, or as the two analysts who oversaw the creation of the Monterey database and have previously mined it, the "grossly ill-conceived and ineffective" nature of terrorist plots involving chemical and biological substances.[185] This overall interpretation of terrorist activity with chemical and biological materials gains strength when one returns to the twelve 1999 cases that the FBI found had some merit. These cases involved industrial chemicals and nonmilitary agents like *Shigella dysenteriae*.[186] Moreover, even though the FBI has articulated some concerns, it has characterized the nature of terrorist activity with chemical and biological substances as interpersonal and small-scale rather than indiscriminate and mass casualty.[187]

As the saying goes, one can either see the glass as half-empty or half-full, and any data set can be viewed accordingly. The Monterey database and other statistical and case history data support more persuasively the half-full perspective: Terrorists have not even approached inflicting harm commensurate with the ten thousand- and 100,000- casualty scenarios that were bandied about in the late 1990s. Although the absence of those types of cases over the past twenty-five years does not preclude their occurrence in the future, analysis of terrorist behavior with chemical and biological substances does not provide much backing for the not-if-but-when catastrophic terrorism school of thought. From 1980 to 1999, the State Department reports 9,255 terrorist attacks worldwide.[188] The sixteen cases in the Monterey database involving five or

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[185] Cases in point include R.I.S.E. and the Covenant, the Sword, and the Arm of the Lord. Tucker and Sands, "An Unlikely Threat," 49. Also on the point of limited damage because mass casualty attacks are beyond the technical ability of terrorists, 1999 Gilmore panel report, 12; Carus, *Bioterrorism and Biocrimes*, 31; and International Institute for Strategic Studies, "The New Face of Terrorism?" 63.

[186] An FBI special agent characterized the nature of the 1999 cases in a 16 May 2000 interview. Other FBI personnel gave similar characterizations of the late 1990s cases, a few of which involved very low strength ricin but most involving industrial chemicals (e.g., bleach). Interviews with author: FBI official (8 September 2000); FBI official (1 August 2000); FBI Special Agent (13 May 2000). For example, a Dallas hospital worker gave twelve of her co-workers severe diarrhea by contaminating the staff's breakfast foods with *Shigella dysenteriae*. Five had to be hospitalized. See Holly Becka, "20-year Sentence Given in Taintings," *Dallas Morning News*, 12 September 1998; Charles Ornstein, "Lab Bacteria Put in Pastries Caused Illnesses," *Dallas Morning News*, 11 November 1996.

[187] See the threat characterization by FBI Director Louis J. Freeh: "In most cases, threats have been limited in scope and have targeted individuals rather than groups, facilities, or critical infrastructure." The FBI "validated" some threats, but deemed the more troublesome ones (e.g., dissemination of a chemical agent through air ventilation systems) "technically not feasible." Louis J. Freeh, FBI, testimony before the Senate Appropriations Committee, 105th Cong., 1st sess., 13 May 1997. See also, Robert M. Blitzer, FBI, testimony before the House Committee on Government Reform and Oversight, 105th Cong., 2nd sess., 2 October 1998. Of concern, for instance, are "indications that international terrorists are procuring large volumes of cyanide and arsenic in commercial centers worldwide." FBI, *Terrorism in the United States: 1998*, 14.

[188] The State Department's database excludes intra-Palestinian violence. US Department of State, *Patterns of Global Terrorism 1999* (Washington, DC: US Government Printing Office, April 2000), Appendix C.

more injuries over a twenty-five year period become a statistical drop in that ocean.[189] Conventional terrorism was far more prevalent, far more harmful, and far more deadly than chemical or biological terrorism. Therefore, if the past is any predictor of the future, terrorist incidents involving chemical and biological substances will continue to be small in scale and far less harmful than conventional terrorist attacks.[190]

[189] If the differences in time coverage are ignored, the statistical drop is 0.17 percent. Six cases involved more than five deaths. Some of these same cases also caused many injuries. Note that the database lists as one case a series of twenty possible murders of cult members using VX that may have taken place intermittently.

[190] "Contrary to the conventional wisdom about the catastrophic nature of chemical and biological terrorism, actual attacks were few in number, small in scale, and generally produced fewer casualties than conventional bombs." Tucker and Sands, "An Unlikely Threat," 48. Similarly, "Conventional explosives, traditionally a favorite tool of the terrorist, will likely remain the terrorist weapon of choice in the near term." 1999 Gilmore panel report, viii, and, on the higher likelihood of small attacks, 12. Also forecasting small attacks as opposed to catastrophic-scale events, Jenkins, "Understanding the Link," 51. On the point of relative threats, with the unconventional terrorism threat "still considered low in comparison to the threat from conventional terrorist tactics, such as bombings, shootings, and kidnappings." FBI, *Terrorism in the United States: 1998*, 14.