

US intelligence warns of the spread of poison gas, anthrax, "gas gangrene," camel pox, and other evils.

Horror Weapons

By Bill Gertz

IN FUTURE conflicts, US forces may well come face to face with a sickening array of biological and chemical weapons.

At least twenty countries either possess or are developing weapons of mass destruction. The Pentagon and the CIA identified five of these as being especially dangerous threats: North Korea, Iran, Iraq, Libya, and Syria.

No fewer than fifteen nations have offensive poison gas programs, according to a white paper prepared by US intelligence agencies and released late last year. However, biological warfare (BW) weapons are inherently the more toxic type of armament and can affect vast battle areas or civilian population centers. Known biological weapons agents include anthrax, botulism, tularemia, plague, and Q-fever.

These pathogens, such as bacteria, viruses, and fungi, are widely recognized as having military utility.

"They are incredibly lethal," warns John Holum, director of the US Arms Control and Disarmament Agency. "They are also not that difficult to make, so I think we have to anticipate a very high risk of these being more widely available."

Biological arms are preferred by developing countries who see them as a "poor man's atom bomb." For a sense of what might await US forces in the future, one need look no further than the special weapons program recently uncovered in Iraq.

Iraq managed to conceal the true extent of its biological weapons program from the end of Operation Desert Storm until late last year, when Baghdad finally revealed it. It featured some of the deadliest pathogens known to man.

Iraq's First Germs

Iraq's biological warfare program began with the development of bacteria strains in 1986. The two key agents being developed were anthrax and botulinum toxin—both extremely deadly, disease-causing material.

Botulism takes only three days to incubate. Experts have reported that botulinum toxin is 100,000 times more deadly than sarin nerve gas, the type allegedly released by religious fanatics in Japan's Tokyo subway last year.

Minute quantities of bacillus anthracis could kill a person in a week. Quantities of several hundred pounds

From Ypres in World War I to Khafji in the Persian Gulf War, soldiers have had to prepare for an enemy's use of "special weapons." Some nations perceive biological weapons as the poor man's atom bomb, and some military planners see lasers, radiological weapons, and sound-wave guns as emerging dangers.



of anthrax spores dispersed from aircraft could cause thousands of deaths.

An outbreak of pulmonary anthrax in 1979 killed hundreds of residents of the Soviet city of Sverdlovsk, now renamed Ekaterinberg. The Sverdlovsk tragedy sprang from an accident at a Soviet military BW facility, where dry virulent anthrax spores were released into the air. Victims suffered from the sudden onset of very high fever and respiratory distress that led to death.

US intelligence agencies that have examined the effects of anthrax, which is weaponized as spores and can be sprayed from a truck or aircraft, say the spores are inhaled or ingested and cause pulmonary anthrax.

It is highly lethal because by the time the first flu-like symptoms caused by the bacteria appear, enough toxins have been produced to kill a person, even if the bacteria are killed off with high doses of antibiotics.

According to the CIA, anthrax proves fatal in eighty percent of cases.

Plague affects its victims in one to three days and is ninety percent fatal, says the CIA. Less lethal bugs include tularemia and cholera, which

can take up to ten days to affect victims and are anywhere from five to fifty percent fatal.

A United Nations report, released October 11, 1995, states that the Iraqi military conducted tests of BW agents on sheep, donkeys, monkeys, and dogs and that weapons field trials were held in 1988. Production began in 1989, with Iraqi plants producing their first 1,500 liters of anthrax agent. The UN report adds that in 1990, Iraq produced 6,000 liters of concentrated botulinum toxin and 8,425 liters of anthrax toxin.

Iraq also worked on a new agent—*Clostridium perfringens*—which causes “gas gangrene.” This malady features the rotting of flesh commonly seen in war casualties, requiring the amputation of affected limbs. This BW agent, when placed within artillery or mortar rounds, would be spread by shrapnel and would cause wounds to develop gas gangrene.

Another BW agent studied by the Iraqis was aflatoxin—a poison common to fungus-contaminated food grains and known to cause liver cancers—which they loaded into bombs. The Iraqis also studied other tricho-

thecene mycotoxins, such as T-2 and DAS. The mycotoxins cause nausea, vomiting, diarrhea, and skin irritations.

Ricin toxin, derived from the common castor bean, also was being developed. This poison causes bleeding pneumonia.

Production of Viruses

Iraq also developed three distinct viral agents: hemorrhagic conjunctivitis virus, rotavirus, and camel pox virus.

The first of these experimental agents causes a disease whose symptoms are extreme pain and temporary blindness, resulting from bleeding eyeballs. The second causes severe diarrhea that can lead to dehydration and death. The third causes fever and skin rash. Camel pox, endemic to Iraq, also causes pus-filled skin eruptions. Iraqis appear not to be affected, though the malady is lethal for foreigners.

BW viruses are submicroscopic infective agents made up of DNA or RNA that need living cells to reproduce. These agents can produce a range of afflictions with varying degrees of toxicity and incubation

Chemical Warfare Agents

Agent Class	Agent	Persistence	Rate of Action
Nerve	Tabun	Low	Very rapid
	Sarin	Low	Very rapid
	Soman	Moderate	Very rapid
	GF	Moderate	Very rapid
	VX	Very high	Rapid
Blister	Sulfur mustard	Very high	Delayed
	Nitrogen mustard	Moderate-very high	Delayed
	Phosgene oxime	Low	Immediate
	Lewisite	High	Rapid
	Phenyldichloroarsine	Low-moderate	Rapid
	Ethylidichloroarsine	Moderate	Delayed
Choking	Methylidichloroarsine	Low	Rapid
	Phosgene	Low	Delayed
	Diphosgene	Low	Variable
Blood	Hydrogen cyanide	Low	Rapid
	Cyanogen chloride	Low	Rapid
	Arsine	Low	Delayed
Riot control (vomiting)	Diphenylchloroarsine	Low	Rapid
	Diphenylcyanoarsine	Low	Rapid
	Adamsite	Low	Rapid
Riot control (tear gas)	Chloroacetophenone	Low	Immediate
	Chloropicrin	Low-high	Immediate
	Bromobenzylcyanide	Moderate-very high	Immediate
	O-chlorobenzylidene malononitrile	Low-high	Immediate
Psychochemicals	3-Quinuclidinyl benzilate	High	Delayed

Source: US intelligence agencies

Biological Warfare Agents

Disease	Causative Agent	Incubation time (days)	Fatalities (percent)
Anthrax	Bacillus anthracis	1-5	80
Plague	Yersinia Pestis	1-3	90
Tularemia	Francisella tularensis	1-10	5-20
Cholera	Vibrio cholerae	2-5	25-50
Venezuelan equine encephalitis	VEE virus	2-5	less than 1
Q-fever	Coxiella burnetti	12-21	less than 1
Botulism	Clostridium botulinum toxin	3	30
Staphylococcal enterotoxemia (food poisoning)	Staphylococcus enterotoxin type B	1-6	less than 1
Multiple organ toxicity	Trichothecene mycotoxin	Dose dependent	Dose dependent

Source: US intelligence agencies

periods. They are introduced into victims through contact with the skin, eating or breathing, or as a result of breaking the skin with agent-coated shrapnel, for example. The list of potential BW agents is long and includes the deadly Ebola virus that broke out in Africa last year.

Iraq's final deployed BW arsenal included at least 19,000 liters of concentrated botulinum toxin—10,000 liters of which were loaded into munitions—and 8,500 liters of concentrated anthrax toxin, with 6,500 liters loaded into munitions.

Some 2,200 liters of concentrated aflatoxin were deployed, with 1,580 liters in munitions, according to the UN report.

"Given the Iraqi claim that only five years had elapsed since [the BW program's] declared inception in 1985, the [program's] achievements . . . were remarkable," the UN concludes.

Dr. Richard Spertzel, a US biological weapons expert who is part of the UN team that investigated the Iraqi program, says the weaponization effort may not have produced ideal weapons, but they would have been effective had they been used in the Persian Gulf War.

"They could have been used against US troops," Dr. Spertzel says. "These weapons . . . were not designed for tactical situations; they were for strategic purposes, deployed in both bombs and Al Hussein missiles."

The weapons were armed with impact-fuze detonators—not an ideal way to disseminate BW agents but one that clearly would have produced casualties, Dr. Spertzel says.

He contends that the Iraqi BW program should be viewed as an in-

dicator that other nations may seek such arms as a relatively easy way to develop their own version of strategic weapons.

"There may be some that already have done that," he notes. The Iraqi program, in just five years, showed remarkable progress and demonstrated how easy it is for a rogue nation to develop these types of arms, he says.

Snakes, Insects, Spiders

Toxins are poisons derived from plants or animals and can be developed into BW protein agents capable of acting on specific receptors in the human body. Toxin weapons are relatively unstable and can be affected by heat or other environmental factors. Developers rely on a variety of sources for toxins, including microbes, snakes, insects, spiders, sea creatures, and plants.

Toxins can also be derived from fungi. Algal toxins, for example, are highly poisonous and difficult to halt with vaccines or other medical treatment. They are also very difficult to detect. Another toxin, saxitoxin, is produced from marine algae and affects nerve cells, eventually causing the victim to stop breathing.

Weapon experts also are looking at the possibility that bioregulators—organic chemicals that regulate cell processes—and physiologically active catalysts and enzymes will be weaponized for BW use in the future.

Bioregulators are produced in small quantities by the body and are essential for controlling normal bodily functions, such as breathing, blood vessel dilation, muscle contraction, blood pressure, heart rate, temperature, and

immune responses. An intelligence community report points out that such chemicals could short-circuit and disrupt these bodily functions and kill the affected victims.

"Exploited in such a way for military purposes, they could potentially cause such effects as rapid unconsciousness, heart failure, paralysis, hypotension or hypertension, or psychological disturbances," the report warns.

Nature's own killer bugs are bad enough, but advancing technology could increase their lethality. Russia is known to have genetically engineered biological weapons. A Soviet biologist involved in Moscow's offensive biological arms program defected to Britain in 1990 with new information about the germ warfare program. The defector revealed that a secret Soviet program known as "Biopreparat" was working on a variety of bioarms, including bacteria capable of causing a "superplague" able to wipe out entire cities.

Scientists suspect that biological arms can be made deadlier by creating antibiotic-resistant strains of bacteria or by growing benign microorganisms that are genetically engineered to produce toxins, venoms, or bioregulators within the body.

Science can develop viruses with increased resistance to vaccines. There are also fears among military officials that BW producers could make deadly bacteria able to withstand exposure to air and the environment.

Easy to Make

To build these nasty bugs, a nation does not need special facilities. Three levels of production have been

identified in proliferating countries—laboratory scale, pilot scale, and industrial scale. Laboratory-level production could be sufficient to produce strategically significant amounts of BW agent for military uses.

It is relatively easy to create organisms suited for germ weapons. All that is needed are special containers capable of fermenting whole cellular organisms or the toxins they produce. Then, through the use of centrifuges, the deadly bugs or toxins can be cleaned for use as weapons.

"Virtually any known disease-causing agent can be manufactured in the laboratory, and many can be produced on an industrial scale," the intelligence white paper says. "With genetic engineering, new possibilities have emerged, which could allow for the design of new pathogens, more virulent strains of organisms, or organisms with characteristics tailored to specific military requirements."

Samples of deadly viruses needed for starting BW programs can be obtained on the international black market. US counterproliferation officials are especially concerned that BW starter cultures could be smuggled out of the territory of the old Soviet Union by scientists looking to make money.

Unlike chemical weapons programs, which require the use of large-scale industrial equipment and possession of precursor chemicals, BW weapons do not need to be stockpiled. Nations can keep small quantities or even sample cultures on hand in freeze-dried form. Cultures can be mass produced at any time.

Iraq's chemical arms program also was found to be larger and more advanced than Baghdad ever admitted, specifically with production and storage of an advanced nerve agent, VX. Experts say the nerve agent is so deadly that one drop can kill a person.

Chemical warfare began in 1915 when Germany fired large clouds of the choking agent chlorine on French troops. Both sides eventually resorted to the use of choking and blistering agents, and by the end of the conflict more than a million soldiers had been killed or wounded in chemical attacks.

Chemical warfare agents are classified by their physical and chemical properties, such as lethality, mode of action, speed of action, toxicity, persistence, and state.

These weapons can be dispersed

Chemical and biological weapons are only the best-known types of special weapons likely to confront US armed forces. Also in store are less-developed types of unconventional weapons, such as blinding lasers, radiological weapons, and ultralow-frequency sound-wave guns that can cause severe intestinal distress.

"The emerging dangers are in the kinds of weapons that pose a somewhat less cosmic threat but are much more accessible, easier to make, easier to conceal," says John Holum, director of the US Arms Control and Disarmament Agency.

Military planners believe that the US will have to deal with the threat of some type of radiological weapon, possibly one with a conventional explosive mixed with radioactive material, such as plutonium. Radiological arms can spread nuclear contamination over large areas, dispersing enough radiation to sicken troops. It can debilitate a force without a nuclear blast, yet cause radiation sickness.

"What it comes down to is a dirty, low-yield bomb," Mr. Holum says, "a weapon that in a military sense would be called a fizzle but in the sense of immediate impact, a very dangerous weapon."

Blinding lasers are another emerging unconventional threat. At an arms exhibition last year, China's North Industries Corp. unveiled a "portable laser disturber" capable of injuring eyesight.

Laser weapon research programs reportedly are under way in France, Britain, Russia, Ukraine, Israel, and Germany.

in aerial bombs, artillery rockets and shells, grenades, mines, missile warheads, and mortar rounds, and they kill or incapacitate in a number of ways, including damaging eyes and lungs and blistering skin.

Choking agents, like those used in World War I, affect the lungs and cause victims to choke on their own mucus. Blood agents are inhaled and block the body's ability to absorb oxygen into cells, causing rapid damage to tissues.

Military analysts maintain that a military force engaged in chemical warfare would use blood agents in areas they hope to occupy quickly. The reason: Blood agents dissipate quickly and therefore pose less of a threat to advancing forces.

Chemical Agents

More advanced chemical weapons include the G-series nerve agents tabun (GA), soman (GD), and sarin (GB). These highly lethal agents attack the nervous system and are similar in chemical structure to pesticides. German chemists discovered the three agents accidentally while developing new pesticides in the 1930s.

The more advanced nerve agents that pose a greater threat to US soldiers include V-series nerve agents, such as VE, VG, VM, VS, and VX, developed in the 1950s by British scientists. They are more toxic and linger longer than the G-series chemicals do. Small amounts on the skin

can kill, and they pose a long-term contamination danger to the territory and equipment they are used against.

Also on the horizon is the potential use of "vomiting agents" in combat. These arsenic-based chemicals cause great discomfort and can force troops to remove protective masks. With masks removed, a second-wave attack could then be launched using highly lethal nerve agents.

Another possibility being explored by military planners is the attack by various psychochemicals. These include the well-known LSD (lysergic acid diethylamide) and two other chemicals, known in the intelligence community as BZ (3-Quinuclidinyl benzilate) and benactyzine. The chemicals alter the nervous system and create visual and aural hallucinations, a sense of unreality, and changes in thought processes and behavior.

Psychochemicals have a dual capability and could be used to inactivate both civilian and military personnel for relatively short periods.

Highly advanced communications are putting such weapons know-how in the hands of anyone with a computer and modem. "The ingredients for sarin and other chemical weapons are easily accessible over the Internet," said Sen. Sam Nunn (D-Ga.), the senior Democrat on the Senate Armed Services Committee, "as is information about biological weapons and even instructions on how to make a nuclear device." ■

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