



The Biological Warfare Threat

The biological warfare (BW) capabilities of state and nonstate actors are growing worldwide. This trend leads us to believe that the risk of an attack against the United States, its interests and allies will increase in the coming years. In addition, the United States would be affected by the use of BW agents anywhere in the world—a strong possibility in the years ahead. Washington probably would be called upon to help contain conflicts or deal with a terrorist attack in which biological agents were used—either overtly or covertly—or to provide scientific expertise and humanitarian assistance to deal with their effects.

Biological weapons lend themselves to covert development and use; a deliberately initiated disease outbreak can be difficult to distinguish from an infectious disease that occurs naturally. The intentional introduction of disease to a susceptible population—human, animal, or plant—by state or nonstate actors could prove to be very costly politically, economically, and in terms of human life. Although the preparation and effective use of BW agents by both states and nonstate actors are more difficult than some popular literature seems to suggest, the degree of difficulty varies with the specific biological agent sought and the sophistication of the dispersal mechanism.

- Mature BW programs may include extensive research and development efforts on pathogens to improve their virulence, stability, and resistance to detection and vaccines or treatments. Such BW programs also have the means to produce large quantities of biological agents and the means to optimize their delivery.
- The materials for a simple, unsophisticated biological agent delivery device are widely available. A state or nonstate actor with the objective of causing some limited casualties and creating panic probably could design and assemble the components for a crude biological device and develop an unsophisticated method of agent dispersal.

This memorandum was prepared under the auspices of the National Intelligence Officer for S&T. It responds to a request from the SSCI to produce an unclassified report on the biological warfare threat. It was reviewed by the DCI's Nonproliferation Center, CIA, DIA, NSA, INR, and NIMA.

2 January 2001

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Biological Warfare Agents

Biological agents—living microorganisms or their derivatives, including bacteria, viruses, fungi, and toxins—could be used to target humans as well as crops and animals. Many biological agents are found naturally in the environment but vary considerably in transmissibility, infectivity, and virulence or toxicity. A biological attack could mimic a natural disease outbreak, making it extremely difficult to identify the incident as an attack. A nonstate group or individual pursuing a biological weapons capability is more likely to choose bacteria, fungi, or toxins; such agents are generally easier to handle and produce and require less specialized production equipment than viruses.

- **Bacteria** are single-celled organisms that include the causative agents of anthrax, brucellosis, tularemia, plague, and many other diseases. Rickettsiae are a genus of bacteria that cause diseases such as typhus, Q fever, and Rocky Mountain spotted fever. Rickettsiae differ from most other types of bacteria in that they require a host cell for replication.
- **Viruses** are organisms that contain DNA or RNA and require other living cells to replicate. ~~Examples of viruses that could be used for BW include smallpox, Ebola, Marburg, and Venezuelan equine encephalitis.~~
- **Fungi** are “plant-like” multi-cellular organisms devoid of chlorophyll, varied in complexity, and adapted for absorptive nutrition. Examples of fungal BW agents include the plant pathogens that cause wheat stem rust and potato blight.
- **Toxins** are noxious or poisonous substances produced by some living organisms as part of their normal metabolism. *Clostridium botulinum* produces a toxin—botulinum toxin—that has been exploited for BW purposes.

What Distinguishes a Biological Attack from Other Unconventional Weapons Attacks?

- **Scale.** If contagious biological agents are disseminated, use in one area could potentially affect other areas or nations as infected people move from one place to another—from office to home, from one airport to another—spreading the disease and causing additional casualties. Such biological agents gradually could cause far more casualties than other weapons of mass destruction.
- **Delayed onset.** Most biological agents cause symptoms that have a delayed onset, ranging from a few hours to many days. Thus, the fact that an attack has taken place can be masked, and identification of the perpetrators would be extremely difficult.

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- **First responders.** If there were no prior warning, the first responders to a covert civilian attack probably would be health care providers, local agricultural services personnel, or veterinarians responding to a seemingly natural disease outbreak. This contrasts with other attacks—such as conventional or chemical attacks—which have an immediate explosive or toxic effect and would initiate an immediate response from emergency personnel, such as firefighters, paramedics, and police.
- **Political response.** Public health officials and local government authorities would face the potential for large-scale panic: the use of BW agents, which has been hyped in the press, books, and movies, could incite mass terror. People lack knowledge of the effects of BW agents, such as whether an agent is contagious or persistent and how it spreads, and would be susceptible to inaccuracies in media reporting.
- **Retribution.** Policymakers and military decision-makers would face difficult decisions in responding to an attack, even if the instigator were known. Difficulties abound in planning for a proportional response to an attack, given that the spectrum for biological attacks could range from simple food poisonings to attacks against economic targets to large-scale biological attacks designed to cause mass human casualties. A policymaker would have to decide which weapon would be an effective and proportional response.

The Trend Lines

The growing threat of BW is generated by three disturbing trends:

- The number of players possessing biological weapons or seeking to acquire a biological warfare capability is increasing.
- Biological agents with increasing lethality are being developed.
- Detection of BW programs and of the acquisition of BW-related capabilities is difficult.

First Trend: Expanding Number of Players

The United States and other concerned governments are working energetically to combat proliferation. Nonetheless, the number of players, state and nonstate, possessing or seeking to clandestinely acquire a BW capability is growing, despite the fact that the development, possession, and use of biological weapons are banned by international treaty.

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States with Biological Warfare Programs

More than a dozen states, including Iran, Iraq, Libya, North Korea, and Syria, either possess or are actively pursuing offensive BW capabilities for use against their adversaries. Some may be pursuing BW programs for use against internal enemies and opposition groups or for tactical use in regional conflicts, making those potential conflicts all the more deadly and destabilizing if and when they occur. Some states also are likely to be pursuing BW programs to maintain or acquire an asymmetric warfare capability, with BW viewed as a means of countering overwhelming US conventional military superiority. Some leaders probably view a BW capability as a means to accomplish their goals of achieving regional power, reducing Western influence, and deterring the United States from becoming engaged in a conflict in their region. Two states in particular—Iraq and Iran—have extensive programs underway, although both are signatories to the Biological and Toxin Weapons Convention. We also have concerns about the status of Russia's BW program.

Iraq

Iraq initiated a BW program in 1985. The program rapidly moved from BW agent research and development to large-scale agent production and weaponization, providing Iraq an offensive BW capability by the time of the Gulf war.

- After four-and-a-half years of claiming it had conducted only “defensive research” on biological agents, Iraq finally declared in 1995 that it had produced some 30,000 liters of concentrated BW agents including botulinum toxin, *Bacillus anthracis*, *Clostridium perfringens*, aflatoxin, and ricin. The United Nations Special Commission (UNSCOM) believed that Iraq produced substantially greater amounts—perhaps two to three times as much as was declared.
- Iraq refuses to disclose fully the extent of its offensive BW program and has used concealment and deception to deny access to the program. Baghdad still has not credibly accounted for 25 BW agent-filled Al-Hussein missile warheads and nearly 200 BW bombs officials claim to have unilaterally destroyed, as well as more than three metric tons of imported growth media—directly related to past and future BW agent production capabilities.
- Iraq has demonstrated the capability to deliver BW agents from aircraft.
- Iraq retains an offensive BW capability of undetermined size and probably is exploiting opportunities presented by the absence of UN inspectors and the increase in foreign contacts to expand and improve its offensive BW capabilities.

Iran

Iran initiated a BW program in the 1980s during the Iran-Iraq war. The program is now in the late stages of research and development, and Tehran probably already holds some stocks of BW agents and weapons. Iran probably has done research on both toxins and live organisms as BW agents and could use many of the same delivery systems it would employ for CW delivery—artillery shells and aerial bombs.

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- Iran has the technical infrastructure to support a significant BW program. It conducts high-quality legitimate biomedical research at various institutes, which we suspect also support the BW program.
- Tehran is expanding its efforts to acquire biotechnical materials, equipment, and expertise from abroad—primarily from entities in Russia and the West. Because of the dual-use nature of the equipment and technology, Iran could divert such equipment and technology to support its BW effort and make more rapid advances in its BW program than would otherwise be possible.
- We assess that no matter who is in power in Tehran, Iran will continue to develop and expand its BW and other WMD programs as long as it perceives threats from US military forces in the Gulf, and from Israel and Iraq.

Russia

The Soviet Union signed the Biological Weapons Convention on 10 April 1972, but then greatly expanded its BW R&D and production to maintain the largest offensive BW program in history. ~~The Soviets also maintained multi-ton BW agent stockpiles of bacterial and viral agents until the~~ late 1980s. With the fall of the Soviet Union, Russia inherited at least 31 known sites for BW research, production, and weaponization.

After Yeltsin's April 1992 decree to end the program, some research and production facilities were deactivated, and many took severe personnel and funding cuts. However, the Russians are continuing to do research with the same organisms that the Soviets developed as BW agents, and some facilities, in addition to being engaged in legitimate activity, may be maintaining the capability to produce these agents. Increased transparency through US engagement programs has reduced concern that facilities of the civilian cover organization BIOPREPARAT are currently involved in BW work. However, Ministry of Defense facilities involved in the Soviet offensive BW program have remained closed to Western visitors.

Russia's remaining capability to produce and weaponize BW agents, together with the continued involvement of officials associated with the former Soviet BW program, cause us to maintain significant concern about the status of its offensive BW program.

The Proliferation of BW Expertise, Technologies, and Pathogens

By importing expertise and the required technologies and buying the necessary materials, state and nonstate actors can make dramatic leaps forward in the development of biological agents and delivery systems and achieve a self-sufficient BW capability much earlier than would otherwise be possible.

- Russia's economic problems continue to make Russian scientists with BW-related expertise vulnerable to recruitment by both countries and nonstate actors.

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- Collections of biological pathogens exist in many facilities worldwide, including universities, vaccine and pharmaceutical plants, and various research institutions. These collections are vulnerable to theft or even to the legitimate acquisition of pathogens that could be used for BW purposes.

Nonstate Actors

In addition to the dozen or more states with BW programs, a small number of terrorist groups have expressed an interest in biological materials or agents—although we judge terrorists will continue to depend primarily on conventional weapons. Usama Bin Ladin has publicly called the acquisition of weapons of mass destruction a “religious duty,” and in 1999, a member of the Egyptian Islamic Jihad (EIJ)—a group closely aligned with Bin Ladin—claimed in a press interview to possess biological weapons.

- In addition, some members of the Aum Shinrikyo cult confessed to attempting to use *B. anthracis* and botulinum toxin against targets in Japan in 1993 and 1995.

Nonstate actors with biological capabilities have fewer constraints on their activities than states and may be more likely to use biological agents. The delayed effects of most biological agents may make them attractive to use clandestinely, and potential attackers might not be deterred by fear of retribution. A biological attack by a nonstate actor probably would cause fewer casualties than an attack by a state, but the terror that such an attack would cause among the population would still be substantial. Some of the terrorist groups—Bin Ladin’s is the best example—have an international network. Adding to the uncertainty and unpredictability of possible biological attacks are the “lone militants” or *ad hoc* groups who may try to conduct a biological attack.

Second Trend: Increasing Lethality of Agents

The fact that the number of BW players is increasing does not tell the whole story about the growing threat of BW, however. The second trend making the BW threat more dangerous is the increasing sophistication and lethality of BW agents. Rapid advances in biotechnology, especially in genetic engineering technology, present the prospect of a whole new array of toxins or live agents that will require new detection methods, preventive measures, and treatment, including vaccines and therapies. In addition, researchers are exploring mixtures of slow- and fast-acting agents and “cocktails” with chemical agents.

- In addition to making biological agents more difficult to detect, genetic engineering could be used to make them resistant to antibiotics and vaccines and to increase their stability in weapons and the environment.

BW attacks need not be directed only at humans. Plant and animal pathogens could be used against agricultural targets, creating potential economic devastation. Moreover, the economic, political, and legal repercussions associated with mandatory seizure and destruction of property (animals or crops) in response to such a disease outbreak would be large.

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At the same time, dissemination techniques, delivery options, and strategies for use of BW agents are becoming more advanced. The possibility that several countries may be developing BW warheads for ballistic missiles raises concerns. We believe, however, that biological weapons are particularly well suited to covert delivery by a country's special operations forces or intelligence services.

Third Trend: Difficulties in Detection

The third trend raising the level of the BW threat is that actors are engaging in more effective denial and deception techniques—more aggressively concealing and protecting their BW programs. Given the dual-use nature of the materials, technologies, and expertise associated with biological weapons, activities related to BW program development are difficult to detect. Concealment is relatively simple because a BW program includes many of the same activities as legitimate research and commercial biotechnology; it is relatively easy to cloak offensive BW work within ostensibly legitimate research, and very little distinguishes a vaccine plant from a BW agent production facility. Supposedly legitimate facilities could be used to conduct clandestine BW research or could be converted rapidly to biological agent production, providing a mobilization or “breakout” capability. As a result, large stockpiles of biological agents simply may not be required.

The public as well as some in the security community probably do not fully appreciate the wide availability of BW-relevant technology and knowledge. In a technologically advanced society that invests in healthcare, medical technology and treatment, safe food, and scientific research, commercial biotechnology is imperative. Developing countries also need clean water, productive agriculture, food processing technology, medical care, and good public health, and they too need to be engaged in biotechnological research. Consequently, when materials, technologies, or expertise that can be used for either offensive BW program development or commercial R&D purposes are imported, it is difficult to know their destination and end-use without additional information. To better understand the BW threat, we need to discern not only the BW capabilities of states and nonstate actors, but also the intentions of potential actors. Determining this intent is difficult, but it is essential if we are to better understand the BW threat.

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