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**National Developments of Biological Weapons
in the Middle East: An Analytic Overview**

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Table of Contents

BIOLOGICAL PROLIFERATION AFFECTS MANY KEY COUNTRIES.....	1
* PROBABLY NO LONGER USABLE.....	1
THE SEARCH FOR BIOLOGICAL WEAPONS BY COUNTRY.....	2
<i>Algeria and Biological Weapons</i>	2
<i>Libya and Biological Weapons</i>	2
<i>Egypt and Biological Weapons</i>	2
<i>Israel and Biological Weapons</i>	2
<i>Syria and Biological Weapons</i>	3
<i>Iran and Biological Weapons</i>	4
<i>Iraq and</i>	6
<i>The Sudan and Biological Weapons</i>	11
<i>India and Biological Weapons</i>	11
<i>Pakistan and Biological Weapons</i>	11
IRAQI COVERT BREAK OUT CAPABILITIES.....	12
WHAT IS AT STAKE IN TERMS OF THE UNSCOM CRISIS IN IRAQ:.....	13
IRAQI BIOLOGICAL WARFARE PROGRAM.....	15
IRAQI KEY PERSONALITIES IN PROLIFERATION.....	16
ATTACK SCENARIOS: “DR. BEN NO” AND “PROFESSOR ABU MORIARITY” AT WORK IN THE MIDDLE EAST - PART ONE.....	17
STRENGTHS AND WEAKNESSES OF WEAPONS OF MASS DESTRUCTION - PART ONE.....	20
STRENGTHS AND WEAKNESSES OF WEAPONS OF MASS DESTRUCTION - PART TWO.....	21
STRENGTHS AND WEAKNESSES OF WEAPONS OF MASS DESTRUCTION - PART THREE.....	22
KEY BIOLOGICAL WEAPONS THAT MAY BE IN THE MIDDLE EAST: PART ONE.....	23
KEY BIOLOGICAL WEAPONS THAT MAY BE IN THE MIDDLE EAST: PART TWO.....	24
THE RELATIVE KILLING EFFECT IN NUMBERS OF DEAD FOR BIOLOGICAL VS. CHEMICAL WEAPONS WITH A OPTIMAL AEROSOL DELIVERY.....	25
THE NOMINAL LETHALITY OF DIFFERENT BIOLOGICAL WEAPONS.....	26
THE NOMINAL LETHALITY OF DIFFERENT BIOLOGICAL WEAPONS.....	27
BIOLOGICAL WEAPONS: KNOWN DEVELOPMENT OF AGENTS BY THE MAJOR POWERS BEFORE THE BWC.....	28
THE EFFECTS OF IRAQ’S.....	29
THE COMPARATIVE EFFECTS OF BIOLOGICAL, CHEMICAL, AND NUCLEAR WEAPONS AGAINST A TYPICAL URBAN TARGET IN THE MIDDLE EAST.....	30
THE RELATIVE KILLING EFFECT OF CHEMICAL VS. BIOLOGICAL WEAPONS OF MASS DESTRUCTION FOR A 1,000 KILOGRAM BOMB OR WARHEAD.....	31
THE RELATIVE KILLING EFFECT IN NUMBERS OF DEAD FOR BIOLOGICAL VS. CHEMICAL WEAPONS WITH A OPTIMAL AEROSOL DELIVERY.....	32

Biological Proliferation Affects Many Key Countries

<u>Country</u>	<u>Weapons of Mass Destruction</u>			<u>Long Range Strike Systems</u>	
	<u>Nuclear</u>	<u>Chemical</u>	<u>Biological</u>	<u>Missiles</u>	<u>Aircraft</u>
Algeria	Research	?	?	No	MiG-23
Libya	Research	Deployed	Research	Scud B	Su-24
Egypt	Research	Stockpile	Research	Scud B	F-16C
Israel	100-200	Developed	Developed	Jericho II	F-15C
Syria	No	Deployed	Developed	Scud C	Su-24
Iran	Developing	Deployed	Deployed	Scud C	Su-24
Iraq	Research	Covert	Covert	Covert	Su-24
Yemen	No	Stockpiled*	No	SS-21*	Su-22

* Probably no longer usable.

The Search for Biological Weapons By Country

Algeria and Biological Weapons

- Some research activity.
- No evidence of production capability.

Libya and Biological Weapons

- Libya acceded to the BWC in 1982.
- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, and identified Libya as a key country seeking biological weapons.
- No evidence of production capability.

Egypt and Biological Weapons

- Research and technical base.
- US experts feel there is no evidence of major organized activity leading to production, stockpiling, or deployment.
- Israeli reports are different. One claims that Anwar al-Sadat said in 1970 that Egypt has biological weapons stored in refrigerators and could use them against Israel's crowded population. It speculates that this declaration was apparently intended to warn Israel against a nuclear strike, and Israel did contemplate during the height of the October 1973 war. It reports that Egypt's biological warfare efforts might include work on plague, botulism toxin, encephalitis virus, anthrax, Rift Valley fever, and mycotoxicosis.¹
- The US State Department report on arms control compliance states that Egypt has signed but has not ratified the BWC. The United States believes that Egypt had developed BW agents by 1972. There is no evidence to indicate that Egypt has eliminated this capability and it remains likely that the Egyptian capability to conduct BW continues to exist.

Israel and Biological Weapons

- Israel has not signed the BWC.
- Extensive research into weapons and defense.
- Ready to quickly produce biological weapons, but no reports of active production effort.
- Israel has at least one major research facility with sufficient security and capacity to produce both chemical and biological weapons.² There are extensive reports that Israel has a biological weapons research facility at the Israel Institute for Biological Research at Nes Tona, about 12 miles south of Tel Aviv, and that this same facility also has worked on the development and testing of nerve gas. This facility has created enough public concern in Israel so that the mayor of Nes Tona has asked that it be moved away from populated areas. The facility is reported to have stockpiled Anthrax and to have provided toxins to Israeli intelligence for use in covert operations and assassinations like the attempt on a Hamas leader in Jordan in 1997.³
 - The Israel Institute for Biological Research is located in a 14 acre compound. It has high walls and exceptional security, and is believed to have a staff of around 300, including 120 scientists. A former deputy head, Marcus Kingberg, served 16 years in prison for spying for the FSU.
- US experts privately state that Israel is one of the nations included in US lists of nations with biological and chemical weapons. They believe that Israel has at least some stocks of weaponized nerve gas, although they may be stored in forms that require binary agents to be loaded into binary weapons.
 - They believe that Israel has fully developed bombs and warheads capable of effectively disseminating dry, storable biological agents in micropowder form and has agents considerably more advanced than anthrax.

Opinion differs over whether such weapons are actively loaded and deployed. Unconfirmed reports by the British *Sunday Times* claimed that IAF F-16s are equipped for strikes using both these weapons and chemical weapons.⁴

Syria and Biological Weapons

- Signed, but not ratified the 1972 Biological and Toxin Weapons Convention. Extensive research effort.
- ACDA report in August 1996 indicated that, "it is highly probably that Syria is developing an offensive biological capability."
- Extensive research effort.
- Reports of one underground facility and one near the coast. Several dual-use sites are of concern, including a pharmaceuticals plant in Aleppo that was left mysteriously "unfinished" in 1989 after the Syrian government had invested nearly \$ 40 million in its construction.
 - Syria can tap the potential of more than a dozen government-run pharmaceuticals plants spread across the country, which could be converted rapidly to produce a wide variety of CBW agents.
 - Syria's principle suppliers of CBW production technology were large chemical brokerage houses in Holland, Switzerland, France, Austria and Germany, including many of the same companies that were supplying Iraq.
 - Probable production capability for anthrax and botulism, and possibly other agents.
 - Israeli sources claim Syria weaponized Botulin and Ricin toxin in early 1990s, and probably anthrax.
 - Limited indications may be developing or testing biological variations on ZAB-incendiary bombs and PTAB-500 cluster bombs and Scud warheads.
- Major questions exist regarding Syria's strike capabilities:
 - Older types of biological weapons using wet agents, and placed in older bomb and warhead designs with limited dissemination capability, can achieve only a small fraction of the potential effectiveness of biological weapons. Dry micropowders using advanced agents – such as the most lethal forms of Anthrax – can have the effectiveness of small theater nuclear weapons. It is difficult to design adequate missile warheads to disseminate such agents, but this is not beyond Syrian capabilities – particularly since much of the technology needed to make effective cluster munitions and bomblets for VX gas can be adapted to the delivery of biological weapons.⁵
 - The design of biological bombs and missile warheads with the lethality of small nuclear weapons may now be within Syrian capabilities, as is the design of UAV, helicopter, cruise missile, or aircraft-borne systems to deliver the agent slowly over a long line of flight and taking maximum advantage of wind and weather conditions. US and Soviet texts proved that this kind of "line source" delivery could achieve lethality as high as 50-100 kiloton weapons by the late 1950s, and the technology is well within Syria's grasp. So is the use of proxy or covert delivery.
- The CIA estimated in January 1999 that Syria continued to seek CW-related precursors from various sources during the reporting period. Damascus already has a stockpile of the nerve agent sarin and may be trying to develop more toxic and persistent nerve agents. Syria remains dependent on foreign sources for key elements of its CW program, including precursor chemicals and key production equipment.
- The FAS estimates that Syria is rapidly expanding its biomedical industrial base:
 - Syria simplified the procedures for foreign investments in a May 1991 law, and companies are being set up to negotiate licensing and technology transfer agreements with foreign suppliers.
 - The largest project of this kind has been announced by Saeb Nahas, whose GAS group is partially owned by the Syrian state. GAS owns a 51% share in the newly-formed Ibn Zahr Pharmaceuticals Company, which claims to be negotiating to build "one of the largest pharmaceuticals plants in the Middle East" at a cost of \$ 15 million. Discussions are currently under way with companies in Germany, Britain, and Holland

to obtain production licenses and manufacturing technology, and with the European Community to obtain export financing.

- The American medical supplier group, Baxter International, has contracted to build a factory to produce intravenous fluids for the Syrian military. Of concern in this case are the manufacturing processes, which could be applied to a broad-range of CBW activities, and the end-user, which is the Syrian army. Vigorous intervention by the Simon Wiesenthal Center with Baxter director, G. Marshall Abbey, caused the company to back off from this contract temporarily in 1991. However, it was subsequently reported that Baxter was attempting to complete the sale through the intermediary of an unknown supply house called Medport, located in Amhurst, Ohio.
- Despite the attempts to attract private sector interest, the two largest pharmaceutical conglomerates in Syria, Thameco and DIMAS, remain under rigid state control. Together they control a third company, Saydalaya, which serves as the foreign procurement board for all Syrian imports of chemicals and processed medicines
- Thameco is controlled the Syrian Ministry of Industry and employs approximately 900 people at its principle production site in Damascus. A second plant, built in Aleppo at a cost of nearly \$ 40 million by a consortium of French pharmaceuticals companies in the late 1980s, was reportedly "abandoned" in 1989 because of financial difficulties. However, suspicion remains that Syria may have simply switched suppliers, in order to better disguise conversion of the plant to the production of CW agents.
- DIMAS (the General Establishment for Blood and of Medical Industries) is directly controlled by the Syrian Ministry of Defense, and is the only manufacturer of serum in Syria. DIMAS is run by General Hikmat Tahrani, and controls a large production plant in Damascus.
- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, and identified Syria as a key country seeking biological weapons.

Iran and Biological Weapons

- Extensive laboratory and research capability.
- Weapons effort documented as early as 1982. Reports surfaced that Iran had imported suitable type cultures from Europe and was working on the production of Mycotoxins -- a relatively simple family of biological agents that require only limited laboratory facilities for small scale production.
- US intelligence sources reported in August, 1989, that Iran was trying to buy two new strains of fungus from Canada and the Netherlands that can be used to produce Mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.
- The Imam Reza Medical Center at Mashhad Medical Sciences University and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.
- Many experts believe that the Iranian biological weapons effort was placed under the control of the Islamic Revolutionary Guards Corps, which is known to have tried to purchase suitable production equipment for such weapons.
- Since the Iran-Iraq War, Iran has conducted research on more lethal active agents like Anthrax, hoof and mouth disease, and biotoxins. In addition, Iranian groups have repeatedly approached various European firms for the equipment and technology necessary to work with these diseases and toxins.
- Unclassified sources of uncertain reliability have identified a facility at Damghan as working on both biological and chemical weapons research and production, and believe that Iran may be producing biological weapons at a pesticide facility near Tehran.
- Some universities and research centers may be linked to biological weapons program.
- Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified

agents. Similar reports indicated that agents had destroyed German bio-containment equipment destined for Iran.

- More credible reports by US experts indicate that Iran has begun to stockpile anthrax and Botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.
- The CIA has reported that Iran has, “sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use.” It also reported in 1996 that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran's effort to “weaponize” and produce biological weapons.
 - Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads and bombs and covert devices.
 - Iran may have begun active weapons production in 1996, but probably only at limited scale suitable for advanced testing and development.
- CIA testimony indicates that Iran is believed to have weaponized both live agents and toxins for artillery and bombs and may be pursuing biological warheads for its missiles. The CIA reported in 1996 that, “We believe that Iran holds some stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance.
- CIA reported in June 1997 that Iran had obtained new dual use technology from China and India during 1996.
- Iran announced in June 1997 that it would not produce or employ chemical weapons including toxins.
- The CIA estimated in January 1999 that Iran continued to pursue purchasing dual-use biotechnical equipment from Russia and other countries, ostensibly for civilian uses. Its biological warfare (BW) program began during the Iran-Iraq war, and Iran may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials and equipment being sought and the many legitimate end uses for these items.
- Russia remains a key source of biotechnology for Iran. Russia's world-leading expertise in biological weapons makes it an attractive target for Iranians seeking technical information and training on BW agent production processes.
- The DCI Nonproliferation Center (NPC) reported in February 2000 that Tehran continued to seek considerable dual-use biotechnical equipment from entities in Russia and Western Europe, ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.
- A CIA report in August 2000 summarized the state of biological weapons proliferation in Iran as follows,⁶
 - For the reporting period, Tehran expanded its efforts to seek considerable dual-use biotechnical materials, equipment, and expertise from abroad—primarily from entities in Russia and Western Europe—ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.
 - Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia's world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.
- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, and identified Iran as a key country seeking biological weapons. He stated that, “Iran, for example, driven in

part by stringent international export controls, is acquiring the ability to domestically produce raw materials and the equipment to support indigenous biological agent production.”

Iraq and Biological Weapons

- Had highly compartmented “black” program with far tighter security regulations than chemical program.
- Had 18 major sites for some aspect of biological weapons effort before the Gulf War. Most were nondescript and had no guards or visible indications they were a military facility.
- The US targeted only one site during the Gulf War. It struck two sites, one for other reasons. It also struck at least two targets with no biological facilities that it misidentified.
- Systematically lied about biological weapons effort until 1995. First stated that had small defensive efforts, but no offensive effort. In July, 1995, admitted had a major defensive effort. In October, 1995, finally admitted major weaponization effort.
- Iraq has continued to lie about its biological weapons effort since October, 1995. It has claimed the effort was headed by Dr. Taha, a woman who only headed a subordinate effort. It has not admitted to any help by foreign personnel or contractors. It has claimed to have destroyed its weapons, but the one site UNSCOM inspectors visited showed no signs of such destruction and was later said to be the wrong site. It has claimed only 50 people were employed full time, but the scale of the effort would have required several hundred.
- Since July 1995, Iraq has presented three versions of FFCDs and four “drafts.”
 - The most recent FFCD was presented by Iraq on 11 September 1997. This submission followed the UNSCOM’s rejection, of the FFCD of June 1996. In the period since receiving that report, UNSCOM conducted eight inspections in an attempt to investigate critical areas of Iraq’s proscribed activities such as warfare agent production and destruction, biological munitions manufacturing, filling and destruction, and military involvement in and support to the proscribed program. Those investigations, confirmed the assessment that the June 1996 declaration was deeply deficient. The UNSCOM concluded that the new FFCD, it received on 11 September 1997, contains no significant changes from the June 1996 FFCD
- Iraq has not admitted to the production of 8,500 liters of anthrax, 19,000 liters of Botulinum toxin, 2,200 liters of Aflatoxin,
- Reports indicate that Iraq tested at least 7 principal biological agents for use against humans.
 - Anthrax, Botulinum, and Aflatoxin are known to be weaponized.
 - Looked at viruses, bacteria, and fungi. Examined the possibility of weaponizing gas gangrene and Mycotoxins. Some field trials were held of these agents.
 - Examined foot and mouth disease, haemorrhagic conjunctivitis virus, rotavirus, and camel pox virus.
 - Conducted research on a “wheat pathogen” and a Mycotoxin similar to “yellow rain” defoliant.
 - The “wheat smut” was first produced at Al Salman, and then put in major production during 1987-1988 at a plant near Mosul. Iraq claims the program was abandoned.
- The August 1995 defection of Lieutenant general Husayn Kamel Majid, formerly in charge of Iraq’s weapons of mass destruction, revealed the extent of this biological weapons program. Lt. General Kamel’s defection prompted Iraq to admit that it:
 - Imported 39 tons of growth media (31,000 kilograms or 68,200 pounds) for biological agents obtained from three European firms. According to UNSCOM, 3,500 kilograms or 7,700 pounds) remains unaccounted for. Some estimates go as high as 17 tons. Each ton can be used to produce 10 tons of bacteriological weapons.
 - Imported type cultures from the US which can be modified to develop biological weapons.
 - Had a laboratory- and industrial-scale capability to manufacture various biological agents including the bacteria which cause Anthrax and botulism; Aflatoxin, a naturally occurring carcinogen; clostridium perfringens, a gangrene-causing agent; the protein toxin Ricin; tricothecene Mycotoxins, such as T-2

- and DAS; and an anti-wheat fungus known as wheat cover smut. Iraq also conducted research into the rotavirus, the camel pox virus and the virus which causes haemorrhagic conjunctivitis.
- Created at least seven primary production facilities including the Sepp Institute at Muthanna, the Ghazi Research Institute at Amaria, the Daura Foot and Mouth Disease Institute, and facilities at Al-Hakim, Salman Pak Taji, and Fudaliyah. According to UNSCOM, weaponization occurred primarily at Muthanna through May, 1987 (largely Botulinum), and then moved to Al Salman. (Anthrax). In March, 1988 a plant was open at Al Hakim, and in 1989 an Aflatoxin plant was set up at Fudaliyah.
 - Had test site about 200 kilometers west of Baghdad, used animals in cages and tested artillery and rocket rounds against live targets at ranges up to 16 kilometers.
 - Took fermenters and other equipment from Kuwait to improve effort during the Gulf War.
 - Iraq had least 79 civilian facilities capable of playing some role in biological weapons production still in existence in 1997.
- The Iraqi program involving Aflatoxin leaves many questions unanswered.
 - Iraqi research on Aflatoxin began in May 1988 at Al Salman, where the toxin was produced by the growth of fungus aspergillus in 5.3 quart flasks.
 - The motives behind Iraq's research on Aflatoxin remain one of the most speculative aspects of its program. Aflatoxin is associated with fungal-contaminated food grains, and is considered non-lethal. It normally can produce liver cancer, but only after a period of months to years and in intense concentrations. There is speculation, however, that a weaponized form might cause death within days and some speculation that it can be used as an incapacitating agent.
 - Iraq moved its production of Aflatoxin to Fudaliyah in 1989, and produced 481 gallons of toxin in solution between November, 1988 and May, 1990.
 - It developed 16 R-400 Aflatoxin bombs and two Scud warheads. Conducted trials with Aflatoxin in 122 mm rockets and R-400 bombs in November 1989 and May and August 1990. Produced a total of 572 gallons of toxin and loaded 410.8 gallons into munitions.
 - UNSCOM concluded in October, 1997, that Iraq's accounting for its Aflatoxin production was not credible.
 - Total Iraqi production of more orthodox biological weapons reached at least 19,000 liters of concentrated Botulinum (10,000 liters filled into munitions); 8,500 liters of concentrated Anthrax (6,500 liters filled into munitions); and 2,500 liters of concentrated Aflatoxin (1,850 liters filled into munitions).
 - It manufactured 6,000 liters of concentrated Botulinum toxin and 8,425 liters of Anthrax at Al-Hakim during 1990; 5400 liters of concentrated Botulinum toxin at the Daura Foot and Mouth Disease Institute from November 1990 to January 15, 1991; 400 liters of concentrated Botulinum toxin at Taji; and 150 liters of concentrated Anthrax at Salman Pak.
 - Iraq is also known to have produced at least:
 - 1,850 liters of Aflatoxin in solution at Fudaliyah.
 - 340 liters of concentrated clostridium perfringens, a gangrene-causing biological agent, beginning in August 1990.
 - 10 liters of concentrated Ricin at Al Salam. Claim abandoned work after tests failed.
 - Iraq weaponized at least three biological agents for use in the Gulf War. The weaponization consisted of at least:
 - 100 bombs and 16 missile warheads loaded with Botulinum.
 - 50 R-400 air-delivered bombs and 5 missile warheads loaded with anthrax; and
 - 4 missile warheads and 7 R-400 bombs loaded with Aflatoxin, a natural carcinogen.
 - The warheads were designed for operability with the Al Husayn Scud variant.

- Iraq had other weaponization activities:
 - Armed 155 mm artillery shells and 122 mm rockets with biological agents.
 - Conducted field trials, weaponization tests, and live firings of 122 mm rockets armed with Anthrax and Botulinum toxin from March 1988 to May 1990.
 - Tested Ricin, a deadly protein toxin, for use in artillery shells.
 - Iraq produced at least 191 bombs and 25 missile warheads with biological agents.
 - Developed and deployed 250 pound aluminum bombs coverage in fiberglass. Bombs were designed so they could be mounted on both Soviet and French-made aircraft. They were rigged with parachutes for low altitudes drops to allow efficient slow delivery and aircraft to fly under radar coverage. Some debate over whether bombs had cluster munitions or simply dispersed agent like LD-400 chemical bomb.
 - Deployed at least 166 R-400 bombs with 85 liters of biological agents each during the Gulf War. Deployed them at two sites. One was near an abandoned runway where it could fly in aircraft, arm them quickly, and disperse with no prior indication of activity and no reason for the UN to target the runway.
 - Filled at least 25 Scud missile warheads, and 157 bombs and aerial dispensers, with biological agents during the Gulf War.
- Developed and stored drop tanks ready for use for three aircraft or RPV s with the capability of dispersing 2,000 liters of anthrax. Development took place in December 1990. Claimed later that tests showed the systems were ineffective.
 - The UN found, however, that Iraq equipped crop spraying helicopters for biological warfare and held exercises and tests simulating the spraying of Anthrax spores.
 - Iraqi Mirages were given spray tanks to disperse biological agents.
 - Held trials as late as January 13, 1991.
 - The Mirages were chosen because they have large 2,200 liter belly tanks and could be refueled by air, giving them a longer endurance and greater strike range.
 - The tanks had electric valves to allow the agent to be released and the system was tested by releasing simulated agent into desert areas with scattered petri dishes to detect the biological agent. UNSCOM has video tapes of the aircraft.
- Project 144 at Taji produced at least 25 operational Al Husayn warheads. Ten of these were hidden deep in a railway tunnel, and 15 in holes dug in an unmanned hide site along the Tigris.
- Biological weapons were only distinguished from regular weapons by a black stripe.
- The UN claims that Iraq has offered no evidence to corroborate its claims that it destroyed its stockpile of biological agents after the Gulf War. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.
- UNSCOM reported in October 1997 that:
 - Iraq has never provided a clear picture of the role of its military in its biological warfare program, and has claimed it only played a token role.
 - It has never accounted for its disposal of growth media. The unaccounted for media is sufficient, in quantity, for the production of over three times more of the biological agent -- Anthrax -- Iraq claims to have been produced.
 - Bulk warfare agent production appears to be vastly understated by Iraq. Expert calculations of possible agent production quantities, either by equipment capacity or growth media amounts, far exceed Iraq's stated results
 - Significant periods when Iraq claims its fermenters were not utilized are unexplained

- Biological warfare field trials are underreported and inadequately described.
- Claims regarding field trials of chemical and biological weapons using R400 bombs are contradictory and indicate that, “more munitions were destroyed than were produced.
- The Commission is unable to verify that the unilateral destruction of the BW-filled Al Hussein warheads has taken place.”
- There is no way to confirm whether Iraq destroyed 157 bombs of the R400 type, some of which were filled with Botulin or anthrax spores.
- “The September 1997 FFCD fails to give a remotely credible account of Iraq’s biological program. This opinion has been endorsed by an international panel of experts.”
- The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998):

<u>Agent</u>	<u>Declared Concentrated Amount</u>		<u>Declared Total Amount</u>		<u>Uncertainty</u>
	<u>Liters</u>	<u>Gallons</u>	<u>Liters</u>	<u>Gallons</u>	
Anthrax	8500	12,245	85000	22457	Could be 3-4 times declared amount
Botulinum toxin	19,400	NA	380,000	NA	Probably twice declared amount. Some extremely concentrated.
Gas Gangrene Clostridium Perfringens	340	90	3,400	900	Amounts could be higher
Aflatoxin	NA	NA	2,200	581	Major uncertainties
Ricin	NA	NA	10	2.7	Major uncertainties

- UNSCOM cannot confirm the unilateral destruction of 25 warheads. It can confirm the destruction of 23 of at least 157 bombs. Iraq may have more aerosol tanks.
- UNSCOM used to inspects 79 sites -- 5 used to make weapons before war; 5 vaccine or pharmaceutical sites; 35 research and university sites; thirteen breweries, distilleries, and dairies with dual-purpose capabilities; eight diagnostic laboratories.
- Iraq retains laboratory capability to manufacture various biological agents including the bacteria which cause anthrax, botulism, tularemia and typhoid.
- Many additional civilian facilities are capable of playing some role in biological weapons production.
- A State Department spokesman reported on November 16, 1998 that there is a large discrepancy between the amount of biological growth media -procured and the amount of agents that were or could have been produced. Baghdad has not adequately explained where some 8,000 pounds (3,500 kg) of the material went out of some 68,000 pounds (31,000 kg) of biological growth media it imported. Iraq's accounting of the amount of the agent it produced and the number of failed batches is seriously flawed and cannot be reconciled on the basis of this full disclosure Iraq has made.
- The CIA reported in January 1999 that Iraq continues to refuse to disclose fully the extent of its BW program. After four years of denials, Iraq admitted to an offensive program resulting in the destruction of Al Hakam-a large BW production facility Iraq was trying to hide as a legitimate biological plant. Iraq still has not accounted for over a hundred BW bombs and over 80 percent of imported growth media-directly related to past and future Iraqi production of thousands of gallons of biological agent. This lack of cooperation is an indication that Baghdad intends to reconstitute its BW capability when possible.
- A State Department report in September 1999 noted that:

- Iraq refuses to allow inspection of thousands of Ministry of Defense and Military Industries Commission documents relating to biological and chemical weapons and long-range missiles.
- In 1995, Iraqis who conducted field trials of R-400 bombs filled with biological agents described the tests to UNSCOM experts in considerable detail, including the use of many animals. These field trials were reflected in Iraq's June 1996 biological weapons declaration. Yet, amazingly, Iraq now denies that any such trials were conducted at all.
- In September 1995, Iraq finally declared the existence of two projects to disseminate biological agents from Mirage F-1 and MiG-21 aircraft, yet there is no evidence that the prototype weapons and aircraft were ever destroyed. There is also no evidence that the 12 Iraqi helicopter-borne aerosol generators for biological weapon delivery were ever destroyed.
- Apart from one document referring to a single year, no Iraqi biological weapon production records have been given to the UN—no records of storage, of filling into munitions, or of destruction. This is why UNSCOM refers to Iraq's biological weapons program—which deployed SCUD missile warheads filled with anthrax and botulinum toxin to be ready for use against Coalition forces—as a “black hole.”
- The Iraqis have repeatedly changed their story about their biological weapons warheads. Iraq has revised several times its declarations regarding the precise locations of warhead destruction and the fill of warheads. The movements of concealed warheads prior to unilateral destruction, claimed by Iraq, have been proven to be false.
- The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinstate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so.”
- Iraqi defector claims in February 2000 that Iraq had maintained a missile force armed with chemical and biological warheads that can be deployed from secret locations, and they that warheads are stored separately near Baghdad and have been deployed to the missiles in the field in exercises.⁷
- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, and identified Iraq as a key country seeking biological weapons.
- A CIA report in August 2000 summarized the state of biological weapons proliferation in Iraq as follows,⁸
 - Since Operation Desert Fox in December 1998, Baghdad has refused to allow United Nations inspectors into Iraq as required by Security Council Resolution 687. Although UN Security Council Resolution (UNSCR) 1284, adopted in December 1999, established a follow-on inspection regime to the United Nations Special Commission on Iraq (UNSCOM) in the form of the United Nations Monitoring, Verification, and Inspection Committee (UNMOVIC), there have been no UN inspections during this reporting period. Moreover, the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq's WMD programs.
 - Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment—in principle subject to UN scrutiny—also could be diverted for WMD purposes. Since the suspension of UN inspections in December 1998, the risk of diversion has increased.
 - Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.
 - UNSCOM reported to the Security Council in December 1998 that Iraq continued to withhold information related to its CW and BW programs. For example, Baghdad seized from UNSCOM inspectors an Air Force document discovered by UNSCOM that indicated that Iraq had not consumed as many CW munitions

during the Iran-Iraq War in the 1980s as had been declared by Baghdad. This discrepancy indicates that Iraq may have an additional 6,000 CW munitions hidden.

- We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. We assess that since the suspension of UN inspections in December of 1998, Baghdad has had the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so. We know, however, that Iraq has continued to work on its unmanned aerial vehicle (UAV) program, which involves converting L-29 jet trainer aircraft originally acquired from Eastern Europe. These modified and refurbished L-29s are believed to be intended for delivery of chemical or biological agents.

The Sudan and Biological Weapons

- The CIA reported in August 2000 that given its history in developing CW and its close relationship with Iraq, the Sudan may be interested in a BW program as well.

India and Biological Weapons

- India is a signatory to the BWC of 1972.
- India has long been involved in the development of biological weapons; possibly since the early 1980s.
- India has a well-developed biotechnology research base and its production facilities include numerous pharmaceutical production facilities and bio-containment laboratories (including BL-3) for working with lethal pathogens. It also has qualified scientists with expertise in infectious diseases
- The FAS estimates that some of India's facilities are being used to support research and development for BW defense purposes. These facilities constitute a substantial potential capability for offensive purposes as well.
- The FAS reports that Defence Research and Development Establishment (DRDE) at Gwalior is the primary establishment for studies in toxicology and biochemical pharmacology and development of antibodies against several bacterial and viral agents. Work is in progress to prepare responses to threats like Anthrax, Brucellosis, cholera and plague, viral threats like smallpox and viral haemorrhage fever and bio-toxic threats like botulism. Researchers have developed chemical/biological protective gear, including masks, suits, detectors and suitable drugs.
- India has probably reached the point of final development and weaponization for a number of agents.
- US experts feel there is no evidence of production capability, stockpiling, or deployment.

Pakistan and Biological Weapons

- Pakistan has long been involved in the development of biological weapons; possibly since the early 1980s.
- It has probably reached the point of final development and weaponization for a number of agents.
- No evidence of production capability, but has a well-developed biological and biotechnical R&D and production base by the standards of a developing nation.
- Pakistan has signed the BWC, and is participating in the negotiations to develop a verification protocol. It has opposed artificial deadlines and an emphasis on creating a comprehensive verification regime that could not be based on consensus.

Iraqi Covert Break Out Capabilities

- UNSCOM and the IAEA's success have created new priorities for Iraqi proliferation. The UN's success in destroying the large facilities Iraq needs to produce fissile materials already may well have led Iraq to focus on covert cell-like activities to manufacture highly lethal biological weapons as a substitute for nuclear weapons.
- All of the biological agents Iraq had at the time of the Gulf War seem to have been "wet" agents with limited storage life and limited operational lethality. Iraq may have clandestinely carried out all of the research necessarily to develop a production capability for dry, storage micro-power weapons which would be far easier to clandestinely stockpile, and have much more operational lethality.
- Iraq did not have advanced binary chemical weapons and most of its chemical weapons used unstable ingredients. Iraq has illegally imported specialized glassware since the Gulf War, and may well have developed advanced binary weapons and tested them in small numbers. It may be able to use a wider range of precursors and have developed plans to produce precursors in Iraq. It may have improved its technology for the production of VX gas.
- Iraq is likely to covertly exploit Western analyses and critiques of its pre-war proliferation efforts to correct many of the problems in the organization of its proliferation efforts, its weapons design, and its organization for their use.
- Iraq bombs and warheads were relatively crude designs which did not store chemical and biological agents well and which did a poor job of dispersing them. Fusing and detonation systems did a poor job of ensuring detonation at the right height and Iraq made little use of remote sensors and weather models for long-range targeting and strike planning. Iraq could clandestinely design and test greatly improved shells, bombs, and warheads. The key tests could be conducted using towers, simulated agents, and even indoors. Improved targeting, weather sensors, and other aids to strike planning are dual-use or civil technologies that are not controlled by UNSCOM. The net impact would be weapons that could be 5-10 times more effective than the relatively crude designs Iraq had rushed into service under the pressure of the Iran-Iraq War.
- UNSCOM and the IAEA's success give Iraq an equally high priority to explore ways of obtaining fissile material from the FSU or other potential supplier country and prepare for a major purchase effort the moment sanctions and inspections are lifted and Iraq has the hard currency to buy its way into the nuclear club. Iraq could probably clandestinely assemble all of the components of a large nuclear device except the fissile material, hoping to find some illegal source of such material.
- The components for cruise missiles are becoming steadily more available on the commercial market, and Iraq has every incentive to create a covert program to examine the possibility of manufacturing or assembling cruise missiles in Iraq.
- UN inspections and sanctions may also drive Iraq to adopt new delivery methods ranging from clandestine delivery and the use of proxies to sheltered launch-on-warning capabilities designed to counter the US advantage in airpower.
- Iraq can legally maintain and test missiles with ranges up to 150 kilometers. This allows for exoatmospheric reentry testing and some testing of improved guidance systems. Computer simulation, wind tunnel models, and production engineering tests can all be carried out clandestinely under the present inspection regime. It is possible that Iraq could develop dummy or operational high explosive warheads with shapes and weight distribution of a kind that would allow it to test concepts for improving its warheads for weapons of mass destruction. The testing of improved bombs using simulated agents would be almost impossible to detect as would the testing of improved spray systems for biological warfare.
- Iraq has had half a decade in which to improve its decoys, dispersal concepts, dedicated command and control links, targeting methods, and strike plans. This kind of passive warfare planning is impossible to forbid and monitor, but ultimately is as important and lethal as any improvement in hardware.
- There is no evidence that Iraq made an effort to develop specialized chemical and biological devices for covert operations, proxy warfare, or terrorist use. It would be simple to do so clandestinely and they would be simple to manufacture.

**What is At Stake in Terms of the UNSCOM Crisis in Iraq:
Summary of the Iraqi Threat Reported in the Note by the Secretary General, "Report of the Secretary-
General on the Activities of the Special Commission,"
S/1997/774, October 6, 1997**

- Analysis had shown that Iraq had destroyed 83 of the 85 missiles it had claimed were destroyed. at the same time, it stated that Iraq had not given an adequate account of its proscribed missile assets, including launchers, warheads, and propellants. It also stated that Tariq Aziz, Iraq's Deputy Prime Minister, "gave an explicit order in the presence of the Executive Chairman, to the Iraqi experts not to discuss such issues with the Chairman."
- Iraq had continued to lie regarding the way in which it has destroyed its pre-war inventory of missile launchers, and major uncertainties remained over its holdings of biological and chemical missile warheads. Iraq initially claimed that it had 45 missile warheads filled with chemical weapons in 1992. It then stated that it had 20 chemical and 25 biological warheads in 1995. UNSCOM established that it had a minimum of 75 operational warheads and 5 used for trials. It has evidence of the existence of additional warheads. It can only verify that 16 warheads were filled with Sarin, and 34 with chemical warfare binary components, and that 30 were destroyed under its supervision -- 16 with Sarin and 14 with binary components. Iraq again failed to provide documentation on this issue in September, 1997.
- It continued to conceal documents describing its missile propellants, and the material evidence relating to its claims to have destroyed its indigenous missile production capabilities indicated in might has destroyed less than a tenth of what it claimed.
- "The Commission identified some other areas of concern related to Iraq's chemical weapons program. The most important among them are the accounting for special missile warheads intended for filling with chemical or biological warfare agent, the material balance of some 550 155 mm mustard gas shells, the extent of VX programs, and the rationale for the acquisition of various types of chemical weapons."
- UNSCOM stated that it had been able to destroy 120 pieces of additional equipment for the production of chemical weapons that Iraq had only disclosed in August, 1997. Major uncertainties still existed regarding some 4,000 tons of declared precursors for chemical weapons, the production of several hundred tons of additional chemical warfare agents, the consumption of chemical precursors, and Iraq's claims to have unilaterally destroyed some 130 tons of chemical warfare agents. Major uncertainties existing regarding 107,500 empty casings for chemical weapons, whether several thousand additional chemical weapons were filled with agents, the unilateral destruction of 15, 620 weapons, and the fate of 16,038 additional weapons Iraq claimed it had discarded. "The margin of error" in the accounting presented by Iraq is in the neighborhood of 200 munitions."
- The uncertainties affecting the destruction of VX gas affect some 750 tons of imported precursor chemicals, and 55 tons of domestically produced precursors. Iraq has made unverifiable claims that 460 tons were destroyed by Coalition air attacks, and that it unilaterally destroyed 212 tons. UNSCOM has only been able to verify the destruction of 155 tons out of this latter total, and destroy a further 36 tons on its own. Iraq systematically lied about the existence of its production facilities for VX gas until 1995, and made "significant efforts" to conceal its production capabilities after that date.
- "Iraq has not provided physical evidence (relating to) binary artillery munitions and aerial bombs, chemical warheads for short range missiles, cluster aerial bombs, and spray tanks." Iraq has claimed these were only prototype programs, but there is no current way to know how many were deployed as weapons.
- "Until July, 1995, Iraq totally denied it had any offensive biological warfare program. Since then, Iraq has presented three versions of FFCDs and four "drafts." The most recent FFCD was presented by Iraq on 11 September 1997. This latest submission followed the Commission's rejection, in April 1997, of the previous FFCD of June 1996...In the period since that report, the Commission conducted eight inspections in an attempt to investigate critical areas of Iraq's proscribed activities such as warfare agent production and destruction, biological munitions manufacturing, filling and destruction, and military involvement in and support to the proscribed program. Those investigations, along with documents and other evidence available to the Commission, confirmed the assessment that the June 1996 declaration was deeply deficient....The new FFCD, received on 11 September 1997, contains fewer errata and is more coherent. However, with regard to the

important issues...the report contains no significant changes from the June 1996 FFCD. ..the Commission's questions are rephrased to in order to avoid having to produce direct answers, or are answer incompletely, or are ignored completely...Little of the information the Commission has gathered since June 1996 has been incorporated into the new document."

- Iraq has never provided a clear picture of the role of its military in its biological warfare program, and has claimed it only played a token role. It has never accounted for its disposal of growth media. "Media unaccounted for is sufficient, in quantity, for the production of over three times more of the biological agent -- Anthrax -- stated by Iraq to have been produced...Bulk warfare agent production appears to be vastly understated by Iraq...Experts calculations of possible agent production quantities, either by equipment capacity or growth media amounts, far exceed Iraq's stated results....Significant periods when the fermenters were claimed not to be utilized are unexplained."
- Iraq's accounting for its Aflatoxin production is not credible. Biological warfare field trials are underreported and inadequately described. Claims regarding field trials of chemical and biological weapons using R400 bombs are contradictory and indicate that, "more munitions were destroyed than were produced." No documentation has been provided on munitions filling. The account of Iraq's unilateral destruction of bulk biological agents is "incompatible with the facts...The Commission is unable to verify that the unilateral destruction of the BW-filled Al Hussein warheads has taken place."
- There is no way to confirm whether Iraq destroyed 157 bombs of the R400 type, some of which were filled with Botulin or anthrax spores.
- "The September 1997 FFCD fails to give a remotely credible account of Iraq's biological program. This opinion has been endorsed by an international panel of experts."

Iraqi Biological Warfare Program

BW Agent Production Amounts

BW Agent	Declared Concentrated Amounts	Declared Total Amounts	Comments
Anthrax (Bacillus anthracis)	8,500 liters (2,245 gallons)	85,000 liters (22,557 gallons)	UNSCOM estimates production amounts were actually 3-4 times more than the
Botulinum toxin (Clostridium Botulinum)	19,400 liters (10x and 20x concentrated) (5,125 gallons)	380,000 liters (100,396 gallons)	UNSCOM estimates production amounts Were actually 2 times more than the Declared amounts, but is unable to confirm.
Gas Gangrene (Clostridium perfringens)	340 liters (90 gallons)	3,400 liters (900 gallons)	Production amounts could be higher, but UNSCOM is unable to confirm.
Aflatoxin (Aspergillus flavus and Aspergillus parasiticus)	N/A	2,200 liters (581 gallons)	Production amounts and time frame of production claimed by Iraq do not correlate.
Ricin (Castor Bean plant)	N/A	10 liters (2.7 gallons)	Production amounts could be higher, but UNSCOM is unable to confirm.

BW-Filled and Deployed Delivery Systems

Delivery System	Anthrax	Botulinum Toxin	Aflatoxin	Comments
Missile warheads Al-Husayn (modified Scud B)	5	16	4	UNSCOM cannot confirm the unilateral Destruction of these 25 warheads due to conflicting accounts provided by Iraq.
R-400 aerial bombs	50	100	7	Iraq claimed unilateral destruction of 157 Bombs, but UNSCOM is unable to confirm
Aircraft aerosol spray tanks F-1 Mirage modified fuel drop tank	4			Iraq claims to have produced 4, but may Have manufactured others.

BW Agent Growth Media

Media	Quantity Imported	Unaccounted For Amounts
BW Agent Growth Media	31,000 kg (68,200 lbs.)	3,500 kg (7,700 lbs.)

Total refers to the amount of material obtained from production process, while *concentrated* refers to the amount of concentrated .agent obtained after final filtration/purification. The *concentrated* number is the amount used to fill munitions.

Media refers to the substance used to provide nutrients for the growth and multiplication of micro-organisms.

Adapted by Anthony H. Cordesman from material provided by the NSC on February 19, 1998.

Iraqi Key Personalities in Proliferation

Husayn Kamil Hasan al-Majid, Saddam's son-in-law, was the pre-eminent military industries official and a fundamental player in Iraq's efforts to procure weapons of mass destruction before his defection to Jordan in August 1995. A strict and capable manager, Kamil took charge of Iraq's efforts to develop its WMD program around 1987. As the head of the Ministry of Industry and Military Industrialization until 1990, he oversaw Iraq's nuclear weapons research, continued Iraq's development of biological and chemical weapons, and supervised the successful development of the Al-Husayn missile -- an indigenous modification of the Scud. During this time, it is possible that Kamil directed Iraq's testing of its chemical and biological weapons on Iranian prisoners of war.

-- After the Gulf war, Kamil -- first from his position as Minister of Defense and then as the director of the Ministry of Industry and Minerals and the Organization of Military Industrialization -- led Iraq's efforts to conceal its WMD program from international inspectors.

-- Husayn Kamil's influence over the Iraqi weapons of mass destruction program did not end with his defection in 1995. For instance, he is largely responsible for using Saddam's security services -- of which he was a member in the early 1980s -- to hide proscribed materials and documents from the United Nations.

Despite Kamil's influence, the Iraqi WMD program did not die with his defection and subsequent murder, as Iraq claims it did. Qusay Husayn -- Saddam's second son -- has assumed many of the responsibilities for concealing the proscribed programs. In addition, many of the leading scientists in Iraq's WMD programs during Husayn Kamil's tenure are still associated with the regime:

-- Lt. Gen. Amir Hamud Sadi -- who serves officially as a presidential adviser and is a leading official in Iraqi relations with UNSCOM -- was one of the principal engineers in the WMD program and essentially served as Husayn Kamil's deputy. With a doctorate in chemical engineering, Sadi has dedicated his entire career to conventional and non-conventional weapons development. In 1987, Sadi received rare public praise from Saddam for his role in the development of the Al-Husayn missile.

-- Humam Abd al-Khaliq Abd al-Ghafur -- currently Minister of Culture and Information -- is Iraq's leading nuclear official and the former head of its nuclear program. Abd al-Ghafur also was a close associate of Husayn Kamil, and he occasionally serves as an interlocutor with the IAEA, leading an Iraqi delegation to the IAEA annual conference in October 1997.

-- Jafar Dia Jafar is perhaps Iraq's foremost nuclear scientist and served as Abd al-Ghafur's deputy in the Iraqi Atomic Energy Organization. Jafar now officially serves as a presidential adviser, but his position -- unlike that of Sadi -- appears to be largely nominal.

-- Dr. Rihab Taha is the leading official in charge of Iraq's biological weapons program. She has overseen Iraqi efforts to develop anthrax and Botulinum toxin and directed testing on animal subjects. Taha is also politically well-connected -- she is married to the Minister of Oil, Amir Rashid Ubaydi, who helps direct Iraqi relations with UNSCOM.

Adapted by Anthony H. Cordesman from material provided by the NSC on February 19, 1998.

Attack Scenarios: “Dr. Ben No” and “Professor Abu Moriarity” At Work in the Middle East - Part One

- A radiological power is introduced into the air conditioning systems of Cairo’s high-rise tourist hotels. Symptoms are only detected over days or weeks or public warning is given several weeks later. The authorities detect the presence of such a power, but cannot estimate its long-term lethality and have no precedents for decontamination. Tourism collapses, and the hotels eventually have to be torn down and rebuilt.
- Parts for a crude gun-type nuclear device are smuggled into Israel or bought in the market place. The device is built in a medium sized commercial truck. A physics student reading the US Department of Defense weapons effect manual maps Tel Aviv to maximize fall out effects in an area filled with buildings with heavy metals and waits for a wind maximizing the fall out impact. The bomb explodes with a yield of only 8 kilotons, but with an extremely high level of radiation. Immediate casualties are limited but the long-term death rate mounts steadily with time. Peace becomes impossible and security measures become Draconian. Immigration halts and emigration reaches crisis proportions. Israel as such ceases to exist.
- Several workers move drums labeled as cleaning agents into a large shopping mall, large public facility, subway, train station, or airport. They dress as cleaners and are wearing what appear to be commercial dust filters or have taken the antidote for the agent they will use. They mix the feedstocks for a persistent chemical agent at the site during a peak traffic period. Large scale casualties result, and Draconian security measures become necessary on a national level. A series of small attacks using similar “binary” agents virtually paralyze the economy, and detection is impossible except to identify all canisters of liquid.
- Immunized terrorists visit a US carrier or major Marine assault ship during the first hours of visitor’s day during a port call in the Middle East. They are carrying anthrax powder in bags designed to make them appear slightly overweight. They slowly scatter the powder as they walk through the ship visit. The immediate result is 50% casualties among the ship’s crew, its Marine complement, and the visitors that follow. The US finds it has no experience with decontaminating a large ship where anthrax has entered the air system and is scattered throughout closed areas. After long debates over methods and safety levels, the ship is abandoned.
- A terrorist seeking to “cleanse” a nation of its secular regime and corruption introduces a modified type culture of Ebola or a similar virus into an urban area -- trusting God to “sort out” the resulting casualties. He scatters infectious cultures in urban areas for which there is no effective treatment. By the time the attack is detected, it has reached epidemic proportions. Medical authorities rush into the infected area without proper protection, causing the collapse of medical facilities and emergency response capabilities. Other nations and regions have no alternative other than to isolate the nation or center under attack, letting the disease take its course.
- A terrorist group modifies the valves on a Japanese remote-controlled crop spraying helicopter which has been imported legally for agricultural purposes. It uses this system at night or near dawn to spray a chemical or biological agent at altitudes below radar coverage in a line-source configuration. Alternatively, it uses a large home-built RPV with simple GPS guidance. The device eventually crashes undetected into the sea or in the desert. Delivery of a chemical agent achieves far higher casualties than any conventional military warhead. A biological agent is equally effective and the first symptoms appear days after the actual attack -- by which time treatment is difficult or impossible.

Attack Scenarios: “Dr. Ben No” and “Professor Abu Moriarity” At Work in the Middle East - Part Two

- A truck filled with what appears to be light gravel is driven through the streets of Tel Aviv or Cairo during rush hour or another maximum traffic period. A visible powder does come out through the tarpaulin covering the truck, but the spread of the powder is so light that no attention is paid to it. The driver and his assistant are immunized against the modified form of Anthrax carried in the truck which is being released from behind the gravel or sand in the truck. The truck slowly quarters key areas of the city. Unsuspected passersby and commuters not only are infected, but carry dry spores home and into other areas. By the time the first major symptoms of the attack occur some 3-5 days later, anthrax pneumonia is epidemic and some septicemic anthrax has appeared. Some 40-65% of the exposed population dies and medical facilities collapse causing serious, lingering secondary effects.
- A terrorist group scatters high concentrations of a radiological, chemical, or biological agent in various areas in a city, and trace elements into the processing intakes to the local water supply. When the symptoms appear, terrorist group makes its attack known, but claims that it has contaminated the local water supply. The authorities are forced to confirm that water is contaminated and mass panic ensues.
- Immunized terrorists carry small amounts of anthrax or a similar biological agent onto a passenger aircraft like a B-747, quietly scatter the powder, and deplane at the regular scheduled stop. No airport detection system or search detects the agent. Some 70-80% of those on the aircraft die as a result of symptoms that only appear days later.
- Several identical nuclear devices are smuggled out of the FSU through Afghanistan or Central Asia. They do not pass directly through governments. One of the devices is disassembled to determine the precise technology and coding system used in the weapon's PAL. This allows users to activate the remaining weapons. The weapon is then disassembled to minimize detection with the fissile core shipped covered in lead. The weapon is successfully smuggled into the periphery of an urban area outside any formal security perimeter. A 100 kiloton ground burst destroys a critical area and blankets the region in fall out.
- The same device is shipped to Israel or a Gulf area in a modified standard shipping container equipped with detection and triggering devices that set it off as a result of local security checks or with a GPS system that sets it off automatically when it reaches the proper coordinates in the port of destination. The direct explosive effect is significant, but “rain out” contaminates a massive local area.
- Iraq equips a freighter or dhow to spread Anthrax along a coastal area in the Gulf. It uses a proxy terrorist group, and launches an attack on Kuwait City and Saudi oil facilities and ports. It is several days before the attack is detected, and the attacking group is never fully identified. The form of Anthrax involved is dry and time encapsulated to lead to both massive prompt casualties and force time consuming decontamination. Iraq not only is revenged, but benefits from the resulting massive surge in oil prices.
- A terrorist group scatters small amounts of a biological or radiological agent in a Jewish area during critical stages of the final settlement talks. Near panic ensues, and a massive anti-Palestinian reaction follows. Israeli security then learns that the terrorist group has scattered small amounts of the same agent in cells in every sensitive Palestinian town and area, and the terrorist group announces that it has also stored some in politically sensitive mosques and shrines. Israeli security is forced to shut down all Palestinian movement and carry out intrusive searches in every politically sensitive area. Palestinian riots and then exchanges of gun fire follow. The peace talks break down permanently.
- The Iranian Revolutionary Guards equips dhows to spread Anthrax. The dhows enter the ports of Dubai and Abu Dhabi as commercial vessels -- possibly with local or other Southern Gulf registrations and flags. It is several days before the attack is detected, and the resulting casualties include much of the population of Abu Dhabi and government of the UAE. The UAE breaks up as a result, no effective retaliation is possible, and Iran achieves near hegemony over Gulf oil policy.

Attack Scenarios: “Dr. Ben No” and “Professor Abu Moriarity” At Work in the Middle East - Part Three

- A terrorist group attempting to drive Western influence out of Saudi Arabia smuggles a large nuclear device into Al Hufuf on the edge of the Ghawar oil field. It develops a crude fall out model using local weather data which it confirms by sending out scouts with cellular phones. It waits for the ideal wind, detonates the devices, shuts down the world’s largest exporting oil field, and causes the near collapse of Saudi Arabia.
- Alternatively, the same group takes advantage of the security measures the US has adopted in Saudi Arabia, and the comparative isolation of US military personnel. It waits for the proper wind pattern and allows the wind to carry a biological agent over a Saudi airfield with a large US presence from an area outside the security perimeter. The US takes massive casualties and has no ability to predict the next attack. It largely withdraws from Saudi Arabia.
- A freighter carrying fertilizer enters a Middle Eastern port and docks. In fact, the freighter has mixed the fertilizer with a catalyst to create a massive explosion and also carries a large amount of a chemical, radiological, and/or biological agent. The resulting explosion destroys both the immediate target area and scatters the chemical or biological weapon over the area.
- Extreme believers in Eretz Israel move a “cocktail” of radiological and persistent biological/chemical agents to the Temple Mount to contaminate the Mosques. They use carefully designed devices which only scatter very heavy matter over a limited area, although they use explosives to ensure a high degree of contamination within the mosques. All prayer in the mosque area must be halted indefinitely and there are significant casualties among the Islamic faithful in Jerusalem. The Jewish group issues a statement demanding that the temple area be clear of all non-Jewish religious activity triggering mass violence.
- A large terrorist device goes off in a populated, critical economic, or military assembly area -- scattering mustard or nerve gas. Emergency teams rush into deal with the chemical threat and the residents are evacuated. Only later does it become clear that the device also included a biological agent and that the response to this “cocktail” killed most emergency response personnel and the evacuation rushed the biological agent to a much wider area.

Strengths and Weaknesses of Weapons of Mass Destruction - Part One

Chemical Weapons:

Destructive Effects: Poisoning skin, lungs, nervous system, or blood. Contaminating areas, equipment, and protective gear for periods of hours to days. Forcing military units to don highly restrictive protection gear or use incapacitating antidotes. False alarms and panic. Misidentification of the agent, or confusion of chemical with biological agents (which may be mixed) leading to failure of defense measures. Military and popular panic and terror effects. Major medical burdens which may lead to mistreatment. Pressure to deploy high cost air and missile defenses. Paralysis or disruption of civil life and economic activity in threatened or attacked areas.

Typical Military Targets: Infantry concentrations, air bases, ships, ports, staging areas, command centers, munitions depots, cities, key oil and electrical facilities, desalinization plants.

Typical Military Missions: Killing military and civilian populations. Intimidation. Attack of civilian population or targets. Disruption of military operations by requiring protective measures or decontamination. Area or facility denial. Psychological warfare, production of panic, and terror.

Military Limitations: Large amounts of agents are required to achieve high lethality, and military and economic effects are not sufficiently greater than careful target conventional strikes to offer major war fighting advantages. Most agents degrade quickly, and their effect is highly dependent on temperature and weather conditions, height of dissemination, terrain, and the character of built-up areas. Warning devices far more accurate and sensitive than for biological agents. Protective gear and equipment can greatly reduce effects, and sufficiently high numbers of rounds, sorties, and missiles are needed to ease the task of defense. Leave buildings and equipment reusable by the enemy, although persistent agents may require decontamination. Persistent agents may contaminate the ground the attacker wants to cross or occupy and force use of protective measures or decontamination.

Strengths and Weaknesses of Weapons of Mass Destruction - Part Two

Biological Weapons

Destructive Effects: Infectious disease or biochemical poisoning. Contaminating areas, equipment, and protective gear for periods of hours to weeks. Delayed effects and tailoring to produce incapacitation or killing, treatable or non-treatable agents, and be infectious on contact only or transmittable. Forcing military units to don highly restrictive protection gear or use incapacitating vaccines/antidotes. False alarms and panic. High risk of at least initial misidentification of the agent, or confusion of chemical with biological agents (which may be mixed) leading to failure of defense measures. Military and popular panic and terror effects. Major medical burdens which may lead to mistreatment. Pressure to deploy high cost air and missile defenses. Paralysis or disruption of civil life and economic activity in threatened or attacked areas.

Typical Military Targets: Infantry concentrations, air bases, ships, ports, staging areas, command centers, munitions depots, cities, key oil and electrical facilities, desalinization plants. Potentially far more effective against military and civil area targets than chemical weapons.

Typical Military Missions: Killing and incapacitation of military and civilian populations. Intimidation. Attack of civilian population or targets. Disruption of military operations by requiring protective measures or decontamination. Area or facility denial. Psychological warfare, production of panic, and terror.

Military Limitations: Most wet agents degrade quickly, although spores, dry encapsulated agents, and some toxins are persistent. Effects usually take some time to develop (although not in the case of some toxins). Effects are unpredictable, and are even more dependent than chemical weapons on temperature and weather conditions, height of dissemination, terrain, and the character of built-up areas. Major risk of contaminating the wrong area. Warning devices uncertain and may misidentify the agent. Protective gear and equipment can reduce effects. Leave buildings and equipment reusable by the enemy, although persistent agents may require decontamination. Persistent agents may contaminate the ground the attacker wants to cross or occupy and force use of protective measures or decontamination. More likely than chemical agents to cross the threshold where nuclear retaliation seems justified.

Strengths and Weaknesses of Weapons of Mass Destruction - Part Three

Nuclear Weapons

Destructive Effects: Blast, fire, and radiation. Destruction of large areas and production of fall out and contamination -- depending on character of weapon and height of burst. Contaminating areas, equipment, and protective gear for periods of hours to days. Forcing military units to don highly restrictive protection gear and use massive amounts of decontamination gear. Military and popular panic and terror effects. Massive medical burdens. Pressure to deploy high cost air and missile defenses. Paralysis or disruption of civil life and economic activity in threatened or attacked areas. High long term death rates from radiation. Forced dispersal of military forces and evacuation of civilians. Destruction of military and economic centers, and national political leadership and command authority, potentially altering character of attacked nation and creating major recovery problems.

Typical Military Targets: Hardened targets, enemy facilities and weapons of mass destruction, enemy economy, political leadership, and national command authority. Infantry and armored concentrations, air bases, ships, ports, staging areas, command centers, munitions depots, cities, key oil and electrical facilities, desalinization plants.

Typical Military Missions: Forced dispersal of military forces and evacuation of civilians. Destruction of military and economic centers, and national political leadership and command authority, potentially altering character of attacked nation and creating major recovery problems.

Military Limitations: High cost. Difficulty of acquiring more than a few weapons. Risk of accidents or failures that hit friendly territory. Crosses threshold to level where nuclear retaliation is likely. Destruction or contamination of territory and facilities attacker wants to cross or occupy. High risk of massive collateral damage to civilians if this is important to attacker.

Source: Adapted by the Anthony H. Cordesman from Office of Technology Assessment, Proliferation of Weapons of Mass Destruction: Assessing the Risks, US Congress OTA-ISC-559, Washington, August, 1993, pp. 56-57.

Key Biological Weapons that May Be in the Middle East: Part One

<u>Disease</u>	<u>Infectivity</u>	<u>Transmissibility</u>	<u>Incubation Period</u>	<u>Mortality</u>	<u>Therapy</u>
<u>Viral</u>					
Chikungunya fever	high?	none	2-6 days	very low (-1%)	none
Dengue fever		high	none	5-2 days	very low (-1%) none
Eastern equine encephalitis	high	none	5-10 days	high (+60%)	developmental
Tick borne encephalitis	high	none	1-2 weeks	up to 30%	developmental
Venezuelan equine encephalitis	high	none	2-5 days	Low (-1%)	developmental
Hepatitis A	-	-	15-40 days	-	-
Hepatitis B	-	-	40-150 days	-	-
Influenza		high	none	1-3 days	usually low available
Yellow fever		high	none	3-6 days	up to 40% available
Smallpox (Variola)	high	high	7-16 days	up to 30%	available
<u>Rickettsial</u>					
Coxiella Burneti (Q-fever)	high	negligible	10-21 day	Low (-1%)	antibiotic
Mooseri - Prowazeki	-	6-14 days	-	-	-
Psittacosis		high	6-15 days	moderate-high	4-15 days Mod-high antibiotic
Rickettsi (Rocky mountain spotted fever)		high	none	3-10 days	up to 80% antibiotic
Tsutsugamushi	-	-	-	-	-
Epidemic typhus	high	none	6-15 days	up to 70%	antibiotic/vaccine
<u>Bacterial</u>					
Anthrax (pulmonary)	mod-high	negligible	1-5 days	usually fatal	antibiotic/vaccine
Brucellosis		high	none	1-3 days	-25% antibiotic
Cholera		low	high	1-5 days	up to 80% antibiotic/vaccine
Glanders			high	none	2-1 days usually fatal
poor antibiotic					
Meloidosis		high	none	1-5 days	usually fatal moderate antibiotic
Plague (pneumonic)		high	high	2-5 days	usually fatal antibiotic/vaccine
Tularemia		high	negligible	1-10 days	low to 60% antibiotic/vaccine
Typhoid fever		mod-high	mod-high	7-21 days	up to 10% antibiotic/vaccine
Dysentery		high	high	1-4 days	low to high
antibiotic/vaccine					

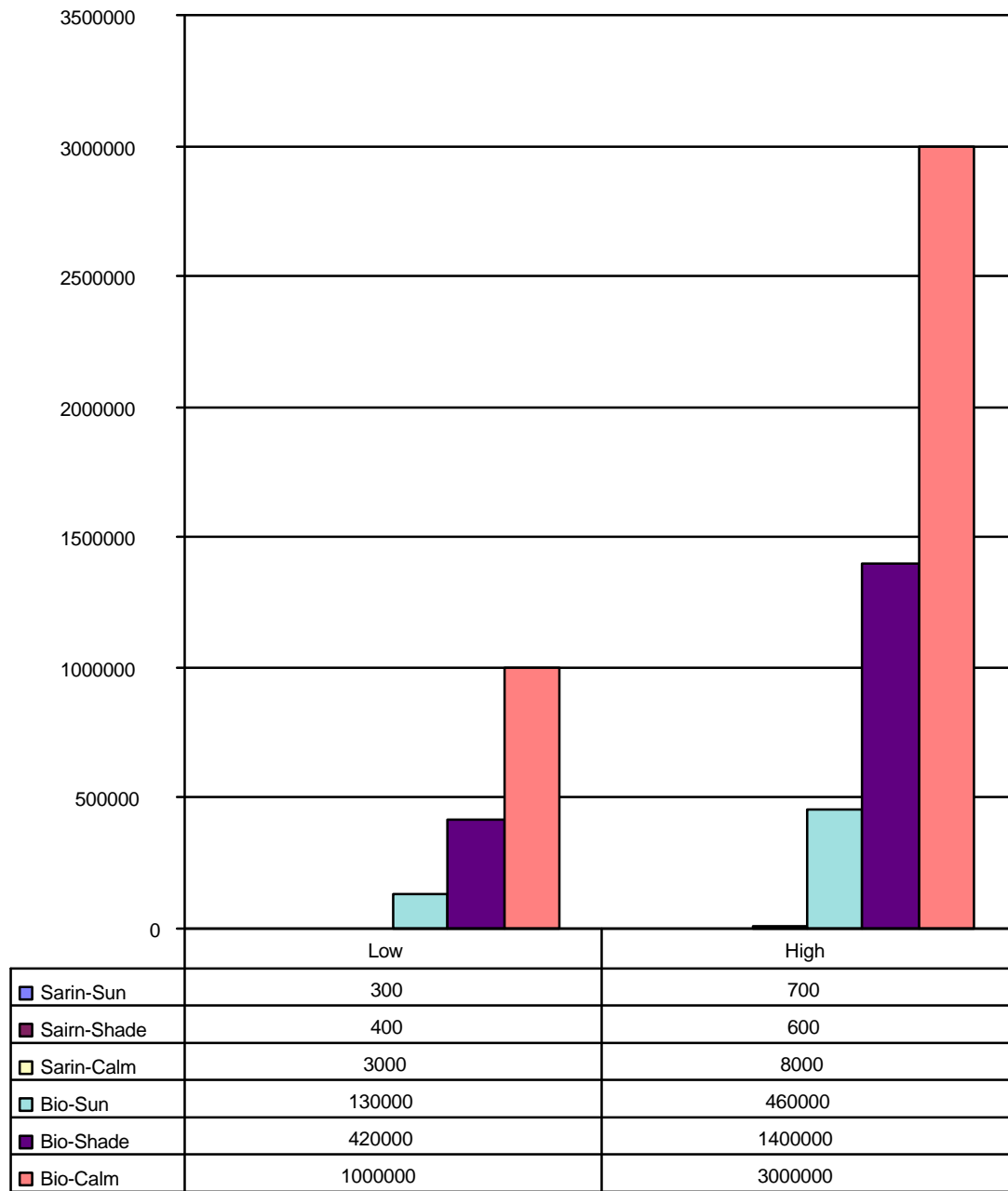
Key Biological Weapons that May Be in the Middle East: Part Two

<u>Disease</u>	<u>Infectivity</u>	<u>Transmissibility</u>	<u>Incubation Period</u>	<u>Mortality</u>	<u>Therapy</u>
<u>Fungal</u>					
Coccidioidomycosis	high	none	1-3 days	low	none
Coccidioides Immitis	high	none	10-21 days	low	none
Histoplasma					
Capsulatum	-	-	15-18 days	-	-
Norcardia Asteroides	-	-	-	-	-
<u>Toxins^a</u>					
Botulinum toxin	high	none	12-72 hours lar paralysis	high neromusc-	vaccine
Mycotoxin		high	none	hours or days	low to high ?
Staphylococcus	moderate	none	24-48 hours	incapacitating	?

a. Many sources classify as chemical weapons because toxin are chemical poisons.

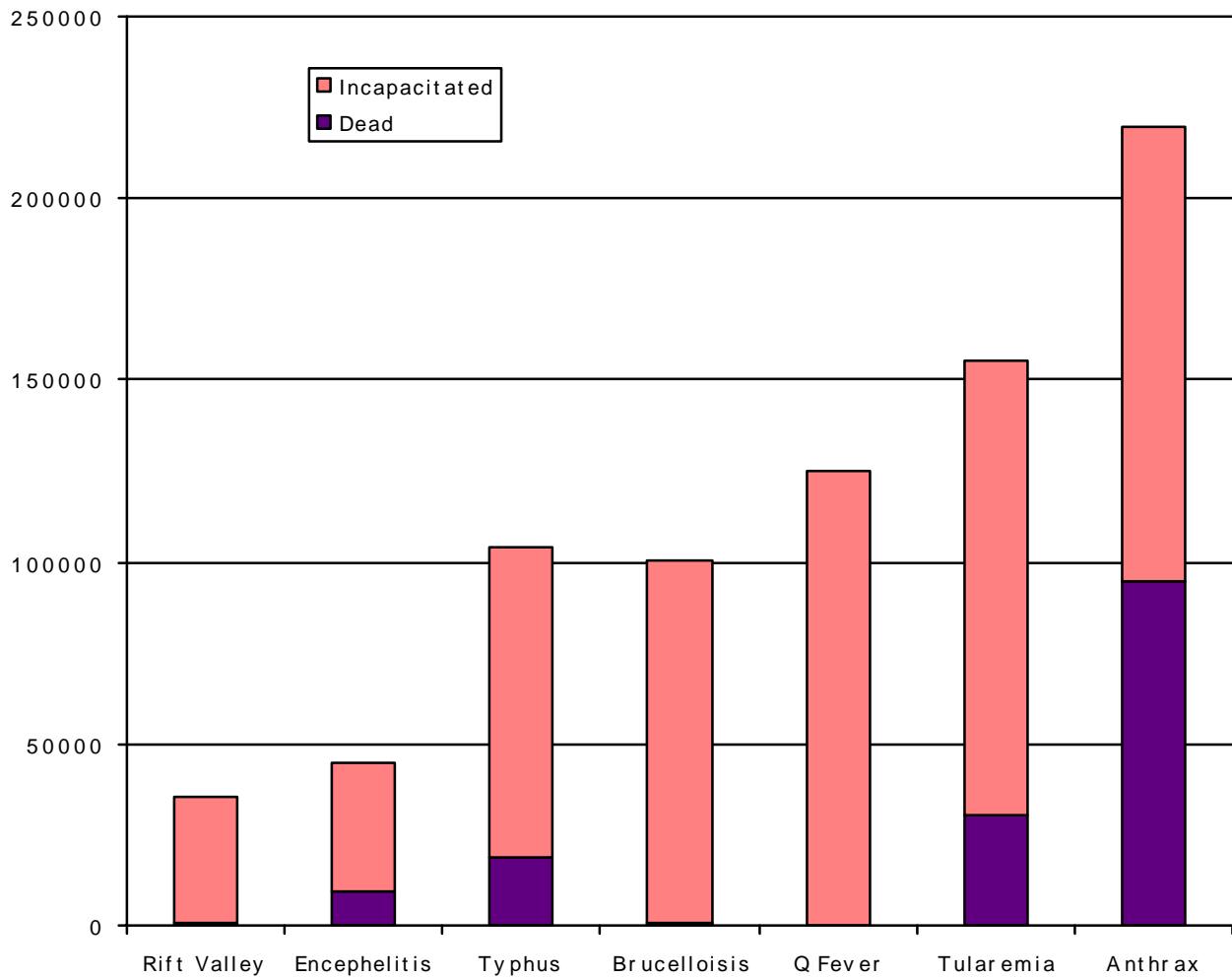
Source: Adapted by Anthony H. Cordesman from Report of the Secretary General, Department of Political and Security Affairs, Chemical and Bacteriological (Biological) Weapons and the Effects of Their Possible Use, New York, United Nations, 1969, pp. 26, 29, 37-52, 116-117; Jane's NBC Protection Equipment, 1991-1992; James Smith, "Biological Warfare Developments," Jane's Intelligence Review, November, 1991, pp. 483-487.

The Relative Killing Effect in Numbers of Dead for Biological vs. Chemical Weapons with a Optimal Aerosol Delivery



The Nominal Lethality of Different Biological Weapons

(Numbers of dead from delivery of 1,000 Kilograms)



<u>Agent</u>	<u>Downwind Reach</u> (kilometers)	<u>Casualties</u>	
		<u>Dead</u>	<u>Incapacitated</u>
Rift Valley Fever	1	400	35,000
Tick-Borne Encephalitis	1	9,500	35,000
Typhus	5	19,000	85,000
Brucellosis	10	500	100,000
Q Fever	20+	150	125,000
Tularemia	20+	30,000	125,000
Anthrax	20++	95,000	125,000

The Nominal Lethality of Different Biological Weapons

(Numbers of dead from delivery of 1,000 Kilograms)

<u>20-90% Deaths in 1-10 Days</u>	<u>20%-100 Deaths in 5-20 Days</u> <u>Weeks</u>	50%-100 Incapacity for Two Weeks
Anthrax (bc)	Brucellosis (c)	Brill-Zinsser disease
Bolivian hemor. fever	Blastomycosis	Dengue fever
Ebola infection	Congo Crim. hem. Fever (d)	Eastern equine encephalitis
Glanders (d)	Monkey herpes B	Epidemic typhus (d)
Lassa infection (d)	Korean hemor. fever (d)	Legionellosis
Marburg infection	Japanese encephalitis	Murine typhus
Plague (bd)	Monkeypox infection	Q fever (c)
Smallpox (abd)	Omsk hemor. fever (d)	Rift Valley fever
Yellow fever (b)	Russian S/S encephalitis	Salmonellosis
Melioidosis	Tularemia (bc)	Scrub typhus (d)
	Argentine hemor. fever (d)	
	Bolivian hemor. fever (d)	
	Influenze (d)	

a. Untreated. Days are numbers of days after symptoms appear.

b. Vaccine available – if not genetically altered

c. Known to be weaponized,

d. Probably weaponized.

Source: Dr. Kenneth Alibeck, "Biological Weapons Protection," Hadron, Inc. June 1, 2000, and USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, pp. 4-20 to 4-21.

Biological Weapons: Known Development of Agents by the Major Powers Before the BWC

Agent	Canada	France	Germany	Japan	UK	USA	Russia
Bacteria							
Anthrax	+	+	+	+	+	+	+
Brucella		+					+
Chlamydia psittaci						+	
Dysentaria		+			+	+	+
Gas gangrene		+			+		
Leprosy					+		+
Tuberculosis							+
Pseudomonas mallei		+	+	+	+		+
Pseudomonas Pseudomallei		+			+		+
Tetanus		+			+	+	+
Typhoid		+			+	+	+
Typhus		+			+	+	
Vibro Cholera				+	+	+	+
Yersinia Pestis				+	+	+	+
Viruses							
Ebola		+				+	+
Encephalitis		+					+
FMD			+				+
Fowl plague		+					+
Influenza		+			+		+
Newcastle disease							
Rinderpest	+	+		+			+
Korean haemorrhagic Fever					+		
Toxins							
Botulin	+	+			+	+	+
Ricin		+			+	+	+
Saxitoxin							+
Staphylococcus							+
Enterotoxin B						+	
Snake Toxins					+		
Tetrodotxin (fish poison)					+		
Arthropods							
Potato beetles		+		+			
Fungi							
Coccidioides immitis							+
Other							
Malaria					+		
Weeds				+			
Phytopathogens							+
Fish pathogens							+

Source: SIPRI and IDA

The Effects of Iraq's Biological Weapons

<u>Disease</u>	<u>Weapon</u>	<u>Main Symptoms</u>	<u>Incubation Period</u>	<u>Untreated Fatality Rate</u>	<u>Contagious?</u>
Anthrax (Pulmonary) <i>Bacillus Anthrax</i>	Bacterial Spore in vapor or dry micro- powder	High fever, difficult breathing, rapid pulse, chest pains, shock, toxic blood poisoning	1-5 days	90% as a military agent. Antibiotics only effective after short period	No
Botulism <i>Clostridium Botulinum</i> bacterium	Botulinum toxin in vapor or dry micro- powder	Fatigue, nausea, headache, constipation, thirst, fever, cramps, dizziness, blurred vision, problems in swallowing, followed by respiratory paralysis and death	2-36 hours	65%	No
Gas Gangrene <i>Clostridium perfringens</i>	Vapor or mist	Enters open wounds, Toxins kill muscle muscle cells and cause bloating, shock, jaundice, and sometimes death	2-36 hours	25%	No
Aflatoxin	Powered mold or vapor	High concentrations can confuse and incapacitate, and later cause jaundice, internal bleeding, and liver cancer.	Hours to years	?	No
Ricin	Castor bean derivative in powder or vapor form. Can ingest or inject.	Can be insecticide or weapon. Kills cells and impedes breathing and circulation, causes nausea, vomiting, bloody diarrhea, stupor, convulsions, shock, liver damage and death.	10 Hours. Lethal amounts kill in two days	?	No
Plague, pneumonic <i>Yersinia pestis</i> bacterium	Vapor, possibly dry powder	Infection of lungs, fever, headache, pneumonia. hemorrhages, heart failure.	2-5 days	95%	Yes, extremely.
Smallpox Variola virus	Vapor, possibly dry power	Headache, chills, fever, lesions of skin and mucous membranes	12 days	25-40%	Yes, extremely

Adapted by Anthony H. Cordesman from work by the Monterey Institute, CIA report of February 19, 1998, and Washington Post, February 22, 1998, p. A-28.

The Comparative Effects of Biological, Chemical, and Nuclear Weapons Against a Typical Urban Target in the Middle East

Using missile warheads: Assumes one Scud sized warhead with a maximum payload of 1,000 kilograms. The study assumes that the biological agent would not make maximum use of this payload capability because this is inefficient. It is unclear this is realistic.

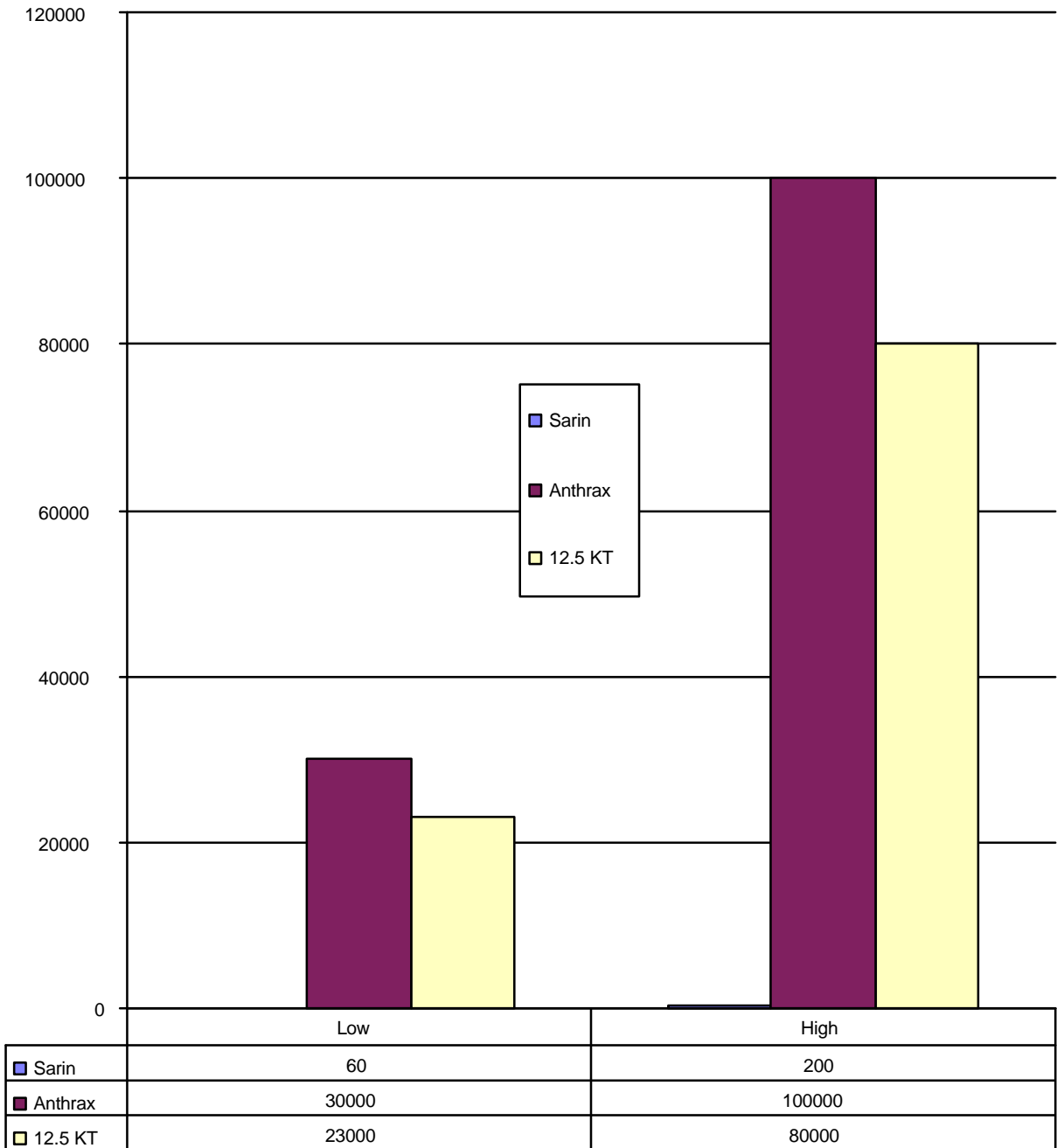
	Area Covered in Square Kilometers <u>Per Square Kilometer</u>	Deaths Assuming 3,000-10,000 people <u>Per Square Kilometer</u>
<u>Chemical</u> : 300 kilograms of Sarin nerve gas with a density of 70 milligrams per cubic meter	0.22	60-200
<u>Biological</u> 30 kilograms of Anthrax spores with a density of 0.1 milligram per cubic meter	10	30,000-100,000
<u>Nuclear</u> :		
One 12.5 kiloton nuclear device achieving 5 pounds per cubic inch of over-pressure	7.8	23,000-80,000
One 1 megaton hydrogen bomb	190	570,000-1,900,000

Using one aircraft delivering 1,000 kilograms of Sarin nerve gas or 100 kilograms of anthrax spores: Assumes the aircraft flies in a straight line over the target at optimal altitude and dispensing the agent as an aerosol. The study assumes that the biological agent would not make maximum use of this payload capability because this is inefficient. It is unclear this is realistic.

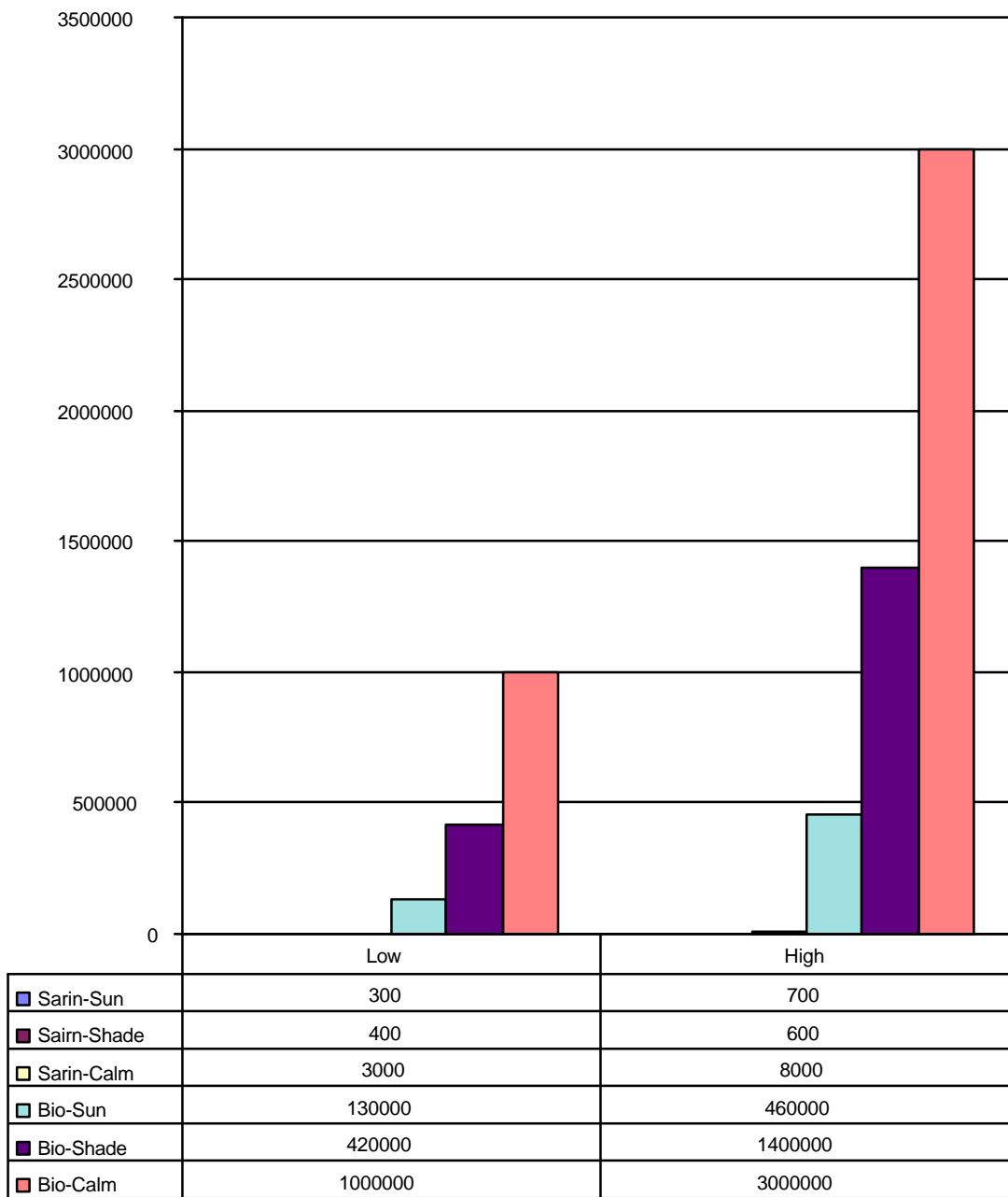
	Area Covered in Square Kilometers	Deaths Assuming 3,000-10,000 people <u>Per Square Kilometer</u>
<u>Clear sunny day, light breeze</u>		
Sarin Nerve Gas	0.74	300-700
Anthrax Spores	46	130,000-460,000
<u>Overcast day or night, moderate wind</u>		
Sarin Nerve Gas	0.8	400-800
Anthrax Spores	140	420,000-1,400,000
<u>Clear calm night</u>		
Sarin Nerve Gas	7.8	3,000-8,000
Anthrax Spores	300	1,000,000-3,000,000

Source: Adapted by the Anthony H. Cordesman from Office of Technology Assessment, Proliferation of Weapons of Mass Destruction: Assessing the Risks, US Congress OTA-ISC-559, Washington, August, 1993, pp. 53-54.

The Relative Killing Effect of Chemical vs. Biological Weapons of Mass Destruction for a 1,000 Kilogram Bomb or Warhead



The Relative Killing Effect in Numbers of Dead for Biological vs. Chemical Weapons with a Optimal Aerosol Delivery



¹ See Dany Shoham, [“Evolution of Chemical and Biological Weapons in Egypt,”](#) Ariel Center for Policy Research and “Egypt War Preparations Against IDF Viewed,” FBIS-NES-98-320 ; 11/17/98 [Tel Aviv Hatzofe in Hebrew 25 Sep 98]

² This information is unconfirmed, and based on only one source. Israel does, however, have excellent research facilities, laboratory production of poison gas is essential to test protection devices as is the production of biological weapons to test countermeasures and antidotes.

³ [Philadelphia Inquirer](#), November 1, 1998, p. A-7; Associated Press, October 8, 1998, 1350.

⁴ [Washington Times](#), October 7, 1998, p. A-14.

⁵ [Jane’s Defense Weekly](#), September 3, 1997. P. 3

⁶ CIA, August 10, 2000, Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 1999 internet edition.

⁷ London [Sunday Times](#), February 21, 2000.

⁸ CIA, August 10, 2000, Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 1999 internet edition.