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## CHEMICAL AND BIOLOGICAL TERRORISM: LESSONS FROM HISTORY

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Terrorism using chemical or biological weapons has a sparse history, despite the immense amount of attention the issue has received recently. In particular, the type of chemical and biological weapons terrorism of greatest concern today—use of chemical and biological weapons (CBW) to cause mass casualties—has only been attempted a handful of times.

### **Instances of terrorist use of CBW since WWII**

For CW, only two serious attempts have occurred. In 1946, a group of Jewish holocaust survivors known as Avenging Israel's Blood (known also by its Hebrew acronym DIN), plotted to kill tens of thousands of German civilians by poisoning municipal water supplies, in retribution for civilian complicity in the holocaust. This plan proved technically and politically difficult, and they turned instead to a back-up plan that targeted Nazi war criminals. To this end, they infiltrated the bakery in a US prison camp near Nuremberg, Germany, and treated several thousand loaves of bread with arsenic. They successfully poisoned more than two thousand inmates, about 200 of whom were seriously enough ill to be hospitalized, but there were apparently no fatalities.

More recently, in 1994 and 1995, the religious cult Aum Shinrikyo used nerve agents in several attacks in Japan. The most

serious ones involved the release of sarin in Matsumoto (7 people killed and over 100 injured) and in the Tokyo subway at rush hour (12 killed and hundreds injured). The intent of the first attack was to disrupt a trial whose verdict was expected to go against Aum; the intent of the second was primarily to distract police from their investigation of Aum. A secondary goal was to provoke an acapocalypse that the sect predicted, in which the world would be consumed and only Aum members would survive. The first attack was successful in delaying the verdicts, as the judges were among the injured; the second achieved neither of its goals, and the police shut down Aum shortly afterwards.

Although the results of the Tokyo subway attacks were devastating, they could have been much worse. Aum had destroyed its major sarin stockpile in anticipation of police raids, and when they decided, on short notice, to attack the subway they could only make a small amount of quite impure agent. Had they used, rather than destroying, their much larger and more highly refined stockpile, the death toll would likely have been in the thousands.

For BW also, only two serious efforts are known for certain. One series of attacks was by Aum Shinrikyo, the same Japanese sect that used sarin in Matsumoto and Tokyo. Prior to its use of nerve agent, the Aum tried to release anthrax spores or botulinum toxin in numerous locations in and around Tokyo, from 1991 to 1995. Their most serious attempt was the release of thousands of liters of an anthrax culture in aerosol form from the roof of their Tokyo headquarters, which was clearly intended to cause tens of thousands of fatalities. None of the attacks was successful. Aum failed to obtain lethal agents--their botulinum toxin preparation was harmless (probably they failed to isolate a toxigenic *Clostridium botulinum*), and their strain of *Bacillus anthracis* was an avirulent vaccine strain. They were also unable to prepare the botulinum toxin or anthrax spores in an effective weapons formulation, and they appear not to have been able to disseminate them in a way that would cause disease even if their agents had been lethal. For instance, the anthrax aerosol released from their Tokyo headquarters consisted of droplets far too large to be inhaled deeply into the respiratory tract, a necessary first step in anthrax infection of the lungs.

A decade earlier, in 1984, another religious sect, this one led by Bagwan Shree Rajneesh, used *Salmonella* to attack The Dalles, Oregon (USA)--apparently without their leader's knowledge. The

attack involved spreading the *Salmonella* culture on foods at restaurant salad bars, and was spectacularly successful. Public health authorities identified over 750 cases of salmonellosis, of whom 45 were hospitalized (none died). However, given the historical under-reporting of salmonellosis, it is likely that there were actually several thousand cases. The attack was a trial run to see if it would be possible to disrupt local elections sufficiently to affect the outcome. In the end, the intended attack at election time was not implemented because it became obvious that favorable election results were impossible in any case.

In addition to these events, the 2001 release of anthrax spores through the US mail, which killed 5 people and sickened another 16, may constitute a third instance of bioterrorism. Since the perpetrator and motive are unknown, it is not clear whether this was a criminal or terrorist act. The anthrax spore preparation used was of very high quality, equivalent to the best weaponized preparations of former offensive BW programs of any nation. The number of casualties was so low only because each anthrax letter was identified as containing anthrax, which caused most potential victims to be placed on prophylactic antibiotic treatment, greatly limiting the number of cases. Each letter also contained a macroscopically visible mass of powder, and the corners were taped shut. These precautions suggest that the intent was not to cause fatalities, but rather to provoke concern or to test a theory. The attacks are widely thought to be the work of a domestic individual who is a current or former employee of the US biodefense program, or of a civilian contractor to it, with access to classified BW records. Whether criminal or terrorist, they are significant in that they hint at the potential should this level of expertise become available to terrorist groups interested in causing mass casualties. There is no doubt that the same quantity of this high-quality spore preparation could have caused hundreds, possibly thousands, of casualties had there been a serious intent to do so.

There have also been a significant number of recent instances in which terrorist groups have been suspected of intending to use cyanide or ricin to mount an attack. It is unlikely that such agents in terrorist hands would achieve mass casualties; both agents have been rejected by state bioweapon programs because they make poor biological weapons in the gas or aerosol state. Nevertheless, they could indeed cause deaths, widespread terror, and substantial social

disruption, and the evidence of terrorist intent to use them must be taken with the utmost seriousness.

### **Lessons from the historical record**

Given this very sparse record, it is audacious, bordering on recklessness, to attempt to draw any lessons. The sparseness itself, and the small number of resulting fatalities, would suggest that the threat is significantly less severe than commonly assessed. However, it could be dangerous to place much confidence in such a conclusion; the great amount of attention the threat has received, plus the large amount of technical information about the nature of the agents and about dissemination methods that has appeared in the press, probably have markedly increased the likelihood of future successful use of these weapons.

Nevertheless, it seems clear that the extraordinary concern about bioterrorism that has characterized the last decade is misplaced. It has been sparked not by a rational threat analysis, but by worst-case scenarios that assume that terrorist groups are on the verge of developing the capability to deliver a military-style aerosol biological attack. There is no evidence that any terrorist group is within a decade of such a capability, and the failure of Aum to come even close to developing effective BW, despite their lavish funding (millions of dollars were spent on their weapons programs) and the high educational level of many of their members, is consistent with this. However, this assessment could change quite quickly if a terrorist group were able to recruit technical experts with knowledge comparable to that of the perpetrator of the anthrax letter attacks. This suggests that steps to prevent the terrorist recruitment of technical experts knowledgeable about weaponization and dissemination of BW agents is critically important. It further suggests that countries should be extremely cautious in incorporating into their biodefense programs elements that will train additional personnel in offensive BW development.

This difficulty in successfully weaponizing existing biological agents also suggests that the current anxiety about possible terrorist abuses of genetic engineering and cutting-edge biology is misplaced. There is no reason to prevent open dissemination of scientific and medical results because of concerns about terrorist misuse of the information. It may be that the information could be used by some

countries that are attempting to develop a covert BW capability in contravention of the Biological Weapons Convention, so to the extent that such proliferation is considered a problem (and there is room for doubt that it is), some restrictions on publication of sensitive information may be indicated. But such restriction certainly is not indicated by the commonly stated concern about terrorist use of the information.

In contrast to Aum, the success of the Rajneesh in causing what were probably well over 1000 cases of salmonellosis by the simple expedient of contaminating salad bars with crude microbial cultures suggests a very different, and more disturbing scenario. The Rajneesh deliberately chose an agent with intrinsically low mortality; however, there are some lethal agents that could be disseminated by the same route, and the prospects for a successful mass-casualty attack by this route may be considerably higher than by the aerosol route. Probably the most effective measure countries could take would be to ban self-service restaurant facilities, as these are, by a large margin, the most vulnerable to such attack (food purchased in markets is commonly washed or cooked)

The threat from chemical agents shows some similarities to the BW threat, but important differences. As with anthrax spores, the most accessible agents do not easily lend themselves to mass-casualty aerosol distribution, but some may be effectively distributed by food contamination, as demonstrated more than 50 years ago by DIN.

Unlike their efforts to create effective bioweapons, Aum was able to develop an industrial-scale synthetic capability for sarin (and they succeeded in synthesizing smaller quantities of several other nerve agents). This success, in only two years of effort, suggests that a similar capability may be within the reach of other terrorist groups. Measures to prevent this should be a high priority, perhaps focusing on reducing access to the chemical equipment, protective gear, and chemical compounds necessary to produce significant quantities of nerve agents.

**Further reading:** a good scholarly, but readable, account of the history of CB terrorism is Jonathan B. Tucker (editor), *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*. Massachusetts Institute of Technology Press (Cambridge Massachusetts, and London), 2000.