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Biological Weapons Arms Control

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Introduction

The Biological Weapons Convention (BWC) was signed on April 10, 1972. The United States, the USSR, and United Kingdom deposited their instruments of Ratification of the Convention on March 26, 1975, and the Treaty came into force. It was the first—and for a long time only—post-World War II disarmament treaty in which an entire class of weapons of mass destruction was done away with—or so it was widely assumed at the time—and the arms control community by and large thought biological warfare had been removed from the scene. Contrary to the nuclear Nonproliferation Treaty of 1968 (NPT), there was to be no preferred group of countries that would continue to retain the weapons. Biological weapons were to be prohibited to all, into the future. This was the first major and unique distinction of the subject.

The second was that one of the two superpowers—the United States—that did possess biological weapons, gave them up and destroyed them, even before the Treaty came into being:

> "Biological weapons provide a case in which the usual approach to arms limitation was reversed. Instead of first negotiating a treaty and then implementing its provisions, an entire class of weapons was renounced by a major possessor without any prior international agreement. This was in November 1969, when President Nixon, after extensive review, declared that the United States would unconditionally renounce the deployment, procurement, and stockpiling of biological weapons, would destroy all stocks of agents and weapons, and would convert facilities for their development and production to peaceful purposes. In announcing these decisions, he also declared support for the principles and objectives of a draft convention prohibiting biological weapons that had been proposed by Great Britain. Three months later, the United States unconditionally renounced toxin weapons."[1]

The United States chose this policy at the time to dissociate biological from chemical

[1] Matthew Meselson *et al.*, "Verification of Biological and Toxin Weapons Disarmament," Chapter 9 in *Verification: Monitoring Disarmament*, Francesco Caloger (ed.), Westview Press, Boulder, 1990, pp. 149-164.

weapons, the combined and historical framework under which arms control deliberations on them had been carried on for many years in Geneva. Article 9 of the BWC was an undertaking to continue negotiations to achieve a chemical weapons disarmament treaty—but an additional 22 years would pass before that would be achieved. The BWC additionally carried *no* verification provisions; on-site verification was not something that the USSR would consider or accept before the Stockholm Conference in 1986 and the Intermediate-Range Nuclear Forces (INF) Treaty in December 1987. Nonetheless, the BWC does address the question of non-compliance.

There was, however, a third major and unique distinction of the BWC: in 1992 Russia admitted that the former USSR had been in gross, generic violation of the Treaty, the only instance in which one of the superpowers admitted to having been in total violation of a post-World War II arms control treaty. By the end of the 1980s, it had also become clear that a half dozen or more countries had decided to develop biological weapons in the intervening years. Thus the assumed achievement of the 1970s had been, at least in part, reversed. Chemical weapons had been used in the war between Iraq and Iran in the 1980s, and allied troops that fought Iraq in the Gulf War in 1991 ran a risk of being attacked by both chemical and biological weapons. From the mid-1980s on, there had also been movement to strengthen the BWC and add some kind of verification provisions to it, particularly once the Chemical Weapons Convention was signed in January 1993. In 1994, it was also reported that "U.S. military doctrine on nuclear weapons since 1993 has assumed the possible use of nuclear weapons to deter or respond to a chemical or biological attack. . . ," although there is no official U.S. government statement to this effect.[2]

All these things placed biological weapons once again on the active arms control agenda. This paper examines four areas of interest:

- What was learned in recent years regarding the BW program of the former USSR, and now Russia, and its present status;
- Proliferation of BW: reviews of the state of public knowledge regarding those countries known or strongly suspected of having BW programs;

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[2] "U.S. Nuke Response Is Included in Doctrine," *Defense News*, November 14-20, 1994, and Theresa Hitchens, "U.S. Must Spell Out BioWar Response," *Defense News*, September 11-17, 1995.

In the case of chemical weapons, on May 13, 1991, President Bush announced that when the Chemical Weapons Convention went into force, provided that the then-USSR was a participant, the United States would not use CW under any circumstances, including retaliation against a chemical attack. This was reiterated by the chairman of the U.S. Joint Chiefs of Staff, and in this case it was assumed that retaliation would be through the massive use of conventional high-explosive munitions.

- Developments in BW arms control since 1975, and particularly in the last six years;
- Some discussion of the problems of verification of BW arms control.

In the proliferation section, the disclosures since 1990-1991 and the Gulf War regarding Iraq's BW program are treated in the greatest detail. The proliferation section also includes a discussion of the potential use of biological weapons by extra-national or "terrorist" groups.

The Biological Weapons Program of the Former USSR and Russia

It was not the astonishing harvest of arms control treaties at the end of President Gorbachev's tenure—the INF, Strategic Arms Reductions Treaties (START), Conventional Forces in Europe (CFE) agreements—and the USSR's admission to having a chemical weapons stockpile that brought about the exposure and admission of its BW program. It was not even the dissolution of the USSR. It was essentially the result of a crucially positioned defector from the USSR who reached Britain in 1989. As a consequence, President Bush and Prime Minister Thatcher both pressed the issue with President Gorbachev. He denied that the USSR had a BW program. It took three years for the British and American governments to obtain a Russian admission. It came in a speech by Boris Yeltsin in January 1992, on the eve of his visit to the United States to meet with President Bush, when he referred to "a lag in implementing" the 1972 BWC.[3] On January 19, 1993, the U.S. government released its arms control treaty compliance report for the previous year. It stated the following:

> "The United States has determined that the Russian offensive biological warfare program, inherited from the Soviet Union, violated the Biological Weapons Convention through at least March 1992. The Soviet offensive BW program was massive, and included production, weaponization, and stockpiling. The status of the program since that time remains unclear."[4]

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[3] Details of the history of events dealing with the USSR's and then Russian BW program between 1989 and 1994, as well as a more detailed treatment of U.S. allegations regarding that program from 1975 on, appeared in a series of four papers: Milton Leitenberg, "A Return to Sverdlovsk: Allegations of Soviet Activities Related to Biological Weapons," *Arms Control*, 12:2, September 1991, pp. 161-190; Milton Leitenberg, "Anthrax in Sverdlovsk: New Pieces to the Puzzle," *Arms Control Today*, 22:3, April 1992, pp. 10- 13; Milton Leitenberg, "The Biological Weapons Program of the Former Soviet Union," *Biologicals*, 21:3, September 1993, pp. 187-191; Milton Leitenberg, "The Conversion of Biological Warfare Research and Development Facilities to Peaceful Uses," Chapter 8 in *Control of Dual-Threat Agents: The Vaccines for Peace Programme*, E. Geissler and J.P. Woodall (eds.), SIPRI and Oxford University Press, 1994, pp. 77-105.

[4] "Adherence to and Compliance with Arms Control Treaties," January 19, 1993; pp. 14-15, "The 1972

The United States had noted the USSR's non-compliance with the BWC in its annual reports since 1984.

The program was halted—or at least in part circumscribed—only after extensive pressure by the U.S. and British governments, and following U.S. Senate legislation which forbade U.S. financial assistance to Russian strategic weapons destruction programs unless the U.S. president could certify that the former USSR, and subsequently Russia, "was committed to moving toward compliance with all arms control agreements." In April 1992 President Yeltsin announced a decree stating that "It shall be established that the development and implementation of biological programmes in breach of the Convention. . . is not being permitted in the territory of the Russian Federation."[5] In the decree, Yeltsin also appointed a committee—headed by Major General Anatoly Kuntsevich, formerly deputy head of the Soviet chemical forces—which was to report to him in a month about how to achieve this.[6] In the succeeding months, however, the British and U.S. governments remained convinced that the Russian BW program continued activities that violated the BWC. And in September, 1992 they obtained Russian agreement to the establishment of a "trilateral" process of information sharing and mutual site visits in an effort to increase the

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Biological and Toxin Weapons Convention."

In 1986, after Gorbachev's accession to power in the USSR, the Soviet ambassador to the Second Review Conference of the BWC, held in 1986, made the following statement to the conference:

"In accordance with the legislation and practice of the Soviet Union, observance of the provisions of the biological weapons convention, which was ratified by the decree of 11 February 1975 of the Presidium of the Supreme Soviet of the USSR, is guaranteed by the relevant State institutions of the USSR. The Soviet Union does not possess any of the bacteriological (biological) agents or toxins, weapons, equipment or means of delivery specified in Article I of the convention, nor does it conduct research or development work for the purposes of producing or perfecting that kind of weapon.

". . . In the Soviet Union, research and development work with the use of microorganisms and toxins is conducted exclusively for peaceful purposes, in the interests of health, the microbial industry, and agricultural production." Michael E. Kokeiv, "The Reality of Disarmament," *Disarmament* (United Nations) 10:1, Winter 1986-1987, pp. 66-72.

[5] "Decree of the President of the Russian Federation on Fulfilling International Obligations with Regard to Biological Weapons," April 11, 1992, two pages.

[6] In September 1992, General Kuntsevich stated the following in a Russian interview: "Indeed these clear violations on the convention were only admitted after the totalitarian regime collapsed and duplicity in politics was abandoned. . . .The remnants of the offensive programs in the area of biological weapons were still around as recently as 1991. It was only in 1992 that Russia absolutely stopped this work. . .

"We did not have stockpiles of biological weapons. The point is that they cannot be kept for a long time. Therefore, the question of their destruction does not come up. . .

"Within the Russian Defense Ministry's structure the relevant directorate has been abolished and a directorate for radiological, chemical, and biological protection has been set up." Interview with General Kuntsevich in *Rossiyskiye Vesti*, September 22, 1992, in FBIS-SOV-92-186, September 24, 1992.

transparency of the Russian program and to bring an end to its illegitimate activities.

The trilateral statement "confirmed the termination of offensive research, the dismantlement of experimental technological lines for the production of agents, and the closure of the biological weapons testing facility" in Russia.[7] It also "dissolved the department in the Ministry of Defense responsible for the offensive biological programme. . . , cut the number of personnel involved in military biological programmes by 50 percent, (and) reduced military biological research funding by 30 percent." That partial reduction was demonstrably less of a curtailment than the zero budget allocation and the "halt (in) Russian research into biological weapons" that President Yeltsin and his then military advisor, General Volkogonov, had promised in February 1992. Reciprocal visits that could take place at any time with unrestricted access to each other's *non*-military, but potentially BW-related facilities, were to be negotiated. They were not true "short notice" visits, but in essence, challenge inspections with some caveats. The first visits to a Soviet facility had actually taken place in 1991. There were other important provisions to the agreement as well, and trilateral working groups were instituted so that a continuous process was initiated. Russian government visitors had actually been to the U.S. *military* facility, the United States Army Research Institute of Infectious Diseases (USAMRIID, the lead agency of the U.S. Biological Defensive Research Program) at Fort Detrick, Maryland, in mid-1992, just as the former USSR dissolved, as well as to the site of a U.S. Department of Defense (DoD)-contracted vaccine production facility. These visits had in all likelihood been arranged as part of the effort to get the former USSR to permit on-site inspection of Russian laboratories outside nominal Soviet Ministry of Defense control that the United States was interested in opening up. (See discussion below on the organization of the Soviet BW program.) Nevertheless, for the next three years the USSR did not permit site visits to its military BW facilities, and as of May 1996, it has still proved impossible to arrange for Western visits to them.

U.S. and British concerns continued, however. In April 1994, U.S. officials stated "We have evidence that leads us to understand that there is still an offensive biological weapons program underway (in Russia). . . Yeltsin's decrees have not filtered down to the working levels."[8] There had been virtually no publicly available information in the 18

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[7] Joint Statement on Biological Weapons by the Governments of the United Kingdom, the United States, and the Russian Federation, September 15, 1992, three pages. See also, "Certification of Commitments of Russia: Justification," United States Department of State, February 10, 1994, p. 8, in respect to the 1972 BWC.

[8] R. Jeffrey Smith, "U.S. Wary of Russian Germ Arms; Despite Assurances from Yeltsin, Effort May Be Continuing," *Washington Post*, April 8, 1994. See also, Thomas W. Lippman, "Administration Voices Concern on Russian Treaty Compliance; Congress Told Russian Chemical, Germ Weapons Plans Are Suspect,"

months between September 1992 and April 1994 on what was taking place inside the institutions that comprised the BW R&D program of the former USSR. Once again, U.S. and British qualms were substantially based on information from inside the Russian program, delivered by two new defectors, one in the winter of 1992, and the last in the fall of 1993. In addition, the U.S. and British inspections in 1993 and 1994 "demonstrated that a 'substantial infrastructure with no commercial purpose' and with links to the Russian military remains largely intact."[9]

These issues had yet again been brought to the attention of Russian President Boris Yeltsin—now by President Clinton during his visit to Moscow in January 1994, during U.S. Secretary of Defense Perry's visit to Moscow in March 1994, and at the September 1994 Yeltsin-Clinton summit meeting. Also Russia had submitted its annual BWC data declaration to the United Nations in April 1994, but it provided "no additions to Russia's 1992 declaration of past offensive BW activities"—the "Form F" submission which was to recount *all past offensive* programs going back to 1945—and U.S. officials had complained that the 1992 Russian submission was even retrogressive in some respects compared to the one that the USSR had submitted in 1988. In part for reasons unrelated to BW issues, General Kuntsevich was dismissed as director of the Russian Presidential Committee on the Problems of Chemical and Biological Disarmament on April 7, 1994. At the summit in May 1995, Russia agreed—in principle—to finally permit inspection visits to the BW facilities directly managed by the Russian military. The visits were to take place in August 1995;[10] but as of May 1996, they had not yet occurred. The unclassified version of a special U.S. government report in October 1994 on Russian compliance with biological and chemical arms control agreements stated that "The United States continues to have concerns about Russia's compliance with the BWC,"[11] and as recent as April 1996, a U.S. Department of Defense report repeated the following:

"The United States continues to have concerns about Russian compliance

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Washington Post, December 11, 1994.

[9] R. Jeffrey Smith, ibid.

[10] R. Jeffrey Smith, "U.S. Aides Report Progress with Russia on Inspections; No Summit Gains Cited on Other Arms Related Disputes," *Washington Post*, May 17, 1995. See also, R. Jeffrey Smith, "U.S. to Press Moscow on Alleged Arms Violations," *Washington Post*, May 9, 1995.

[11] Report on Demonstration of Russian Commitment to Comply with Three Agreements on Chemical and Biological Weapons, undated, nine page.

> with the Biological Weapons Convention, despite President Yeltsin's decree in April 1992 banning all activities contravening the Convention. Russia may be retaining capability for the production of biological warfare agents."[12]

Given the history of these events since 1989—a period of over *six years*—it seems clear that neither the Soviet nor the Russian senior military or political leadership was in any great hurry to thoroughly do away with residual portions of the USSR's offensive BW program.

What were the parameters of that program? In September 1992 Russian Deputy Foreign Minister Grigory Berdennikov stated that the post-World War II Soviet BW program had been in progress since 1946.[13] For the most part, however, the Soviet institutes, laboratories and administrative structure that were in violation of the BWC were established *after* the 1972-1975 period, after the United States had dismantled most of its BW research apparatus and had destroyed its production facility and BW stockpile, and after the BWC had come into force.

As a result of agreements reached at the Third Review Conference of the BWC in 1986, the USSR agreed to an exchange of information dealing with certain categories of its microbiological research institutions. On October 13, 1987, the USSR provided the first such exchange of information which was subsequently to be deposited annually. It reported five laboratories under Ministry of Defense control: (a) Leningrad (now St. Petersburg); (b)

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[12] *Proliferation: Threats and Response*, U.S. Department of Defense, April 1996, p. 32. The report added that "Ukraine, Kazakstan, and Belarus have no known biological warfare programs and no intention of establishing them."

[13] The original sources for the material in this section are for the most part in Leitenberg, 1994, op. cit. See also, Confidence-Building Measure F; Russian Submission, 1992; Raymond Zilinskas, "Biotechnology in the USSR, Part I," *Biotechnology*, July 2, 1984, pp. 610-615; "Biotechnology in the USSR, Part II," *Biotechnology*, August 2, 1994, pp. 686-692; "The Weapon of Special Designation," Chapter 20 in James Adams, *The New Spies: Exploring the Frontiers of Espionage*, Hutchinson, London, 1994, pp. 270-283; 337; *Ogonyok*; No. 16, April 1995, pp. 36-37; Anthony Rimington, *Technology in Transition: A Survey of Biotechnology in Russia, Ukraine, and the Baltic States*, Pinter Publishers, London, 1992.

A declassified U.S. National Intelligence Estimate of September 1954 ("Soviet Capabilities and Probable Courses of Action Through Mid-1959," NIE 11-4-54, p. 24) indicated no knowledge of specific ongoing Soviet BW programs, and another in 1963 still indicated no knowledge of direct production:

"We believe that the Soviet Union has an active BW research effort which is suitable to support a complete BW program, but there is insufficient evidence on which to base a firm assessment of Soviet BW offensive activities. However, the USSR has a comprehensive biological warfare defensive program which could lead to an offensive capability. The Soviets have concluded research on anti-personnel, anti-livestock, and possibly anti-crop BW agents. Although we have identified no mass production facility for BW agents and have no evidence of Soviet stockpiling of such agents, research laboratories and existing plants for the production of vaccines could provide these agents in quantity." "Soviet Military Capabilities and Policies, 1962-1967," NIE 11-4-63, pp. 56-57.

Kirov; (c) Sverdlovsk (now Ekaterinburg); (d) Zagorsk (subsequently also referred to under its pre-1917 name, Sergiyev-Posad), Moscow oblast; and (e) Aralsk, Kzyl-Ordinsky oblast. There was also an open air BW testing ground on an island in the Aral Sea. The Leningrad site was under the jurisdiction of the USSR Ministry of Defense Scientific Research Institute for Military Medicine; the remaining four were under the USSR Ministry of Defense Scientific Research Institute for Microbiology.

The 1989 Soviet submission and the disclosures of the Soviet defector Dr. Pasechnik in the same year exposed another whole system of laboratories that were heavily involved in the BW program, but were under the control of nominally civilian agencies. These were the All-Union Scientific Institute of Applied Microbiology at Obolensk, the Institute for Ultrapure Drugs in Leningrad and the All-Union Research Institute for Molecular Biology in Koltsovo. Also included were six other facilities that had been referred to on and off for over a decade in leaks to the press by U.S. intelligence agencies, but also several that had not been so identified, located in Moscow and in Chekhov. A still classified 1992 U.S. intelligence report referred to "16 known and suspected (Soviet) biological weapons facilities," up from nine previously "identified," a number that was soon increased to 20. There were also indications that some BW R&D had been carried out in past years in a system of plague research laboratories that the USSR had maintained throughout the country.

This second system of facilities belonged to an organization named Biopreparat, which was under the jurisdiction of the USSR Ministry of the Medical and Microbiological Industry. Biopreparat had 25,000 employees and a budget of 100 million roubles per year in the 1980s. However, its facilities also produced a wide range of civilian products. And there is no available information to indicate what proportion of its facilities or what proportion of its staff were involved in prohibited BW R&D, although some of the facilities were wholly devoted to BW work.[14] There were 400 people working at the Leningrad (Ultrapure) laboratory; 1,200 at Obolensk; at Kirov, 237 senior scientific personnel; at

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[14] U.S. Defense Intelligence Agency estimates late in 1994 still referred to 20 facilities with "6,500 to 25,000" workers. ("Russia Denies Biological Weapon Stockpiling," *Jane's Defense Weekly*, May 13, 1995.) The manner in which the personnel figure was estimated is not known, and it is so uncomfortably wide an estimate—three fold—that it suggests that little is actually known about which facilities are actually doing what.

The names assigned to the Biopreparat organization have changed numerous times, in a manner not atypical of certain Soviet organizations: The All-Union Research and Production Association Biopreparat, The Special Directorate of the Main Administration of the Microbiological Industry, the Main Directorate Biopreparat of the USSR Ministry of the Medical Industry, the State Concern Biopreparat. "On 5 December 1991, it was transferred to the jurisdiction of the Ministry of the Health of Russia. . . .It is still run by a general. The facility is guarded, just as before, by warrant officers of the internal troops. . . ."

Koltsovo over 3,000 personnel, but reportedly only about 10 percent of those were senior scientists. General Kuntsevich's successor, General Valentin Yevstigneyev, (who had headed the USSR/Russian BW defense program since 1985) claimed in September 1992 that only "400 scientists in Russia are engaged in the research." That number seems quite low, both for the number that may have been so engaged even in 1992, and most certainly in the 1980s. In its 1993 BWC declaration, Russia listed five primary facilities, presumably the five under Ministry of Defense control, and seven others, with a total staff of at least 6,000. Taking into account the apparent number of individual institutes involved and the total number of employees in the program, the overall size of the Soviet BW R&D program appears to have been an order of magnitude or more greater than that of the United States at its peak in the late 1960s.

What is perhaps most interesting is what became known regarding the management of the Biopreparat organization, which Deputy Foreign Minister Berdennikov called "one of the best-guarded secrets in the old Soviet Union," and one whose operations the Foreign Ministry professed to know nothing about as late as the end of 1992. Its management staff was apparently taken from the Ministry of Medium Machine Building, one of the former USSR's eight defense industrial ministries, and the one responsible for producing nuclear weapons. It acted as an intermediary for funding and for the supply of resources to its affiliated members and would therefore appear to have been a smaller and highly specialized analogue to the USSR's Military Industrial Commission (VPK). The important particulars are as follows:[15]

- It was established by Central Committee directive in 1973, and its first head was General V.I. Ogarkov.
- "Technical and scientific documentation was transferred to [it] from the Ministry of Defense." A directorate of the Defense Ministry, presumably the one that directed the Ministry's own biological warfare R&D institutes, was its "customer," and it had "strictly military tasks."
- Its staff in 1991 was composed of 150 managers, operated "independently of the structure to which it technically belonged," and were "officers on loan, who had gained experience at the biological facilities of the Ministry of Defense."
- It was responsible for the construction of the institutes in Obolensk and Koltsovo,

[15] V. Umnov, "After 20 years of silence the Soviet microbes are talking," *Komsomol'skaya Pravda*, April 30, 1992, in FBIS-SOV-92-087, May 5, 1992, pp. 4-6. See also, S. Leskov, *Izvestia*, June 26, 1993, in JPRS-TND-93-025, August 2, 1993, pp. 13-17.

but other enterprises as well (two in Vilnius are mentioned) that had nothing to do with the biological warfare programme, and were allegedly a "cover." Also it acquired several operating plants.

- Biopreparat was referred to colloquially as "Ogarkov's system," after the name of its first director. The system contained 18 scientific institutes employing 25,000 workers—of whom 1,000 were scientists—five plants, and a large storage facility in Siberia. Several institutes and plants formerly subordinated to purely civilian departments—such as the Ministry of Agriculture and the Ministry of Health—also worked for it.
- A "mobilization program and department" was organized within the Biopreparat organization to begin production on short notice. "The equipment was mothballed in special shops (as a rule, operating biochemical production facilities were used). Such shops were idle at the Berdsk and Omutninsk Chemical Plants and the Progress Plants in Stepnogorsk. In addition, there was a plant within the organization of the Ministry of Agriculture and two plants within the Ministry of Health." It is not stated, but the "short notice" production presumably would have been a BW agent and not vaccine. It is very likely that this "mobilization department . . . [and] . . . equipment" is the same "experimental technological lines for production of biological agents" referred to in the U.S., British, and Russian statement of September 15,1992. The "mobilization plan" allegedly specified the quantity and types of agents that were to be produced on command.
- After Dr. Pasechnik's defection in 1989, "the special equipment in the mothballed shops. . . was shipped out," some destroyed and some re-stored elsewhere. Allegedly, documentation was also destroyed.
- Also there were apparently other mechanisms of cooperation between the Ministry of Health and Ministry of Defense. Biopreparat, for example, acted as a channel for funding from the Ministry of Health to some of its affiliated institutes. Other indications of close relations between the two ministries were the roles played by senior generals—for example, General Y. I. Smirnov, as Minister of Health. In 1992, the head of Biopreparat was another former general of the Soviet Army's Chemical Troops, Yuri Kalinin.
- The second Biopreparat official who defected reported that offensive BW work had continued within the Biopreparat system even after President Yeltsin's decrees of February and April 1992 and the Russian legislation of August 1992, but that the

production plants had been mothballed.[16]

In summary, the Soviet military BW program was quite large with many facilities spread across the breadth of the USSR, secret, directed by a branch of the General Staff, and its funding was funneled through diverse ministries, including civilian ones. The Defense Ministry's credibility was nil: the General Staff's Directorate for Bacteriological Radiation and Chemical Defense claimed in 1992—following President Yeltsin's admissions—that all charges of an active Soviet (and then Russian) BW program were lies, and that ". . . all work on biological weapons stopped in 1975."[17] The Directorate was renamed, but it retained its existing staff, and its new head became the man who had headed the Soviet BW program since 1985. The directors of individual laboratories continued to profess the total innocence of their respective institutions, and several strongly resisted the idea of, or need for, conversion of their R&D programs to civil needs and programs.

Conversion of these sites should have been particularly easy. Of all the kinds of defense R&D installations, equipment, and personnel, those in the biological and medical related sciences are the easiest to convert.[18] In addition, the former Soviet Union—and then Russia—was in dire need of every pharmaceutical product imaginable, and domestic vaccine

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[16] "Last autumn, another defector from the Biopreparat Project came over to British Intelligence to tell his debriefers what steps the Russian military had taken to keep the project going.
"In every facility that had been opened for inspection to Western intelligence, the Russians had established convincing cover stories that made it appear as if each site had been converted to research and manufacture of vaccines. The secret work continued in parts of the sites that were never visited by the American or British officials. At the same time, a secret new facility was being built at Lakhta near St. Petersburg. Far from the Biopreparat biological warfare programme being shut down, it had undergone considerable modernization. Work is continuing as before, in defiance of Yeltsin's orders." "At Face Value," *The Sunday Times*, March 27, 1994.

[17] As late as April 1994, portions of this establishment, with cooperation from sectors of the Russian government—Radio Moscow being state controlled—were not above a little old-fashioned Soviet-style disinformation. Russian inspectors had visited the U.S. pharmaceutical firm, Pfizer, as part of the trilateral exchange visits, and Radio Moscow reported that Pfizer was "producing biological weapons." Pfizer had also "not only preserved but was modernizing the equipment designed earlier to produce biological warfare formulas." Radio Moscow World Service, in English, April 12, 1994. The same charges were also published in *Izvestiya* on April 5, 1994. The charges were thus mirror image inversions of those that the United States and the UK were making to Russia in the trilateral consultations, regarding what U.S. and UK inspectors had actually found at the Russian laboratories. Soviet diplomatic officials continued to elaborate on this charge in 1995—that U.S. commercial pharmaceutical plants were providing a standby capacity to enable the U.S. government to renew production of BW—and have claimed that it is the ostensible reason for stalling U.S. and UK access to Russian military BW facilities.

[18] The conversion of both the U.S. and former Soviet BW R&D facilities is discussed in detail in Leitenberg, 1994, op. cit.

manufacture production standards had been neglected for decades. The needs were obvious, the relevant plants and trained personnel were all there, but matters dragged on for several years. Conversion programs were proposed, but little seemed to take place. Funding offered by Western nations for research through the International Science and Technology Center (ISTC) offices established in Russia and the Ukraine was delayed by lack of interest in the Russian parliament and by bureaucratic intervention in the Ukraine. It was not until March 1994 that the ISTC could offer funding to Russian and Ukrainian researchers, a delay of some two years.[19]

More recently, some efforts toward serious conversion have apparently taken place at some of these sites. At Koltsovo and Obolensk—both former Biopreparat facilities—small private venture groups have been established by research staff members to utilize their institute's facilities for production and to market pharmaceuticals needed domestically in Russia. Also the U.S. Department of Defense has supplied Nunn-Lugar funds to a U.S. firm entering a joint venture with a former Biopreparat facility at Stepnagorsk in Kazakhstan to produce vitamins, and hoped thereby ". . . to eliminate biological weapons production infrastructure" at the site.[20] In addition to the U.S. Department of Defense, both the U.S. Department of Energy and NASA are funding collaborative projects with laboratories inside former Soviet BW institutions, and particularly, it appears, with those that were in the Biopreparat system.[21]

British, Japanese, South Korean, Finnish, Austrian, and other pharmaceutical firms have also sought to arrange joint ventures with former Soviet "BW" laboratories. However, there is no overall quantitative estimate available as to how much of the plant or personnel that was formerly occupied by the Soviet BW program has actually been converted as of the spring of 1996.

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[19] "Trip Report on Symposium on Vaccine Production in Novosibirsk, Russia, December 12-14, 1994,"U.S. Department of State, February 7, 1995. (The laboratory in question is the Koltsovo institution.) See also, "Report on Bacterial Vaccine Symposium, State Research Center for Applied Microbiology, Obolensk, April 2-4, 1995," U.S. Department of State, undated.

[20] Bill Gertz, "Germ Warfare Gives Way to War on Germs," *Washington Times*, April 6, 1995.

[21] Anne M. Harrington, "Redirecting Biological Weapons Expertise: Realities and Opportunities in the Former Soviet Union," *Chemical Weapons Convention Bulletin*, Issues #29, September 1995, pp. 2-5. Harrington's analysis is narrow and weak on the potential diversity of conversion possibilities, except for one reference to bioremediation. "Commercialization" is *not* the main point—the United States has the CDC and numerous analogous national government laboratories working in other R&D areas that impact on social needs. Neither are "products *exportable* to the West." What is needed is *production for* and processes that can be applied *in the territory of the former USSR.*

There remain the final questions: Why did the USSR mount a major effort in BW precisely after the BWC came into force? And why was it persistently retained even as the USSR and its military leadership—the General Staff—entered into one major strategic arms control treaty after the other: INF and START, the Conventional Forces in Europe (CFE) Treaty dealing with conventional weapons, the acknowledgement of a chemical weapons stockpile, the executive agreement with the United States to withdraw all deployed naval tactical nuclear weapons, and even the dissolution of the Warsaw Treaty Organization, and finally, the USSR itself! Surely each one of these was of far greater military significance than the BW program? Yet they were acceded to, while there obviously was a determined effort to bluff, procrastinate, conceal, and draw out any disclosure of the BW program, to hold on to it as long as possible, and to avoid putting a definitive end to it.

The first clue is provided by the following description of the policy debate in Moscow at the time that the Biological Weapons Convention was being considered for signature. The author is Arkady Shevchenko, the Soviet diplomat who defected to the United States, and who at the time under discussion was a personal advisor to Soviet Foreign Minister Gromyko.

> "The military branch responsible for this. . .business has a huge department in the Defense Ministry. It has rejected any kind of international control or oversight. Several times I asked officials there why they were so adamant. The response was always the same: control was out of the question because it could reveal the extent of the development of these weapons and would show Soviet readiness for their eventual use. . . . While the military strongly opposed any agreement on chemical or biological weapons, the political leadership, Gromyko in particular, felt it necessary for propaganda purposes to respond to a proposal by Great Britain to conclude a special separate convention to prohibit biological warfare as a first step. The military's reaction was to say go ahead and sign the convention; without international controls, who would know anyway? They refused to consider eliminating their stockpiles and insisted upon further development of these weapons. The Politburo approved this approach. The toothless convention regarding biological weapons was signed in 1972, but there are no international controls over the Soviet program, which continues apace."[22]

A second is a purely formalistic point, but one which nonetheless represents the

[22] Arkady N. Shevchenko, *Breaking with Moscow*, Ballantine Books, New York City, 1985, pp. 230-231.

standard approach of any industrial manager or resource allocator in the former Soviet defense industrial sector. The example provided was given by a Russian analyst explaining the response in 1990 to the cuts in defense ministry orders for major conventional weapons:

> "The majority of the defense industry managers went into a "wait-and-see" state. After all, they were under strict instructions not to tamper with the military production lines, as almost all of these lines belonged to the reserve capacity—or mobilization capacity—which by law cannot be sold or converted to civilian production."[23]

This is not too distant from the 1995 remark of a U.S. administration official directly involved with the Russian BW problem, that "it was easier for them to keep going than to change." As powerful as inertia may be, it does not seem a sufficient explanation for the contravention of a major arms control treaty for 20 years, and particularly in the political climate of the 1987 to 1995 period; nevertheless, it undoubtedly was the generic attitude of Soviet defense industrial managers. And not only in the Soviet period. In June 1994,

> ". . . Russian First Deputy Defense Minister Andrei Kokoshin said that the development of dual-use technology constitutes one of the main priorities in Russia's defense conversion effort. He said that the Defense Ministry, the State Committee for Defense Industries, and the Economics Ministry were jointly carrying out research in the practical application of dual-use technology in hopes of preserving the defense sector's mobilization potential and developing a national industrial policy."[24]

The *production* lines for BW agents fit the definition of "dual-use technology" as perfectly as anything could, and it is just that defense sector "mobilization potential," which was referred to in the September 1992 trilateral statement as the "experimental technological lines for the production of agents," that the United States and UK want to see dismantled.

The remaining explanations become more operative and functional, and move in a spectrum from bureaucratic division and inertia, to an explicit strategic purpose on the part of the Ministry of Defense for having made the BW program in the first place, as well as for

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[23] Dr. Alexander Ozhegov, (Analytic Center of the Russian Academy of Sciences) in Lars Wallin (ed.), *Proceedings of a Symposium on the Post-Soviet Military-Industrial Complex*, Stockholm, October 20, 1993: FOA, The Swedish National Defense Research Establishment, 1994, p. 53.

[24] Radio Free Europe/Radio Liberty News Briefs, 3:27, June 27 - July 1, 1994, p. 5.

continuing to maintain it. Some U. S. and UK officials associated with the trilateral process feel that the Soviets assumed for two decades that they could get away with the violation and "that it has taken them four years to decide *whether* to tell the whole story, to write the past story."[25] In addition, they have had an even longer time—since 1989—to "clean up," prepare, remove, consolidate, and move parts of the program. But "it's obvious that they have tried to keep the program." It is also pointed out that at any point along the way, Soviet officials could have argued against disclosure on the grounds that doing so would admit to the past Soviet violation of the BWC. That is obviously true, although the argument loses its meaning with the realization that continuing the program only meant that an even more damaging disclosure would follow at some point later on.

When President Gorbachev was pressured on the question by the American and British governments, apparently he was "stonewalled" by the Soviet military. His personal military advisor, General Akhromeyev, was not particularly interested in having the program ended. "The General Staff probably gave him a memorandum stating that the United States is doing the same, and we have to keep the program." It appears that the Soviet intelligence community did not believe that the United States had relinquished its own BW program, that President Nixon had actually shut it down between 1969 and 1972, before it was necessary to do so. The upsurge in U.S. expenditure for BW R&D during the Reagan administration may also have fed that suspicion. That increase—of over 500 percent between 1980 and 1986—raised questions in the United States as well, as to whether the program was crossing the boundary between defensive and offensive R&D. For the Soviet military, maintaining *any* defense capability was desirable. In addition, secrecy had "worked" in past instances for the USSR, and in Moscow it was easy to keep the program secret; possibly only a small number of generals and colonels on the General Staff were involved—perhaps a dozen. The decision to put the program under the cover of the Biopreparat was made in 1980, although the organization had been established some years earlier. Equally important was the "paranoid" tradition of the Soviet military culture and secrecy: "if the United States wants something of us, they want to hurt us." It is possible that Gorbachev may have suggested that

[25] These and the following quotations are taken from interviews in 1994 and 1995 with a half-dozen present or former government officials—American, British, and Russian—who have been directly involved in the trilateral process, but who cannot be identified.

the program be shut down; at least some reduction in its size did take place between 1986 and 1992.

One is left with the unsatisfactory conclusion that members of the Soviet General Staff saw a strategic advantage in maintaining the former USSR's—and then Russia's—BW capabilities. Why they should have thought that—while at the same time being willing to relinquish SS-20 missiles, large numbers of multiple independent reentry vehicles (MIRVed) intercontinental ballistic missiles (ICBMs), all naval tactical nuclear weapons, tens of thousands of tanks, etc.—still seems to require an explanation that is impossible to provide.

The Proliferation of Biological Weapons

The years since 1972 and 1975—when the Biological Weapons Convention was signed and then entered into force—have been a severe disappointment for arms control in the biological field. One official U.S. estimate is that "The number of nations having or suspected of having offensive biological and toxin warfare programs has increased from four to ten since 1972."[26] And as the same statement noted, some of the 10 nations in question ". . .are signatories of the BWC." A substantial number of these countries are in the Middle East, and these have either not signed or not ratified the BWC. In 1992, the Bush administration made a concerted effort, but failed, in the attempt to convince several of the major Middle East antagonists to either sign and/or ratify the BW Convention.[27]

With the exception of both the former USSR—now Russia—and Iraq, (as a result of

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[26] Barry J. Erlick (Department of the Army) in *Global Spread of Chemical and Biological Weapons*, Hearings, Committee on Governmental Affairs, U.S. Senate, 101st Congress, 1st Session, February 9, 1989, page 33.

These numbers were first presented in U.S. government testimony to Congress the year before, in 1988, by Dr. Thomas J. Welch of the U.S. Department of Defense, to the House Committee on Armed Services. See also, John H. Cushman Jr., "U.S. Cites Increase in Biological Arms," *New York Times*, May 4, 1988.

Another version of this estimate reads, "During the 20 years the BW Convention has existed, the number of countries considered to be developing or recently engaged in offensive BW programs has risen from 4 in 1972 to 10 in 1992—some of which are members of the convention." *U.S. and International Efforts to Ban Biological Weapons*, U.S. General Accounting Office, GAO/NSIAD-93-113, December 1992, pp. 2-3, 16.

[27] Jordan, Lebanon, and Saudi Arabia are parties to the BWC. Egypt and Syria have signed but not ratified. Iraq ratified only after the end of the Gulf War and the UNSCOM process began. Israel has neither signed nor ratified. Iran has ratified, but is widely assumed to be developing biological weapons, and to be in violation, as Iraq was previously. It was after the failure of that diplomatic effort that the Bush administration inserted a few sentences on the BW capabilities of several of the Middle Eastern states in the non-compliance report that it released in January 1993. Israel, however, was not mentioned. See also, W. Seth Carus, "'The Poor Man's Atomic Bomb,' Biological Weapons in the Middle East," *Policy Papers No. 23*, Washington Institute for Near East Policy, 1991.

the Gulf War and the United Nations Special Commission (UNSCOM) process which followed it), there has however been *no* international pressure or penalty applied against any of the suspected BW states. Until around 1988, no national or international spokesperson even made reference to the development; and since then, it has been virtually only U.S. spokespeople who have done so. The statements have been constantly plagued, however, with ambiguities in their descriptive terminology, such as the words ". . .or suspected of having. . ." in the statement quoted above. In 1990, Admiral Trost, the Chief of Naval Operations, told Congress that "three countries worldwide now have bacteriological weapons," and that 15 others were *suspected* of *developing* them.[28] Three weeks later the Director of Naval Intelligence identified Iraq, Syria, and the former USSR as the three "assessed to have (BW) *capability*."[29] In 1988, his predecessor, Admiral Studeman, had also identified China, Taiwan, and North Korea by name. But what the U.S. government's criteria were for the categories of "suspected," "developing," and "capability" were never specified, although in this particular pair of statements "capability" apparently meant weapons' possession.

A statement in the 1992 British Defense White Paper uses the same pattern of ambiguous phrasing, noting that "about ten (nations) have *or are seeking* biological weapons." What was worse, according to this author, is that the number of nations "developing" or with "capability" were frequently aggregated with those doing the same for chemical weapons. The facts that one wanted to know explicitly were which nations had BW R&D programs, which nations had gone into weapons development, and which into production and stockpiling of weapons and the BW agents to fill them. That information was unavailable publicly.[30] In 1993, the Russian government released a report which identified some nations that had biological weapons programs; this report was somewhat more explicit in categorizing their relative stages of development.[31] A larger study on *Biological Weapons Proliferation* released by two U.S. government agencies in April 1994 contained only three-and-a-half pages out of 90 with information on specific BW-proliferating nations, and

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[28] Adm. C. A. H. Trost, House Armed Services Committee, February 20, 1990, p. 5.

[29] Rear Adm. T. A. Brooks, House Armed Services Committee, March 14, 1990, p. 54.

[30] The Chemical and Biological Weapons Elimination Act of 1991 (P.L. 102-182) requires an annual report by the president to Congress that contains a complete list of known or suspected BW programs, including those that are classified.

[31] "Proliferation Issues: A New Challenge After the Cold War, Proliferation of Weapons of Mass Destruction," *Russian Federation Foreign Intelligence Report*, (translation), JPRS-TND-93-007, March 5, 1993.

contained little that was not already in the public domain.[32] Notably, in 1994, two senior U.S. government officials stated in private meetings that no nation was then known to be *producing* and stockpiling BW agents. Iraq had been doing so, but as a result of the Gulf War in 1991, presumably it has not been doing so since then. Some countries apparently have BW production and assembly facilities, but they have been maintaining them in a standby capacity, and—at least in 1994—were not actually producing BW agents in them. Whether such countries had tested weapons and tested the production lines, etc., again remained unstated, but one would have to presume that they had. In June 1995, Anthony Cordesman, an informed analyst with extensive past access to classified information, stated that "Iran. . .is at the point of weaponizing its biological warfare capabilities."[33] "Weaponizing" would presume production. *(See section on Iran which begins on page 44.)*

It seems impossible to make an adequate survey of the status of BW proliferation from the information available in open, unclassified sources. U.S. government resistance to releasing any information on this subject has been particularly severe. Several years of attempts to obtain the declassification of some Defense Intelligence Agency (DIA) reports dealing with North Korean capabilities dating from 1975 resulted in little more than a title page, many blank pages, and one paragraph which reported that North Korea had a national Academy of Sciences. Individuals with access to classified information nevertheless imply clearly that there are a substantial number of active BW programs and that these involve a wide range of agents and the parameters of agent dissemination, survival, etc. How many of these national programs involve agent and weapons production, it is impossible to say. There is a notable contrast with nuclear weapons proliferation, in which it is unquestionably U.S. government policy to specifically and publicly identify by name—at least tardily—those nations with nuclear weapons development programs. That seems not, however, to be the case regarding biological (or chemical) weapons, in which the available information is minimal, frequently ambiguous, or altogether lacking.

It is interesting to look for a moment at the historical record of allegations regarding

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[32] "Biological Weapons Proliferation," *Technical Report*, U.S. Army Medical Research Institute of Infectious Diseases and the Defense Nuclear Agency, April 1994. See also, "Technical Aspects of Biological Weapons Proliferation," Chapter 3 in *Technologies Underlying Weapons of Mass Destruction*, Office of Technology Assessment, U.S. Congress, December 1993, pp. 71-117, and *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, Office of Technology Assessment, U.S. Congress, 1993.

[33] Samuel F. Wells, Jr., "Scholars Critical of U.S. Policy Toward Iran," *The Woodrow Wilson Center Report*, 7:3, November 1995, p. 5. Cordesman's previous pronouncements on BW proliferation in advance of U.S. government disclosures—in the case of Iraq—proved accurate.

national BW programs, and their eventual resolution:

- U.S. allegations between 1976 and the early 1990s of a Soviet program—and even of a continuing Russian one—proved to have been correct. The Soviet denials were false.
- Israeli and other allegations in the late 1980s regarding the Iraqi program proved to have been correct, and the years of Iraqi denials—both before and after 1990—were false.[34]

There are several differences in the lists that have been produced by U.S. and Russian intelligence agencies of nations alleged to have BW programs, and it will be interesting to see the eventual resolution of these discrepancies.

Also there are two major historical allegations of BW *use* in the post-World War II period. On both occasions the United States was charged with having used BW. The USSR, China, and North Korea accused the United States of using BW during the Korean War;[35] Cuba accused the United States of using BW over a period of decades. In *both* cases, the allegations included the total panoply of BW agents: anti-human, anti-plant (crops), and anti-animal (domesticated).[36] The USSR periodically made other charges that the United States had used BW (in the early 1950s, against crops in Eastern Europe; in 1964, in Colombia; in 1968, in Vietnam). The United States has denied all of these charges that are nearly universally considered by the international arms control community, as well as by specialists in the fields of microbiology and epidemiology, to be fraudulent and propagandistic allegations. Because of the severely detrimental effect on arms control of fraudulent allegations, the major charges dealing with the Korean War, as well as the Cuban ones, should have received more serious examination long before this time. These allegations should be either definitively uncovered or definitively disclosed to have been fraudulent.

Of more immediate and practical importance is the question of the degree to which

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[34] "Israel Vows Action Against Iraqi Germ Research," *Washington Times*, January 19, 1989. (Israeli sources presumably provided the information that was carried in several ABC-TV news reports at roughly the same time.)

[35] Milton Leitenberg, "Allegations of Biological Warfare in China and Korea, 1951-1952," *The Prevention of CBW*, Vol. 5, in *The Problem of Chemical and Biological Warfare*, SIPRI, Stockholm International Peace Research Institute, 1971, pp. 238-258.

[36] All of the Cuban charges are summarized, as are other post-WorldWar II Soviet allegations of BW use made against the United States, on p. 183 of Milton Leitenberg, "A Return to Sverdlovsk: Allegations of Soviet Activities Related to Biological Weapons," *Arms Control*, 12:2 , September 1991.

BW proliferating states need, obtain, and benefit from technology transfers from industrialized states. For example,

> "Given Iraq's relatively primitive scientific and industrial base in biotechnology, the BTW programme relied initially on access to foreign technology and expertise. Companies from France, West Germany, the Soviet Union, and the United States played important—and only partly unwittingly—roles in Baghdad's efforts to acquire biological weapons."[37]

The Syrian BW program appears to have depended on, and benefited from, similar technology transfers. The issue is of immediate significance for two reasons: (1) the continued pressure at BWC Review Conferences and preparatory meetings for additional biotechnology transfers under Article 10 of the Convention, and (2) most particularly, the constant harping on this issue above all by Iran, a nation now suspected of having an active BW program.

There are several aspects to the problem: transfer of plant and equipment, technology, and knowledge, including foreign scientists working in another country's BW program. In the last category, the emigration of former Soviet BW scientists to Iran or other Middle East countries (and some former Soviet BW scientists have gone to developing countries), and South Africans to Libya, has been the more recent concern.

Questions can also be raised, however, about U.S. government practices in earlier years. Some of these may very well have taken place in the way the U.S. Atoms for Peace program diffused knowledge regarding nuclear technologies, which particular recipient countries may have subsequently redirected to research in their nuclear weapons development programs. For example, in 1967, U.S. military services maintained seven overseas laboratories doing research on infectious diseases; the Army, four; the Navy, two; and the Air Force, one, with a total of over 885 foreign national employees. Did the U.S. Naval Medical Research Units (NAMRU) groups situated in Taiwan and Egypt—and in part staffed by local scientists—gradually stimulate local government interest in BW?[38] Although a NAMRU unit was never situated in Israel, in some years the U.S. Department of Defense

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[37] J. Tucker, op. cit., p. 237.

[38] The U.S. Army facility in Thailand employed 325 foreign nationals; the Navy (NAMRU) lab in Taiwan, 285; and in Egypt, 156, *The Participation of Federal Agencies in International Scientific Programs, Report*, Committee on Science and Astronautics, U.S. House of Representatives, 90th Congress, 1st Session, 1967, pp. 132-133.

simultaneously provided research contracts to Israeli and to Egyptian scientists on subjects related to BW.

Each year some 300 to 400 foreign visitors visit the laboratory facilities of USAMRIID at Fort Detrick, Maryland.[39] Others visit DoD contractor laboratories. The great majority of these visits are simply short, day-long tours of the laboratories; a very few come to work on projects of up to a year. There are two contradictory ways to appraise the potential of such visits: they could be considered excellent and desirable confidence-building measures (CBMs), precisely fitting one of the categories of CBMs developed in recent years under the BWC to demonstrate the transparency of national programs. On the other hand, they could be considered to carry the risk of transferring knowledge to a potential BW proliferator. There are reportedly a substantial number of Iranian scientists working at the Cuban national biotechnology institute: given the existing strong suspicions of an Iranian BW program, their presence as researchers in another nation's laboratory is far more likely to provide assistance to Iranian proliferation than to produce any benefits of Cuban transparency.

The training personnel that accompany turnkey plants, and other technical personnel supplied by contractors for at least the initial operation, maintenance, and production, are an obvious path of technology transfer—aside from the equipment itself—to any nation developing a BW program. (It seems that technical personnel from West Germany performed this role in Iraq.) The Enhanced Proliferation Control Initiative (EPCI) of November 1990 enacted by the U.S. administration was aimed at controlling the transfer of dual-use technology relevant to biological weapons (as well as chemical and nuclear weapons).[40] Its promulgation very likely owed something to the developments in Iraq, but it was primarily motivated by the fact that the Bush administration had vetoed legislation that would have strengthened U.S. nonproliferation policies. In addition, the Bush administration opposed both the Omnibus Export Administration Act of 1991 and the Nonproliferation of Weapons of Mass Destruction and Regulatory Improvement Act of 1992. The first encouraged international sanctions against countries that *used* chemical or biological

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[39] Of 122 foreign visitors selected for a survey in the two years between June 1988 and June 1990, 33 came from the United Kingdom, but the next highest number, 28, came from Israel, and eight from China. *Defense Research: Protecting Sensitive Data and Material at 10 Chemical and Biological Laboratories*, U.S. Government Accounting Office, NSIAD-91-57, July 1991, p. 21.

[40] Chemical and Biological Weapons Proliferation; Executive Order 12735, November 16, 1990. See also, *Fact Sheet on Enhanced Proliferation Control Initiative,* The White House, Office of the Press Secretary, December 13, 1990.

weapons in violation of international law, and the second would have denied funding to international development institutions until such institutions revoked the membership of countries that did not adhere to nuclear, chemical, and biological nonproliferation regimes.[41] The administration opposed both on the grounds that mandatory legislated sanctions would be an infringement on presidential authority. Neither measure was approved by Congress. Nevertheless, amendments to the provisions of the Arms Control Export Act that were passed by Congress—and were not vetoed—contained requirements that *mandated* major U.S. sanctions against a country that *used* chemical or biological weapons. Unfortunately, the same legislation provided the president with the authority to waive the mandatory sanctions on the grounds of U.S. national security.[42] The value of legislated mandates had been made clear in 1989. The United States had accused Iraq of using chemical weapons against the Kurdish population inside Iraq in August 1988. Those allegations led the U.S. Senate to pass legislation imposing economic sanctions on Iraq, overriding strong objections to the legislation by the U.S. Department of State during the Bush administration. Early in 1989, although government officials admitted that they believed Iraq was developing biological agents, they said ". . .that they do not want to get into another public feud with the Iraqis" over the issue—and nothing was done.[43]

The remainder of this section on proliferation is composed of summaries of the available knowledge regarding specific countries having biological weapons development programs.

IRAQ

Iraq signed the Biological Weapons Convention on May 11, 1972; however it never went on to ratify the Treaty until 1991, after its defeat in the Gulf War. In July 1989, a U.S. administration spokesman was questioned by a member of a congressional committee who noted that in recent months there had been a series of reports on growing Iraqi capabilities

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[41] *Non-Proliferation Regimes: Policies to Control the Spread of Nuclear, Chemical, and Biological Weapons and Missiles*, Report to the Committee on Foreign Affairs, U.S. House of Representatives, CRS-FAND, March 1993, pp. 37-38.

[42] It is known that the administration has provided Congress with many *classified* notifications of violations of provisions of the act. Due to the classification of these notifications, it is not known if any of the violations pertain to the BW provisions of the act, or to other provisions, and if so, what nation may be responsible, or whether *any* of the five possible sanctions have been invoked or waived.

[43] David B. Ottaway, "Official Denies Iraq Has Germ War Plant," *Washington Post*, January 19, 1989.

in biological and nuclear weapons. The administration spokesman replied,

> "We are concerned by indications that Iraq is seeking to develop a biological military capability. However, we have no evidence that Iraq has violated the 1972 Convention on Biological Warfare. Under that convention, 'prophylactic research' is permitted."[44]

The response apparently was very much in error, and contrary information was available to the U.S. government and to several other governments at the time that it was made. In January 1989, an aide to Senator John McCain, Anthony Cordesman, who had access to classified information, stated that Western intelligence agencies ". . . would affirm that Iraq has biological agents in actual production and is stockpiling them for military use."[45] He wrote that there was evidence at the end of 1988 that Iraq ". . . was producing botulinum toxin in military quantities, or some similar agent."[46] In the same month, Secretary of State George Shultz disclosed the Iraqi BW "capability" and the West German government corroborated it.[47] In 1992 Human Rights Watch disclosed the finding of a document captured by Kurdish forces in Northern Iraq that they interpreted as evidence that Iraq had deployed biological weapons in the field during its war with Iran.[48] Following the Persian Gulf War, the U.S. Department of Defense's official report to Congress stated:

> "By the time of the invasion of Kuwait, Iraq had developed biological weapons. Its advanced and aggressive biological warfare program was the most extensive in the Arab world. . . .[T]he program probably began in the late 1970s and concentrated on development of two agents—botulinum toxin and anthrax bacteria. . . .Large scale production of these agents began in 1989

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[44] *Developments in the Middle East; July 1989*; Hearing, Committee on Foreign Affairs, House of Representatives, July 12, 1989, p. 88.

[45] Anthony Cordesman, remarks to ABC News, January 17, 1989, quoted in Seth Carus, *The Genie Unleashed: Iraq's Chemical and Biological Weapons Program*, Policy Papers #14, Washington Institute for Near East Policy, 1989, p. 29.

[46] Anthony Cordesman, "Creating Weapons of Mass Destruction," *Armed Forces Journal*, February 1989, p. 56.

[47] Thomas F. O'Boyle, "Bonn Backs U.S. Charge That Iraq Can Produce Biological Weapons," *Wall Street Journal*, January 23, 1989. Sec. Shultz's remarks were made around January 18, 1989.

[48] Letter to Rolf Ekeus, Chairman, UNSCOM, December 29, 1992, 10 pages, Human Rights Watch. The Iraqi document is dated March 8, 1986, and asks military units to supply an inventory ". . . of Biological and Chemical Materials."

> at four facilities near Baghdad. Delivery means for biological agents ranged from simple aerial bombs and artillery rockets to surface-to-surface missiles."[49]

Before ground combat in Iraq began, official U.S. pronouncements had shifted completely to unqualified statements of Iraq's possession of biological weapons. In September 1990, CIA Director William Webster publicly stated that Iraq had a "sizeable stockpile" of biological weapons, and "U.S. intelligence sources have reported that Iraq has produced a stockpile of biological weapons and will have a 'militarily significant number' of them ready for battlefield use in a few months. . . . Officials said that Iraq had worked intensively the past two years to develop a biological weapons program. . . ."[50] The United States initiated a crash program to produce an anthrax vaccine and to inoculate U.S. service personnel deployed to the Persian Gulf. Obviously the government felt that it had uncovered sufficient information to be convinced that anthrax was one of the agents that the Iraqi BW program had developed for use.[51]

The subsequent disclosure of the nature and dimensions of Iraq's BW program would not have come about if not for Iraq's defeat in the Gulf War and the subsequent unprecedented resolutions by the U.N. Security Council that imposed a series of demands and constraints on Iraq's military capabilities. These provided for the ability to go anywhere within Iraq at any time to search for and to destroy all of Iraq's weapons of mass destruction in all categories, and to assure that they could not be reconstituted.[52]

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[49] *The Conduct of the Persian Gulf War: Final Report to Congress*, Washington D.C., U.S. Department of Defense, April 1992; pages 18-19; quoted in Jonathan B. Tucker, "The Future of Biological Warfare," in W.T. Wander and Eric H. Arnett, *The Proliferation of Advanced Weaponry: Technology, Motivations, and Responses*, American Association for the Advancement of Science, Washington, D.C., 1992, p. 54.

Despite the presence of Soviet technical specialists of various sorts in Iraq until the beginning of the Gulf War bombing campaign at the end of 1990, and having expert Russian personnel participating in the UNSCOM BW inspection teams in Iraq, as late as 1993 the Russian F.I.S. proliferation report was coy on the question of Iraq's previous possession of BW. It expressed skepticism of the "conjecture" that Iraq had developed or produced BW weapons.

[50] Molly Moore, "Iraq Said to Have Supply of Biological Weapons," *Washington Post*, September 29, 1990.

[51] Malcolm W. Browne, "Army Reported Ready for Iraqi Germ Warfare," *New York Times*, January 6, 1991.

[52] ". . . 8. Decides that Iraq shall unconditionally accept the destruction, removal, or rendering harmless, under international supervision, of: a) all chemical and biological weapons and all stocks of agents and all related subsystems and components and all research, development, support, and manufacturing facilities. . .

"9. Decides, for the implementation of paragraph 8 above, the following:

(a) Iraq shall submit to the Secretary-General, within 15 days of the adoption of this resolution, a declaration of the locations, amounts, and types of all items specified in paragraph 8, and agree to urgent, on-

Iraq informed the UNSCOM 7 inspection team that visited Salman Pak in August 1991 that BW-related work had begun there in mid-1986 and had ended in the autumn of 1990, with all research materials destroyed at that time. The UNSCOM team decided, however, that the program had started earlier, probably in 1983, as that was the year in which the construction of Salman Pak had been completed. The facility included the special construction of an aerosol test chamber which had been used for testing botulinum toxin.[53]

But once again, first impressions regarding Iraq's BW program underwent a significant change in the course of several years' experience. Writing in early 1992, the special advisor to UNSCOM wrote, "The destruction of biological weapons capabilities has not posed any problem. The relevant major facilities were completely destroyed later during the hostilities."[54] Two years later, by the end of 1994, it was apparent that determining exactly what Iraq had done in the way of biological weapons, where it had been done, and whether or not it was completely gone had turned out to be the most elusive task for UNSCOM to resolve. Rather than having been "completely destroyed," Iraq's BW plant had been dismantled by Iraq itself, with some portions obliterated and others cached. For one-year-and a-half Iraq denied having any BW program at all, and once it admitted that position to have been false, its successive series of submissions to UNSCOM over a period of two-and-a-half additional years were—one after the other—considered misinformation for the greatest part. As it eventually turned out—in August 1995—that was definitely the case. At the end of 1994 a report to the U.N. Security Council by the U.N. Secretary General had stated,

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site inspection as specified below. . .

(i) The forming of a Special Commission, which shall carry out immediate on-site inspection of Iraq's biological, chemical, and missile capabilities, based on Iraq's declarations and the designation of any additional locations by the Special Commission itself; (ii) the yielding by Iraq of possession to the Special Commission for destruction, removal, or rending harmless. . .

"10. Decides that Iraq shall unconditionally undertake not to use, develop, construct, or acquire any of the items specified in paragraphs 8 and 9 above and requests the Secretary-General, in consultation with the Special Commission, to develop a plan for the future ongoing monitoring and verification of Iraq's compliance with this paragraph, to be submitted to the Council for approval within 120 days of the passage of this resolution."

[53] *Chemical Weapons Convention Bulletin*, No. 13, September 1991, p. 22.

The 1983 date would also corroborate the statement by an Iraqi microbiologist who defected to Iran and claimed that Iraq had developed and tested biological agents as early as 1983. Shyam Bhata, "Iraq Scientist Tells 10-Year Secret," *The Observer*, August 9, 1992.

[54] Johan Molander, "The United Nations and the Elimination of Iraq's Weapons of Mass Destruction: The Implementation of a Cease-Fire Condition," in *From Versailles to Baghdad: Post-War Armament Control of Defeated States*, Fred Tanner (ed.), United Nations (UNIDIR), New York, 1992, p. 151.

> ". . . Iraq's attitude to the provision of data and supporting evidence still fell far short of its obligation to provide full, final, and complete disclosures of its past proscribed programmes and of its current and recent dual-purpose capabilities subject to ongoing monitoring and verification. It appears that many of Iraq's declarations are incomplete and sometimes contradictory. The Commission has both direct and indirect evidence that Iraq is still failing to declare equipment and material acquired for and capable of use in proscribed programmes and that its accounts of certain of its projects do not reflect their true purpose and their role as part of now proscribed weapons programmes. In general, in relation to past programmes, Iraq has not volunteered information and has shown marked lack of transparency, disclosing information only when confronted with evidence by the Commission. Iraq maintains its claim, not believed by the Commission, that it has destroyed all documentation related to these programmes and that no other tangible proofs exist to support its accounts. Indeed, events of the past six months have strengthened the Commission's conviction that important documentation still exists and that the Iraqi authorities have taken the conscious decision not to release it freely to the Commission. In any case, Iraq has not fulfilled its undertaking to resolve all outstanding issues in relation to the past programmes in parallel with the establishment of ongoing monitoring and verification. The importance of doing so has been repeatedly impressed upon Iraq at each of the high-level meetings referred to above, as has the need for Iraq to provide documentation and supporting evidence."[55]

The UNSCOM report of December 15, 1994, demonstrated—by the exquisite use of Iraq's own misstatements and utter ineptness—that Iraq had been persistently lying in its submissions on BW to UNSCOM and continued to do so.[56] In addition, Rolf Ekeus, executive chairman of UNSCOM, stated that Iraq's troop build-up along the Kuwait border in the fall of 1994, which produced a responding U.S. force deployment, was designed to pressure the United Nations into halting its insistence that Iraq divulge all information on its past BW program.[57] Finally, at the end of 1994, UNSCOM discovered that Iraq had

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[55] United Nations Security Council, Note by the Secretary General, S/1994/1422, December 15, 1994, pp. 3-4.

[56] United Nations, Security Council, Note by the Secretary General, S/1994/14422/Add l, December 15, 1994, pp. 10-14, p. 26. See also Report of the Secretary General, United Nations Security Council, S/1994/1138, October 7, 1994, pp. 22-27, p. 36; Barbara Crossette, "Iraq Hinders Arms Monitors, U.N. Panel Reports," *New York Times*, December 21, 1994; R. Jeffrey Smith,"Secretive Iraq Parries U.N. Arms Inspectors; Technology, Patience Pry Open Weapons Data," *Washington Post*, November 4, 1994.

[57] R. Jeffrey Smith, "U.N. Aide Links Iraqi Troop Thrust to Frustration on Disclosure," *Washington Post*,

procured 39 tons of bacteriological growth media in 1988 alone, and additional quantities in 1989, as well as high technology fermenters and spray drying and weapons filling machinery. The data regarding these purchases was supplied by some of the countries whose firms had made the sales—but not until the winter of 1994. The growth media had been imported in large bulk packaging—not in the smaller packaging sizes customarily used for domestic medical uses—in quantities 40 times larger than Iraq's declared annual requirements, and the whereabouts of about half of that media—or its products—were still unaccounted for.[58] Ekeus' comment was "This can only coincide with the production of biological weapons."[59]

The denouement came in two steps, in July and in August 1995. The first, and smaller step came in July. Very likely at the strong urging of France, Russia, and China—all of whom favored ending the sanctions on Iraqi oil sales and on imports, which Iraq was continuously demanding should be revoked—Iraq finally admitted to having had an offensive BW program. The Iraqi government stated the following:

- It had produced very large quantities of anthrax and botulinum toxin.
- The production site had been Al Hakam, which had never been bombed.
- "Iraq never had bombs or other weapons that could be filled with either of the agents."
- The stockpiles of both agents had been destroyed in the fall of 1990 before the Gulf War, "to prevent contamination of the Iraqi countryside during enemy bombing raids."
- The program was originated in 1985, at a supposed pesticide plant at Muhanna, one site of Iraq's CW munitions production. R&D continued there for a year, and then was transferred to the German constructed laboratories at Salman Pak.
- Agent production began in 1989, a year after the end of the Iran-Iraq war.

All this was reported to Rolf Ekeus, verbally, in half an hour. No evidence to support any of the claims was presented; Iraq promised to provide details in a written report

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October 27, 1994.

[58] United Nations, Security Council, Note by the Secretary General and Annex, S/1995/284, April 10, 1995, pp. 16-22, p. 34; Barbara Crossette, "Iraq Hides Biological Warfare Effort, Report Says," *New York Times*, April 12, 1995; Julia Preston, "Iraqi Accounting of Biological Arms Inadequate, U.N. Report Says," *Washington Post*, April 11, 1995.

[59] "Biological Weapons Program in Iraq Larger Than Believed," *Los Angeles Times*, February 28, 1995.

at the end of July.[60] On July 17, Iraq also said that it would cease cooperating with UNSCOM inspectors unless economic sanctions against Iraq were lifted by the end of August. On August 4, Iraq presented yet another "Full, Final and Complete Disclosure" of 530 pages to UNSCOM; its details were never made public, but it followed the verbal presentation of the previous month, and still insisted that no weaponization had taken place.[61]

Within days, Iraq was forced to make far more significant disclosures. On August 7, Lt. General Hussein Kamel Hassan Majeed, Saddam Hussein's son-in-law and the former head of Iraq's entire program of development and production of weapons of mass destruction—nuclear, chemical, and BW—defected to Jordan, together with his brother, (also a Saddam son-in-law), their families, and some 15 additional military officers.[62] After failing both in an attempt to obtain the defector's return and then in an apparent assassination attempt, Iraq asked Rolf Ekeus on August 16 to come to Baghdad and offered "100 percent compliance" and withdrew the deadline for ending cooperation. In the circumstance of potential disclosures by the most well-informed defector possible, the Iraqi government decided to preempt that eventuality by making the disclosures itself. They contradicted even the information provided to UNSCOM only a month before in July:

- Within days after the U.N. Security Council Resolution in December 1990 authorizing the United States and a coalition of nations to wage war against Iraq, Iraq had loaded anthrax, botulinum, and aflatoxin on nearly 200 bombs and SCUD missile warheads. (Fifty bombs and 10 SCUD missiles with anthrax, 100 bombs and 15 missile warheads with botulinum, and 16 bombs with aflatoxin—or 165 bombs and 25 missiles.)
- The weapons were destroyed—allegedly—in July and August 1991, more than four months after the war's end.
- Iraq had also experimented with a drone aircraft BW delivery system, but in the

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[60] R. Jeffrey Smith, "Iraq Had Program for Germ Warfare; Bug Stockpiles Destroyed, U.N. Team Told," *Washington Post*, July 6, 1995; "Four Years of Lies," *Washington Post*, July 7, 1995; "Baghdad's Biological Arsenal," *New York Times*, July 7, 1995; Jack Anderson and Michael Binstein, "Iraqi Confession Raises More Questions," *Washington Post*, July 10, 1995.

[61] "Iraq Gives U.N. Data on Arms; Details Revealed on Germ Arsenal," *International Herald Tribune*, August 7, 1995. Given what followed in a matter of days, a substantial amount of this document was probably again concocted misinformation, and two weeks later, Iraq asked that its August 4 report be considered invalid.

[62] Nora Boustany, "Relatives, Top Aides of Saddam Defect to Jordan," *Washington Post*, August 11, 1995; Youssef M. Ibrahim, "Senior Army Aides to Iraq President Defect to Jordan," *New York Times*, August 11, 1995; "Trouble in the Family," *Newsweek*, August 21, 1995, pp. 14-15; Daniel Williams, "U.S. Questions Top-Level Iraqis; Saddam Calls Defectors Judas," *Washington Post*, August 12, 1995.

end had decided to arm the other systems. Thus, three BW delivery systems had been developed.

- BW production sites were hidden "in ordinary factories and engineering centers." Seven BW agents had been tested for possible use, research on three viruses had begun, and production of agents had taken place at four other sites in addition to Al-Hakam. (Three of these were identified in 1995 as Al Kindi, Taji, and Salman Pak.)[63]
- Iraq had produced 10 times more anthrax than it had previously admitted to (presumably, in its August 4 report).
- Iraq had also developed "a wheat pathogen"—which UNSCOM later reported to be wheat rust—as well as a mycotoxin.
- Iraq didn't use the BW weapons it had armed due to a warning of massive U.S. retaliation if Iraq used weapons of mass destruction. The warning was delivered by U.S. Secretary of State Baker to Iraq's then Secretary of State Tariq Aziz in Geneva in January 1991. At the time, the United States was actually concerned about the possible use of *chemical* weapons by Iraq. Aziz claimed the Iraqi leadership interpreted the U.S. threat as a possible use of nuclear weapons.
- Finally, in a "comic encore," as they drove Ekeus to the airport, Iraqi officials stopped at a chicken farm and gave UNSCOM 140 cartons containing 5,500 documents, tapes, and other materials that they had "just discovered," claiming that the defector, General Kamel, had hidden them from UNSCOM.[64]

On October 11, 1995, UNSCOM's report based on the half-million pages of documents that Iraq had handed over in August was presented to the U.N. Security Council.[65]

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[63] Gordon C. Oehler, "The Chemical and Biological Weapons Threat," Testimony to the U.S. Senate Committee on Government Affairs, November 1, 1995.

[64] Barbara Crossette, "Iraq Gives U.N. Fuller Details on Its Germ Warfare Program; System More Advanced Than Admitted in Past," *New York Times*, August 23, 1995; R. Jeffrey Smith, "U.N. Says Iraqis Prepared Germ Weapons in Gulf War; Baghdad Balked, Fearing U.S. Nuclear Retaliation," *Washington Post*, August 26, 1995; Barbara Crossette, "Crash Nuclear Program by Iraq is Disclosed," *New York Times*, August 26, 1995; Christopher Dickey, "Secret Weapon," *Newsweek*, September 4, 1995, pp. 14-15.

[65] *Note by the Secretary-General, and Annex: Report of the Secretary-General on the Status of the Implementation of the Special Commission's Plan for the Ongoing Monitoring and Verification of Iraq's Compliance with Relevant Parts of Section C of Security Council Resolution 687 (1991*), S/1995/864, October 11, 1995; and R. Jeffrey Smith, "2 Monitoring Groups Accuse Iraq of Withholding Data on Weapons," *Washington Post*, October 12, 1995. Milhollin reports the number of pages of documents turned over by Iraq in August as 680,000 pages; *The Risk Report*, 1:10, December 1995, p. 1.

Aside from the details already indicated—all of which were repeated in the report in more detail including the amounts of BW agents that Iraq had produced—there were several additional points of particular importance. First, the Iraqi government had made a policy decision as early as 1974 to acquire biological weapons, only two years after having signed the Biological Weapons Convention. R and D began in 1975, but was suspended in 1978. The program was restarted in 1985. Second, of course, the Iraqi government had lied in claiming that all documentation had been destroyed in 1991. The newly delivered documents, however, were for the most part only from individual research and production centers, and several major categories of files were still missing: those from the major central policy and management agencies, the Military Industrialization Corporation, and the Ministry of Defense. Third, UNSCOM was skeptical of the detailed progression of the BW R&D program from the mid-1980s to l990 that Iraq had described: "Given the Iraqi claim that only five years had elapsed since its declared inception in 1985, the achievements of Iraq's biological weapons program were remarkable." Finally, UNSCOM indicated even greater skepticism regarding Iraq's description of when and how it had destroyed the filled BW munitions. Iraq claimed that the order for the destruction had been given orally, that there were no records of the destruction, and that Iraqi officials were contradictory about the dates of the destruction and unable to identify the site at which it taken place.

The most critical issues that the report made clear, however, were the following:

- UNSCOM found that Iraq's submissions still continued to be deficient and that the data available from ". . .other sources. . .does not correspond in important aspects to the information provided by Iraq" regarding its BW programs. It was clear that large categories of documentary files were still being withheld.
- The "clear deception" that Iraq had practiced before: Iraq had been lying about its other programs in weapons of mass destruction.
- And that UNSCOM had been fooled, and had previously accepted Iraq's submissions in the nuclear, chemical, and ballistic missile areas.

UNSCOM's realization of that embarrassment was obviously going to make it extremely reluctant to make the same mistake a second time.

On December 17, 1995, UNSCOM released another report, which included the following remarks on Iraq's BW program:

> "The draft full, final and complete disclosures of November was Iraq's third official declaration in the biological weapons area submitted this year. The November document encompasses the disclosures made by Iraq since

August 1995, primarily its admission of a comprehensive and well-advanced offensive biological weapons programme, ranging from research and development on a variety of bacteriological agents, viruses and toxins through the production, weaponization and military deployment of biological and toxin weapons. . . .Iraq continues to find additional documents which it is providing to the Commission to substantiate its declarations. The Government of Iraq has assigned high-ranking officials from its biological weapons programme to lead and participate in discussions with the Commission's representatives.

"Notwithstanding the above positive steps, the November draft contains major deficiencies in structure and content. Serious gaps and omissions exist in the declaration and in the documentary support, especially related to biological warfare agent and munitions production, munition filling and the destruction of weaponized and bulk agents. . . .Evidence available to the Commission establishes that the biological weapons programme was more extensive than has been admitted by Iraq in its November document. . . .The documentation provided by Iraq. . .constitute only a fraction of the documents generated under the biological weapons programme. The Commission continues to believe that important documents are still being withheld by Iraq, despite assurances of full cooperation from the Government of Iraq.

"The Commission is especially concerned by Iraq's continuing failure to provide definite figures on amounts of biological weapons agents and munitions produced, weaponized and destroyed. In the absence of such figures, accompanied by supporting documentation, it is not possible to establish a material balance of proscribed items, nor is it possible for the Commission to provide an assessment to the Security Council that Iraq does not retain biological weapons agents and munitions.

"Security Council resolution 687 (1991) requires that Iraq unconditionally accept the destruction, removal or rendering harmless under [the] Commission's supervision of all biological weapons and all stocks of agents and related substances and components and all research, development, support and manufacturing facilities. . . .Meanwhile, the Commission has requested Iraq to cease all activities at the facilities in question that have made a major contribution to the biological weapons programme and still have significant equipment present. Iraq has begun to do so."[66]

Aside from the particulars of the disclosures, there were several major lessons in this

[66] United Nations Security Council, "Note by the Secretary-General," S/1995/1038, December 17, 1995, Annex, "Tenth Report of the Executive Chairman of the Special Commission...," pages 14 and 15.

four-year escapade, but clearly still not its final denouement. First, the Iraqi government had lied continuously, even as late as in its July 6, 1995, "disclosures" and its August 4, 1995, "Full, Final, and Complete Disclosure." Iraq's credibility is nil, and everything must be verified. Second—under conditions of a police state determined to lie—that UNSCOM and the inspections were not able to turn up major portions of the relevant evidence regarding documents, culture media, research personnel, destruction or non-destruction of agents, etc.—but only strong suspicions as a result of discrepancies. Ekeus' deputy noted in August 1995 that "Iraq has now acknowledged a much more extensive program than UNSCOM had been able to piece together over four years through a process of gathering independent information outside the country and then confronting Iraq with it."[67] Eventually it was learned that Iraq had weaponized four different BW agents, in four different delivery systems—missiles, rockets, bombs, and artillery—and that these had been forward deployed with Iraqi military forces. The senior Iraqi military officials that defected in August 1995, made it apparent that Iraq had nevertheless been deterred from using its BW weapons by messages from U.S. officials that the Iraqi leadership accepted as serious warnings. Finally, that it would have been catastrophic to have revoked the sanctions. Prior to UNSCOM's absolute certainty that Iraq had thoroughly complied with the original provisions of the U.N. Security Council's resolution, Iraq had continuously demanded revocation and its U.N. Security Council advocates—Russia, France, and China—had urged the same.[68] Clearly, Iraq had hoped to get the economic sanctions lifted *without* fully disclosing its BW program, and despite other unresolved issues regarding its production of chemical weapons and ballistic missiles. In March 1996, UNSCOM reported that it believed Iraq was hiding 16 ballistic missiles. The defection of General Kamel in August 1995, ruined that plan. After the disclosures by General Kamel and the new unresolved issues that they and the latest Iraqi documents raised, France and Russia privately informed Iraq that there was no chance in the near future that the U.N. Security Council would lift the sanctions that prevented Iraq's export of oil. Only following that did Iraq inform the United Nations in mid-January 1996, that it was willing to discuss accepting the previous offers by the U.N. Security Council to permit it to export $2 billion of oil, under controlled conditions, and it began discussions with the United Nations for that purpose on February 7, 1996.

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[67] Barbara Crossette, August 23, 1995, op. cit.

[68] Rolf Ekeus, "Iraq: The Future of Arms Control," *Security Dialogue*, 25:1, 1994, pp. 7-16.
Ironically, on August 26 France's U.N. Security Council representative and that of Russia were quick to make the best of the newest Iraqi turnabout.

The developments at the end of 1995 still left some of the basic questions concerning Iraq's BW program unanswered or only partly answered:

(1) Where did the production equipment come from, as well as the cultures for R&D and production?

(2) How many scientists worked in the program and at what institutions; where were they trained?

(3) Was there external assistance by non-Iraqi scientists, or technology transfer, in addition to the purchase of technology?

(4) What organisms were developed for weapons systems, and how far did weaponization go; for which kinds of munitions or delivery systems, and how large was the stockpile?

Partial information for some of these parameters is known, but to an important degree more complete answers are still unknown or not in the public domain and await further reports from UNSCOM.

Equipment and Agents

Equipment, technology, and materials were procured from France, West Germany, the former USSR, and the United States.[69] In November 1974, Iraq contracted with the Institute Merieux for the establishment of Iraq's first vaccine production plant, primarily for veterinary vaccines, including anthrax. In the late 1970s, a second French company built a second vaccine plant, with very substantial overcapacity. In 1980-1981 Iraq contracted with a West German Thyssen subsidiary to build the laboratory facilities at Salman Pak. Fermenters and bacterial strains were purchased beginning in 1985. Nearly 50 bacterial culture samples were bought between 1985 and 1989 from the American Type Culture Collection.[70] Other bacterial cultures were also procured from France and Great Britain. In 1989 Iraq bought a wide variety of biotechnology equipment from various German supply firms, and additional fermenters, also from Germany. Altogether, 24 West German firms

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[69] Jonathan B. Tucker, "Lessons of Iraq's Biological Warfare Program," *Arms Control*, 14:3, December 1993, pp. 229-271. See also, W. Seth Carus, *The Genie Unleashed: Iraq's Chemical and Biological Weapons Program*, Policy Papers #14, Washington Institute for Near East Policy, 1989; Eric Nadler and Robert Windram, "Deadly Contagion: How We Helped Iraq Get Germ Weapons," *The New Republic*, February 4, 1991, pp. 18-19.

[70] *U.S. Chemical and Biological Warfare-Related Dual-Use Exports to Iraq and Their Possible Impact on the Health Consequences of the Persian Gulf War, A Report*, Committee on Banking, Housing, and Urban Affairs, U.S. Senate, May 25, 1994, pp. 264-275.

were involved in the construction of production facilities for biological and chemical weapons in Iraq, with the chemical weapons production infrastructure by far the larger of the two.[71] UNSCOM believed that Iraq may have been working with the organisms that produce anthrax, botulinum toxin, gas gangrene, brucella, tularemia, tetanus, cholera, tuberculosis, and plague, as well as three organisms for simulant R&D.[72] During the late 1980s, U.S. intelligence services reportedly tracked the exports of dual-use equipment that could be used for producing biological weapons agents from European countries to Iraq, and concluded that Iraq had spent approximately $100 million on its BW program between 1980 and 1990, and at the time of its invasion of Kuwait, was producing and stockpiling BW agents at perhaps a dozen sites within Iraq.[73] Iraq had also procured 15 agricultural sprayers from an Italian firm for use for bacterial insecticide spraying by aircraft.

Personnel

According to its disclosures to UNSCOM, Iraq claimed to have operated and managed this entire program with one or two doctorate level, and one-to-three master's level, scientists, in addition to about 100 laboratory technicians and a larger number of support personnel.[74] Another report indicated that Iraq reported to UNSCOM that "10 scientists" had been engaged in the BW program.[75] This is extremely implausible, if not to say impossible, judging by nothing more than the number of culture types that were acquired. This is one area in particular in which one can expect to see further disclosures. By the end of 1995, UNSCOM believed that it had identified additional personnel that had worked in the BW program. The cultures were procured by a half-dozen nominal institutions or ministries, but these may have been way stations to the laboratories that actually received and worked with

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[71] "Firms Said Involved in Iraqi CW Projects," Hamburg DPA, in FBIS-WEU-89-015, January 25, 1989, p. 5; "Doing Business with the Misery of Others," *Der Spiegel*, January 23, 1989, in FBIS-WEU-89-015, pp. 5-9.

[72] Rolf Ekeus, 1994, op. cit., "U.N. Probes Iraq on Chemical Weapons," *Washington Times*, December 20, 1994.

[73] J. Tucker, December 1993, op. cit., pp. 240-241.

[74] Raymond Zilinskas, "UNSCOM and the UNSCOM Experience in Iraq," presentation to the panel on UNSCOM at the American Society of Microbiology meetings, May 22, 1995; in *Policy and the Life Sciences*, 14:2, August 1995, pp. 230-235.

[75] Alan George, "Fears of Iraqi Biological Weapons Don't Abate; Officials Verify Scientists' Efforts," *Washington Times*, December 24, 1994. (The above comments expressing my skepticism of the Iraqi claims regarding personnel were written in June 1995; the disclosures in August 1995 make certain that hundreds of Iraqi *scientists* had to have been involved in the BW program.)

the cultures. Salman Pak is assumed to have been one of these sites.

The individual that Iraq declared to have been the head of their BW program, Dr. Rihab Taha, took her doctorate degree at a British university. However, if there were a far greater number of scientists involved in the Iraqi BW program than has so far been declared, it would seem plausible that Dr. Taha was not likely to have been the program's head. In circumstances where it is generally assumed that Iraq did not make a full disclosure of its past activities, presumably Iraqi officials would not have chosen to make the actual BW program head the brunt of UNSCOM's questioning.

Iraq usually sent its students for training in microbiology to European universities, particularly British ones. Iraq has six medical schools that could be presumed to have Departments of Pharmacology and/or Microbiology in their faculty, in addition to several technological institutes that might also be able to train researchers in relevant disciplines. It has been estimated that there may be 20-30 microbiological scientists in Iraq at the Ph.D. level, with an additional number in teaching positions in universities, and between 50 and 100 with master's degrees. Additionally, scientists in many other disciplines could have participated in different aspects of a BW R&D program. In its August 1995 disclosures, Iraq detailed exactly such collaboration and assistance to its BW program by some of its other weapons development institutes and personnel: weaponization was carried out with the assistance of Iraq's chemical weapons establishment at Muthanna.

External Assistance

It has been suggested that European companies were misled, unknowingly, to provide the basic infrastructure of Iraq's BW program. Certainly, technical experts would have remained at the sites constructed as turnkey plants, to ensure that start-up proceeded properly, to see that plant personnel were trained and that equipment was maintained properly. In addition to the West German and French equipment referred to previously, Iraq also reportedly procured fermenters from an Italian company, Olsa, and from a Swiss company, Chemak.[76] A West German television report in January 1989 claimed that ". . . scientists and technicians from the Federal Republic had helped in the construction of a biological weapons factory south of the Iraqi capital," which could have been either Salman Pak or Al-Hakam.[77] When the issue was raised by the social democratic party (SPD) opposition in the German

[76] William Safire, "Iraq's Threat: Biological Warfare," *New York Times*, February 16, 1995.

[77] Hamburg DPA, op. cit. See also, T. F. O'Boyle, 1989, op. cit.

parliament, the government replied that it ". . . has no real proof usable in court of involvement by German firms and senior employees in the development of bacteriological weapons in Iraq." No further details have appeared about the numbers of West German personnel who were in Iraq, how long they were there, and precisely what they did—beyond the identification of several of the construction firms noted previously.

In 1994, R. James Woolsey, then Director of Central Intelligence (CIA), stated that the Iraqi BW capability hadn't been harmed by the war or by the inspections. Al-Hakam had escaped bombing in 1991, and its equipment was partially removed to warehouse storage after the war's end to sites which have since been visited by UNSCOM inspectors. Writing early in 1993, an assistant to the director of UNSCOM summarized the inspection and control situation at that time in a most pessimistic light:

> "Iraq signed up to the cease-fire conditions in the U.N. Security Council Resolution 687. While this resolution was adopted under Chapter VII of the Charter, and hence binding on all states, including Iraq, and remains so, Iraq was required to officially acknowledge its acceptance of its terms for cease-fire to enter into effect. This it did on 6 April 1991. In other words, Iraq chose to accept the conditions contained therein rather than the consequences of not signing up. Furthermore, as a cease-fire arrangement, if Iraq were subsequently found to be in material breach of the terms, a legal case could be made that the situation post ante would prevail again. Therefore, it was reasonable to assume that Iraq, however reluctantly and even if it argued that it had accepted the terms under duress, would abide by its obligations under that resolution. . .
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> "The UNSCOM process was initially envisaged as having three phases:
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> "(1) Full disclosure by Iraq, through written declaration, of all aspects of its past programmes to acquire the weapons banned to it under the terms of the cease-fire and its holdings of such weapons, backed up with the verification of these declarations by means of open-sources, immediate on-site inspections, and information provided to UNSCOM by Member States;
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> "(2) UNSCOM, together with the IAEA in the nuclear area, would supervise and verify the destruction of Iraq's current holdings of weapons, ancillary systems, and facilities for their production, testing, and repair; and
>
> "(3) Establishment of twin regimes to monitor Iraq's imports and exports on the one hand, and its indigenous dual-capable civilian industry on the other,

in order to ensure that Iraq did not reacquire the banned weapons systems and means for their production. . .

"While, as noted above, Iraq formally accepted in writing the terms of the cease-fire resolution, it has never acknowledged its obligations under Resolution 707 and 715 (1991). Indeed, it has gone so far as to call them 'arbitrary,' 'illegal,' and such as to 'undermine the U.N. Charter.' Recently, Iraq has said that it will never accept Resolutions 707 and 715.

"This issue is crucial to the fulfillment of UNSCOM's mandate. Without the full declarations demanded in Resolution 707, UNSCOM can never make a determination that it has found all Iraq's banned weapons capabilities. Without Iraq's acknowledgement of the terms approved by Resolution 715 for long-term monitoring of its obligation not to reacquire the banned weapons capabilities, UNSCOM cannot be sure under what terms monitoring would proceed once sanctions and the oil embargo were lifted. Consequently, if Iraq maintains its current position, UNSCOM will not be able to determine that it has identified all banned weapons capabilities, that it has destroyed them, and that it is effectively monitoring the long-term situation. . .

"Each time Iraq was found to have lied or concealed items, or sought to obstruct UNSCOM in its work or to limit its rights, questions were raised about the motives for such actions and Iraq's long-term intentions, with the consequence that the burden of proof on Iraq increased. The longer Iraq fails to cooperate fully and honestly, the more UNSCOM will be forced to resort to more intrusive methods in order to obtain the information necessary for it to conclude its task. UNSCOM introduced, at an early stage, U-2 aerial surveillance and its own helicopters for the transportation of inspection teams. It introduced new types of inspections, such as document searches, and subsequently introduced aerial surveillance from helicopter too. . .

"Future prospects depend on two prime factors: Iraq's actions and the continued solidarity of the Security Council in its determination to see Iraq comply. Without the latter, UNSCOM can hope to achieve little more. Currently, it has to be assumed that Iraq would seek to reacquire the banned weapons systems as soon as sanctions are lifted and the inspection regime discontinued or rendered inefficient. But, if Iraq cooperated, the process could move forward very quickly. Efforts must, therefore, concentrate on convincing Iraq that it is in their own best interest to cooperate. For this to happen, Iraq must be made to believe that the determination of the Council

> is unmovable and that sanctions will not be lifted until Iraq is in compliance. Conversely, Iraq must also have the incentive that, if it meets the Council's demands, sanctions will be lifted."[78]

With the latest disclosures on the Iraqi BW program in August 1995, so drastically different from all that preceded them, it is possible that a major break in the situation has been achieved; but as indicated, their completeness remains to be verified. All the remaining inadequacies highlighted in the December 1995, UNSCOM report temper any optimism. UNSCOM did not begin its work until five months after the Gulf War ended, and its efforts in the BW area were particularly delayed after that. Additionally, it did not interrogate Iraqi officials who held the greatest amount of information. Those handicaps have now been remedied, but after a delay of over four years. The most recent UNSCOM report, released on April 11, 1996, adds little new information on Iraq's BW program, but states that " The Commission still believes that Iraq has not yet given a full and correct account of its proscribed activities. . . ."[79]

CHINA

The United States arms control compliance reports of 1993 and 1994 stated: "the United States believes that it is highly probable that China has not eliminated its BW program since becoming a State Party to the Convention in 1984."[80] The same passage had been deleted by presidential assistants in 1991 and 1992 from both *classified and unclassified versions of the report* for reasons that are disputed. Chinese officials denied the charge when questioned by Bush administration officials. The 1995 compliance report was only slightly more expansive:

> "The United States believes that China had an offensive BW program prior to 1984 when it became a party to the BWC. . . . The United States government believes that based on available evidence, China maintained an

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[78] Tim Trevan, "Assessment of the UNSCOM Verification Process," in Steven Mataija and Lynn Bourque (eds.), *Proliferation and International Security: Converging Roles of Verification, Confidence Building, and Peacekeeping*, CISS, York University, Toronto, Canada, 1993, pp. 151-154.

[79] "Note by the Secretary-General," U.N. S/1996/April 11, 1996, p. 21.

[80] "Adherence to and Compliance with Arms Control Agreements," June 23, 1994, U.S. Arms Control and Disarmament Agency, pp. 11-12. (The sentence was exactly the same in the 1993 report.)

offensive BW program throughout most of the 1980s. The offensive BW program included the development, production, stockpiling, or other acquisition or maintenance of biological warfare agents. China's CBM mandated declarations have not resolved concerns about this program and there are strong indications that China probably maintains its offensive program. The United States government, therefore, believes that in the years after its accession to the BWC, China was not in compliance with its BWC obligations, and that it is highly probable that it remains non-compliant with these obligations."[81]

Further information appeared in a 1993 press report:

"The U.S. intelligence community is worried that China may have revived and possibly expanded its offensive germ weapons program, according to current and former U.S. intelligence officials.

"The officials said that, if true, the Chinese effort would violate Beijing's nine-year-old pledge of adherence to an international treaty barring development, production, and stockpiling of toxin and biological agents and the weaponry to deliver them.

"U.S. officials are also concerned that neighboring Taiwan may have maintained a germ weapons program of its own, which also dates from the 1970s—a circumstance that they say may have encouraged the Chinese to continue their program.

"The officials said U.S. concerns about China are partly based on evidence that China is pursuing biological research at two ostensibly civilian-run research centers that U.S. officials say are actually controlled by the Chinese military.

"The research centers were known to have engaged previously in production and storage of biological weapons, the officials said. They said U.S. suspicions intensified in 1991 when one of the suspect biological centers was enlarged. Suspicions heightened further last spring, after Beijing made what one U.S. official termed a 'patently false' declaration to the United Nations that it had never made any germ weapons or conducted any work, permitted under international treaties, to bolster defenses against a biological attack.

"But under President George Bush, they said, senior White House officials repeatedly stripped a strong expression of concern about the suspected Chinese germ weapons program from unclassified versions of an annual

[81] "Adherence to and Compliance with Arms Control Agreements," May 30, 1995, U.S. Arms Control and Disarmament Agency, pp. 15-16. See also, *Proliferation: Threats and Response*, U.S. Department of Defense, April 1996, p. 9.

> report on arms proliferation that the intelligence community prepared for Capitol Hill.
>
> "Only last month did the intelligence report, which is required by law, state for the first time in an unclassified passage that 'it is highly probable that China has not eliminated its BW program' since agreeing to do so in 1984. Bush approved the little-noticed report on January 19, his final full day in office, before sending it to the House and Senate committees on foreign affairs.
>
> "The White House deleted this conclusion about China's activities—a conclusion representing a consensus of all relevant U.S. agencies—from both classified and unclassified versions of the report in 1991 and 1992, the officials said, causing some intelligence analysts to accuse the White House privately of political censorship."[82]

The operative sentence regarding Taiwan in the 1994 compliance report reads,

> "There is some evidence to indicate that Taiwan may have a program, but the evidence is not sufficient to determine if Taiwan is engaged in activities prohibited by the BWC."

and in the 1995 report,

> "The United States believes that Taiwan has been upgrading its biotechnology capabilities by purchasing sophisticated biotechnology equipment from the United States, Switzerland, and other countries. . . . The evidence indicating a BW program is not sufficient to determine if Taiwan is engaged in activities prohibited by the BWC."

The Russian 1993 proliferation report states that "Taiwan does not have biological weapons."

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[82] R. Jeffrey Smith, "China May Have Revived Germ Weapons Program, U.S. Officials Say," *Washington Post*, February 24, 1993. It is possible that the two laboratories are the Institute of Epidemiology and Microbiology Chauaping in Beijing, and the School of Medicine in Shanghai. Laboratories at these two sites placed orders for strain cultures with the CDC in 1988 and 1990. Although that alone is not evidence of a treaty infraction, it may serve to identify the institutions.

SOUTH AFRICA

A surprising disclosure was made in February 1995: South Africa had initiated a biological weapons program in 1985 and had maintained it until quite recently.[83] Although production had reportedly ceased, British and American diplomats were attempting to persuade South Africa to destroy any remaining materials as well as research records and documentation. Allegedly, however, "President Mandela has been unable, despite repeated requests, to persuade his military to relinquish the blueprint. . . ,"[84] ". . . Mandela's government is not in full control of South Africa's biological weapons program, a State Department official said."[85]

The situation has been aggravated by a second factor, the possible diffusion of technology or process information to a second state: "U.S. intelligence sources reportedly tracked Libyan agents trying to gain materials, scientists, or information on the program from South African arms and military establishments."[86] President Mandela subsequently acknowledged that South Africans involved in the country's chemical weapons program, which had allegedly been closed down in 1993, had gone to Libya, and he added weakly, "we cannot prevent anybody from visiting Libya and we cannot take away the knowledge that they have."[87]

The South African program reportedly produced toxins used for the assassination of opponents of apartheid. However, if weapons were produced, means of assassination would not have been all the program was intended for. A spokesman for Deputy President de Klerk claimed that South Africa had initiated its BW program because Angolan forces had used chemical and biological agents in combat against South Africa.[88] The claim is a canard, but no correction was ever made by South African officials. There are no known allegations of

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[83] James Adams, "Qadaffi Lures South Africa's Top Germ Warfare Scientists," *The Sunday Times* (London), February 26, 1995. See also, Paul Taylor, "Toxic S. African Arms Raise Concern; U.S. Wants Assurance '80s Chemical, Germ Weapons Program is Dead," *Washington Post*, February 28, 1995.

[84] Adams, ibid.

[85] Taylor, ibid.

[86] Taylor, ibid.

[87] "Chemical Arms Experts May be 'Visiting' Libya," *Baltimore Sun*, March 3, 1993. See also, Brendan Boyle, "S. African Arms Scientists May be in Libya: Mandela," Reuters World Service, March 2, 1995.

[88] Taylor, op. cit.

Angolan use of BW, and in the alleged instance of CW use, U.S. intelligence assessments concluded that chemical weapons had *not* been used.

A series of reports in the South African press between December 1994, and March 1995, contain additional information, but these are difficult to interpret for several reasons. Nearly all of the statements refer to chemical and biological weapons together, and in some cases, it is difficult or impossible to discern which ones in fact apply to biological as well as to chemical. In addition, some of the statements are highly suspect, while others are contradictory. Nevertheless, important information is made available, some of which follows:[89]

- The surgeon general of the South African National Defence Forces was the official in charge of both the chemical and biological weapons development programs, and the program may have been started "in the late 1970s."
- The Seventh Medical Battalion of the South African military forces seems to have been the locus of the research, development, and production efforts. Individuals who retired from its service set up a series of interlocking commercial enterprises that appear to have done much of the work on contract.
- South Africa could "produce and use biological weapons, and learned how to use BW 'offensively,'" but according to General Knoedel, the Surgeon General, the program was entirely "defensive." (On one occasion, General Knoedel lauded the high quality of the program. On another, he claimed it was all a strategic deception: South Africa had wanted to fool the superpowers into thinking that it had an offensive BW capability.)
- The program was allegedly terminated in January 1993, and all the BW *agents* allegedly destroyed in 1993. However, General Knoedel claimed that President Mandela had approved *not* destroying the R&D records.
- The possibility was raised that Israel and South Africa had collaborated in some of the research.

As of the end of 1995, no further information had become available regarding the

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[89] Jean Le May and Sam Sole, "Police Probe Secret Army Project," *Weekend Argus*, November 27, 1994; Sam Sole, "We Duped the World," *Weekend Argus*, December 18, 1994; Sam Sole *et al.*, "Revealed: SA's Secret Chemical Weapons Plan," *Weekend Argus*, December 11, 1994; Brendan Seery, "Farmlands Hide Deadly Gas Project," *Weekend Argus*, December 11, 1994; Robert Brand and Marco Granelli, "Chemical Arms 'For Defense,'" *Pretoria News*, February 28, 1995. See also, the *Chemical Weapon Convention Bulletin*, No. 27, March 1995, p. 34.

South African program, such as the agents it had worked with, the degree of weaponization, or the number of researchers it employed.[90] The National Institute for Virology in Johannesburg, and the South African Institute for Medical Research have highly qualified virology facilities, but—as far as is presently known—BW R&D work appears not to have been carried out at these laboratories.

It is important to note that the unclassified versions of the annual U.S. arms control treaty compliance reports never referred to South Africa. This raises several questions: Did the classified versions contain such information, or was information on the BW programs of nations such as South Africa (and possibly Israel) omitted from the classified versions as well? These became plausible questions based on the following: the combination of the disclosure of the South African program, its absence from the compliance reports—*in 1995 as well*—combined with the disclosure that also reference to China was omitted in 1991 and 1992 even from the *classified* compliance reports due to an administrative decision by the Office of the President.

IRAN

The 1994 U.S. compliance report states that "The United States judges that Iran probably has produced biological warfare agents, and statements by Iranian officials suggest that it has weaponized a small quantity of those agents."[91] The 1995 report was slightly more expansive:

> "The Iranian BW program has been embedded within Iran's extensive biotechnology and pharmaceutical industries so as to obscure its activities. The Iranian military has used medical, education, and scientific research organizations for many aspects of BW procurement, research, and production. Iran has also failed to submit the data declarations called for in the CBMs. . . Iran probably has produced biological warfare agents and apparently has weaponized a small quantity of those agents."[92]

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[90] The South African Embassy in Washington and the Institute for Defense Policy in Johannesburg have not responded to repeated requests to provide further information regarding the former BW program.

[91] "Adherence to and Compliance with Arms Control Agreements," June 23, 1994, U.S. Arms Control and Disarmament Agency, p. 12.

[92] "Adherence to and Compliance with Arms Control Agreements," May 30, 1995, U.S. Arms Control and Disarmament Agency, p. 16.

Notably, reference to "production" is made twice. A U.S. Department of Defense report of April 1996 added the following:

> "Iran began its biological warfare program in the early 1980s during the Iran-Iraq war. It made agreements with numerous countries for cooperative research, scientific exchanges, and technology sharing. The Iranians are conducting research on toxins and organisms with biological warfare applications. . . . Iran has evolved from piecemeal acquisition of bioprocessing equipment and is now pursuing complete biological production plants that could be converted to producing biological warfare agents. Some of its major universities and research organizations may be linked to its biological warfare program."[93]

The city of Damghan has been identified as the location of a possible "chemical and biological production facility."[94]

In replying to a series of questions in 1993 from the U.S. Senate Committee on Government Affairs, the U.S. Central Intelligence Agency stated that "Iran and Iraq have missiles and aircraft capable of carrying nuclear, biological, or chemical warheads. . . but we believe these countries only have chemical and biological warheads."[95] Iran has reportedly been able to buy a BW delivery system from a Russian company headquartered in Moscow. The Russian Foreign Intelligence Service (F.I.S.) report was, on the other hand, decidedly equivocal, stating that "Iran does not have offensive biological weapons at this time. But it is possible to say with confidence that there is a military-applied biological program."[96] In 1988 and 1989 Iran attempted to procure both fusarium and mycotoxin-producing fungi from Canada and the Netherlands for a laboratory at the Iman Reza Medical Center, Meshed Medical Science University, which also does research on chemical weapons

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[93] *Proliferation: Threat and Response,* U.S. Department of Defense, April 1996, p. 16.

[94] "Iran's Weapons of Mass Destruction," *Jane's Intelligence Review*, Special Report No. 6, June 1995, pp. 3, 17, 24.

[95] "Proliferation Threats of the 1990s," Hearing, Committee on Governmental Affairs, U.S. Senate, February 24, 1993, pp. 180 and 183.

[96] "Proliferation Issues," *Russian Federation Foreign Intelligence Service Report,* March 5, 1993.

agents.[97] A number of Iranian microbiologists have worked in the Cuban National Center for Genetic Engineering and Biotechnology in Havana.

NORTH KOREA (DPRK)

The unclassified versions of the arms control treaty compliance reports released by the United States government do not mention North Korea in regard to BW.[98] In response to a specific question from a senator in 1993, the CIA stated this:

> "We have almost no information on whether Pyongyang seeks to build biological weapons. Nevertheless, North Korea—if it desires—has the capability to develop classic biological agents such as anthrax, plague, or yellow fever."[99]

A U.S. Defense Intelligence Agency report on North Korean military capabilities published in 1991 implied that North Korea was not working on BW.[100] The South Korean Defense White Paper of 1993-1994 says only, "Since the early 1960s North Korea has been pushing forward with research and development as well as acquisition of biological and chemical weapons and protection and detection equipment in preparation for biological and chemical

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[97] Michael Gordon and Stephen Engelberg, "Iran is Said to Try and Obtain Toxins," *New York Times*, August 13, 1989. See also, Purver, op. cit., p. 35.

[98] "Adherence to and Compliance with Arms Control Agreements," June 23, 1994, U.S. Arms Control and Disarmament Agency, p. 184. The May 1995 version of the same (unclassified version) report again does not mention North Korea.

[99] *Proliferation Threats of the 1980s*, Hearing, Committee on Governmental Affairs, U.S. Senate, 103rd Congress, 1st Session, Washington, D.C., February 24, 1993, p. 184.

[100] "Biological warfare has not received the same attention as chemical or nuclear warfare. This could be because North Korea lacks the technical expertise or because the difficulty in controlling biological warfare makes it a less desirable option. North Korea realizes that biological weapons are as dangerous to its own forces as they are to South Korean or U.S. forces, and the North's limited medical services would make the agents more lethal. Therefore, using biological agents is not a likely option. However, if North Korea did choose to employ biological weapons, it probably could use agents such as anthrax, plague, or yellow fever against water and food supplies in the South's rear area." "North Korea, The Foundations for Military Strength," U.S. Defense Intelligence Agency, November 1991, p. 62. There is no apparent reason why the agents mentioned should therefore have been indicated.

Efforts since 1992 to obtain declassification of DIA and CIA documentation regarding North Korea have resulted in obtaining no more than the title page of a 1975 (!) study: "Biological Warfare Capabilities—Asian Communist Countries (U);" Defense Intelligence Agency; ST-CS-03-148-75; CY, ST-S-4-2704.

warfare."[101] Although providing further details about North Korean chemical weapons and production, it contains not another word about biological weapons. The Russian Foreign Intelligence report is substantially more suggestive:

> ". . . North Korea is performing applied military-biological research at a whole series of universities, medical institutes, and specialized research institutes. Work is being performed at these research centers with pathogens for malignant anthrax, cholera, bubonic plague, and small pox. Biological weapons are being tested on the island territories belonging to the DPRK. No information indicating that these programs are offensive in nature has been received."[102]

The final sentences are contradictory: The *testing* of biological *weapons* is by definition "offensive," and in violation of the BWC. In 1996, a U.S. Department of Defense report stated the following:

> "At the direction of President Kim Il-Song, North Korea began to emphasize an offensive biological warfare program during the early 1960s. With the scientists and facilities for producing biological products and micro-organisms, North Korea probably has the ability to produce limited quantities of traditional infectious biological warfare agents or toxins and biological weapons."[103]

One author, with information apparently derived from a combination of Korean Central Intelligence Agency and U.S. Defense Intelligence Agency sources, has claimed that North Korea has a dedicated BW program. This author, Joseph S. Bermudez, Jr., who has identified institutions allegedly participating in that program, states that North Korea is producing biological munitions and, additionally, that it is aiding other countries "with the technology and assistance required to develop, produce, and offensively employ chemical and biological weapons," alleging such cooperation for BW in particular between the DPRK

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[101] *Defense White Paper, 1993-1994*; The Ministry of National Defense, The Republic of Korea, Seoul, Korea, 1994.

[102] "Proliferation Issues," *Russian Federation Foreign Intelligence Service Report,* p. 29.

[103] *Proliferation: Threats and Response,* U.S. Department of Defense, April 1996, p. 7.

and Syria.[104] There is no other corroboration for these allegations.

> "Reports suggest that there are two laboratories and four research facilities engaged in this research. Included within these are the Institute of Microbiological Diseases at the Academy of Medical Science, the Medical Research Institute at the Academy of National Defense Sciences, and a facility known only as the 'No. 25 Factory.' Some advanced genetic research is currently occurring within Kim Il-Song University. Whether this is connected to the DPRK's BW program is presently unknown."

> "It has not been determined when the DPRK actually initiated the production of biological agents for offensive employment. Such a capability currently exists and is believed to have existed at least since the early 1980s, possibly earlier. Limited production of biological agents may be conducted at research facilities but it is possible that separate production facilities exist."

In 1994, a South Korean publication carried information—allegedly supplied by a North Korean defector—that identified five organizations, in addition to a "Chemical-Biological-Radiological Research Center" associated with the North Korean armed forces:

> "North Korea's bacteriological-weapons-related organizations include Kim Il-son University, Pyongyang Medical College, Pyongyang Military Medical College, the Institute of Microbiological Diseases under the Pyongyang Academy of Science, the Bacterium Research Institute under the Second

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[104] Joseph S. Bermudez, Jr., "North Korea's Chemical and Biological Warfare Arsenal," *Jane's Intelligence Review*, May 1993, pp. 225-228.

In a 1989 manuscript ("Korean People's Army NBC Capabilities," February 5, 1989), Bermudez had written the following:

"While the Soviet Union and the PRC have definitely provided the DPRK with chemical agents, they are not believed to have provided any direct assistance in the development of biological weapons. Such capabilities are believed to have been developed indigenously. DPRK biological warfare research is believed to have begun sometime during the mid-1960s and to have focused on 10 different strains of bacteria including: anthrax, cholera, bubonic plague, smallpox, and yellow fever. At present, it is believed that the DPRK has not employed genetic engineering or advanced bio-technology to develop these bacteria. The primary facilities engaged in this research are the 'National Defense Research Institute' and the 'Medical Academy.' However, the exact location of these facilities is presently unknown. It is not known whether the DPRK actually initiated the production of biological agents for offensive employment. However, such a capability presently exists and is believed to have existed since at least the early 1980s and possibly earlier. Limited production of biological agents may be conducted at the 'National Defense Research Institute' and the 'Medical Academy,' however, it is more probable that there exists separate production and research facilities."

Academy of Natural Sciences."[105]

ISRAEL

As long ago as 1974, U.S. military officials testified before the Senate Armed Services Committee that they had been informed by Israeli counterparts that Israel had an offensive chemical capability.[106] In response to a question by Senator Nunn, General Almquist replied that he did not know about a biological capability. It became known in 1993 that the USSR had recruited the former deputy director of the Israeli BW R&D program, Dr. Markus Klingberg, as a spy.[107] Arrested by Israeli authorities in 1983, Klingberg had worked at Ner Ziona, "a top secret institute near Tel Aviv that does research in chemical and biological warfare."[108] Notably, Israel has never been listed by the United States as maintaining a BW R&D program, nor is it referred to at all in the unclassified versions of the annual arms control treaty compliance reports. The Russian F.I.S. report released in 1993 stated in regard to Israel: "There is no direct evidence of the presence of

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[105] U Chong-chang, *Seoul Chugan Choson*, June 30, 1994; in FBIS-EAS-94-126; June 30, 1994, pp. 38-43.

The greatest portion of the article concerned the North Korean nuclear program, alleging underground nuclear tests and other reputed details that cast great doubt on the credibility of any of the information provided in the entire article.

[106] FY 1975 DoD Authorization Hearings, Part 5 (R&D), Senate Armed Forces Committee, March 7, 1974; p. 4931.

[107] "Zwolf Jahre Gefangis Fur Israelischen Oberst; Spionage Zugunsten der Sowjetunion," *Nieu Zurcher Zeitung*, September 2, 1993.

[108] Clyde Haberman, "Israel Lifts Secrecy Veil from Spy Convictions," *New York Times*, May 4, 1995.

biological weapons in Israel."[109]

[109] Proliferation Issues: Russian Foreign Intelligence Service Report; in JPRS-TND-93-007, March 5, 1993, p. 24.

Table 1: **Nations Having BW Programs at Least Approaching Weaponization**

	U.S. Gov't Arms Control Compliance Reports to Congress (1993,1995)	Admirals Brooks,[1] Studeman, Trost (1988,1990,1991); Sec. Cheney, 1990	U.S. and UK Governments (1995)[2]	Russian Federation[2] Foreign Intelligence Report, 1993
Middle East				
Iraq	X	X		
Libya	X	X		X
Syria	X	X		
Iran	X	X		X
Egypt	X			
South/East Asia				
China	X	X		
North Korea		X		X
Taiwan	?	X		
India[4]				?
South Korea				?
Africa				
South Africa			X	
Russia	Ambiguity regarding continuation of offensive program			

1: "Statement of Rear Admiral Thomas A. Brooks, USN, Director of Naval Intelligence, before the Seapower, Strategic, and Critical Materials Subcommittee of the House Armed Services Committee on Intelligence Issues," March 14, 1990, p. 54; "Statement of Rear Admiral William O. Studeman, USN, Director of Naval Intelligence, before the Seapower, Strategic, and Critical Materials Subcommittee of the House Armed Services Committee on Intelligence Issues," March 1, 1988, p. 48; "Statement of Admiral C.A.H. Trost, USN, Chief of Naval Operations, before the Senate Armed Services Committee on the Posture and Fiscal Year 1991 Budget of the United States Navy," February 28, 1990; "Remarks Prepared for Delivery by the Honorable Dick Cheney, Secretary of Defense, American Israel Public Affairs Committee, Washington, D.C., June 11, 1990," News Release, No. 294-90, p. 4.

2: The South African claims that its program was disbanded in 1992. Official UK government statements refer only to "around 10" nations with "or seeking" BW, but do not name any countries aside from the separate identification of South Africa in 1995. Israel and Cuba are two other countries regarding which suspicions have been raised as to whether their BW R&D programs are solely defensive.

3: *Proliferation Issues: A New Challenge After the Cold War, Proliferation of Weapons of Mass Destruction,* Russian Federation Foreign Intelligence Report, (translation), JPRS-TND-93-007, March 5, 1993.

4: In 1994, a Congressional Research Service report (J. M. Collins *et al*, *Nuclear, Biological and Chemical Weapon Proliferation: Potential Military Countermeasures,* Congressional Research Service, 1994-528S, July 5, 1994, p. 2.) included a table of nations either possessing or having "programs" of weapons of mass destruction. For biological weapons it listed Russia as the only nation with "possession confirmed," Iraq as "clear intent" (which, by 1994, should also have been in the "confirmed" column), China, India, Pakistan, North Korea, Taiwan, Iran and Syria as "probable possession" and Egypt and Libya as "suspected programs." The interesting—or anomalous—listings are of India and Pakistan, which have not otherwise been included in any unclassified official U.S. listings.
[Other versions of this table, essentially based on the sources in Footnote 1 (page 49), were published by Elisa Harris (1991), Nicole Ball and Robert McNamara (1990), and Steve Fetter (1991), the Office of Technology Assessment, U.S. Congress, *Proliferation of Weapons of Mass Destruction,* (1993), p. 82, and Ivo Daalder (1994).]

Of those countries that developed BW after World War II to the stage of weapons acquisition, virtually all either acquired all three categories of weapons of mass destruction (nuclear, chemical, and biological), or at least two, and have made attempts at a third:

- The United States, USSR, France, the UK, China, and South Africa procured all three;
- Iraq had chemical and biological and was in advanced development of nuclear;
- Israel has nuclear and chemical; biological is unknown;
- Iran has chemical and biological; seeks nuclear;
- Libya, has chemical; has sought nuclear for decades, and is seeking biological;
- Syria has chemical and biological;
- North Korea has chemical; sought nuclear, and accepting the Russian assessment, apparently has biological;
- India and Pakistan have nuclear; chemical and biological are unknown;
- Taiwan has chemical, South Korean chemical is ambiguous, and both had incipient nuclear programs in the late 1970s.

According to a statement by former CIA Director Woolsey in 1994, nations developing and procuring BW have usually done so following their procurement of CW, and it has frequently been stated that various Arab states in the Middle East developed chemical weapons because of Israel's possession of nuclear weapons. There are no statements or analyses that have extended this rationale specifically to their development of biological weapons as well, although it is an easy, logical extension to make. Note Anthony Cordesman's phrase, "Nations that are interested in biological weapons are already interested because they offer an alternative to nuclear weapons. . . ." It would not be altogether surprising if one learned that some governmental policy group in these states that had considered or was urging the acquisition of nuclear weapons had spun off the suggestion to develop biological weapons. Nevertheless, nothing is publicly known regarding the policy decisions in these states regarding BW development.

The Potential Use of BW by Extra-National, or "Terrorist," Groups.

There have been many warnings over a period of several decades of the possible use of biological weapons by terrorist groups. The reason given is the ostensible ease of preparation of such agents. Nevertheless, to date, this has not taken place. The most serious attempt to produce an agent, which nevertheless failed, was made by the Japanese Aum Shinrikyo group in the early 1990s. The same group did go on to manufacture and use the chemical agent Sarin in Tokyo in 1994, and then again in March 1995. Also there is also a record of threats by several groups or individuals to use BW, and some indication of the nature of these can be given.

The first thorough review of this subject, a substantial monograph titled *Chemical and Biological Terrorism*, became available in June 1995.[110] The author divided his examination into five parts:

(1) Threats to use BW, without any evidence of actual capabilities;
(2) Unsuccessful attempts to acquire BW;
(3) Actual possession of BW agents;
(4) Attempted unsuccessful use of such agents;
(5) Their actual "successful use."

Several events recorded in the past 30 years exemplify developments in this area:

(1) In the 1960s, Robert Depugh, the owner of a veterinary medical products supply company named the Biolab Corporation in the state of Missouri, headed the largest paramilitary right wing organization in the United States, the Minutemen of America. He claimed to have ". . . a number of our own physicians and bacteriologists working on the production of biological agents. . . .Most of this research goes on after hours in public and private institutions where they hold a regular job during the day and have an opportunity to

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[110] Ron Purver, *Chemical and Biological Terrorism: The Threat According to the Open Literature;* Canadian Security Intelligence Service, June 1995, pp. 3-57. See also, Jeffrey A. Simon, "Terrorists and the Potential Use of Biological Weapons: A Discussion of Possibilities," RAND Corporation, R/3771-AFMIC, December 1989;
B.J. Berkowitz, *et. al*., "Superviolence: The Civil Threat of Mass Destruction Weapons," ADCON Corporation, A 72-034-10, September 1972;"Terrorism and Biological Weapons," pp. 35 to 44 in *Technology Against Terrorism: Structuring Security*, Office of Technology Assessment, January 1992; Robert S. Root-Bernstein, "Infectious Terrorism," *Atlantic Monthly*, May 1991, pp. 44-50.

moonlight a few hours in the evening on their own." He claimed that his associates were researching classical BW R&D subject matters, ". . . such as. . . the selective breeding of various pathogens in order to increase or decrease their virulence and to render them resistant to antibiotics."[111] He referred to equine encephalitis virus as one of seven agents his group had selected to work on. He also claimed that he had personally produced Sarin at his company's facilities "and elsewhere across the country." None of these claims were ever validated by any other source, and there is no knowledge that any of the agents implied were actually ever produced, or were ever used. It is not known whether any of the claims were more than bluster and a demonstration of the ability to use the right phraseology.

(2) An attempt was made to extort funds from the Brandt government in West Germany in 1973 by an individual or group threatening to pollute "shopping centers, hotels, factories, and city water systems with deadly bacteria."[112] Nothing occurred following the blackmail attempt.

(3) Sometime between 1980 and 1984 (ostensibly equally expert sources with access to classified U.S. government records dispute the date) the bathroom of a Paris apartment was found to contain flasks of clostridium botulinum. The apartment was a "safe house" of the West German Red Army Faction, also known as the Baader Meinhoff Group. Although the public record does not indicate that the material was produced at that location, the work is attributed to one of the group's members, Silke Maier-Witt, who was a medical assistant by profession.[113]

(4) Sometime in the mid-1980s, the Tamil Elaam secessionist groups, waging a war of secession in Northern Sri Lanka, released a communique threatening to wage biological warfare against the government.[114] The Tamil Elaam was a group that had unquestionably demonstrated an aggressive willingness to take virtually any action—massacres; assassination of the Indian head of state (Rajiv Gandhi) as well as that of Sri Lanka and other senior Sri-Lankan politicians; the use of suicide volunteers—and some facility with using somewhat advanced technologies, such as demolition frogmen. The communique that stated their intentions sounded as if they knew what they were doing. They described four

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[111] Eric Norden, "The Paramilitary Right," *Playboy Magazine*, June 1969, pp. 103-104, 146, 242-264.

[112] "Bacteria Terror Threatened in West German Extortion Bid," *International Herald Tribune*, November 23, 1973.

[113] Ron Purver, op. cit., pp. 36-37.

[114] Rohan Gunaratna, *War and Peace in Sri Lanka*, Institute of Fundamental Studies, Sri Lanka, 1987, pp. 51-52.

operations that they could carry out. Two of these targeted the human population: the transport and introduction of the natural vectors for River Blindness (a snail) and Yellow Fever (mosquitoes) into the south of the country. The remaining two were threats of transporting and introducing two anti-plant agents, against the rubber trees and tea bushes that make up two of Sri Lanka's major export products. Nevertheless there is no evidence of their having carried out any of the four BW operations. [After the March 1995 events in Tokyo, the Tamil Elaam also threatened to use Sarin in attacking government (military) facilities.]

(5) In March 1995, two members of an American right wing militia, "the Minnesota Patriots Council, were convicted of conspiracy charges for planning to use a lethal biological toxin, ricin, to kill Federal employees and law enforcement agents."[115] The conspirators were apprehended before any actual use occurred.

(6) In 1995, a member of an American right wing racist group (Aryan Nation) who was a qualified microbiologist who maintained a small laboratory in his basement, ordered samples of bubonic plague from the American Type Culture Collection because "he needed the bacteria to conduct 'biomedical research using rats to counteract imminent invasion from Iraq of super-germ carrying rats,'" or, alternatively, "because he (was) writing a research book,"[116] The individual was arrested, and the cultures, as well as explosives, were recovered.

(7) On March 20, 1995, members of a Japanese religious sect, the Aum Shinrikyo (Supreme Truth) released Sarin gas in a carefully prepared attack in the Tokyo subway system. Fortunately, mortality was quite low. The same group had also intentionally released Sarin a year before, with several deaths resulting, but had not been apprehended. Following the 1995 attack, Japanese police began a months-long process of searching the extensive facilities owned by the sect—over a hundred individual buildings and sites—something which had not been done previously. In addition to hundreds of tons of intermediate chemicals that had been stockpiled for the production of chemical weapons, police discovered that the sect had been attempting for several years to prepare botulinum toxin for use as an aerosol weapon. At the site of the group's CW production facility, "160 barrels of peptone" media were found in one of the buildings in the village of Kamikuishiki. [117] The group had procured four fermenters, a vacuum dryer, and a milling machine, and had

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[115] Bob Herbert, "Militia Madness," *New York Times*, June 7, 1995.

[116] Michael Janofsky, "Looking for Motives in Plague Case," *New York Times*, May 28, 1995.

[117] Andrew Pollack, "Japanese Police Say They Found Germ-War Material of Cult Site," *New York Times*,

tested their product on guinea pigs. However, in several years of efforts the Aum Shinrikyo had failed to produce botulinum toxin.[118]

There are two significant aspects of the Aum Shinrikyo attempt. The first is that it failed, although it appears to have been the most serious attempt on record, with no lack of resources and time. The second is that the perpetrating group was most certainly not an ordinary "terrorist" group. It would be useful, therefore, to look at both the characteristics of the group and the resources that it applied to produce a BW agent:

- It was a religious sect.
- Its teachings were apocalyptic.
- Its devotees were exposed to classical aspects of the more severe forms of indoctrination and
- It had abducted and killed civilians that it considered "enemies."
- The leadership of the group, at least at one time, had political ambitions; some 25 of its members had run for seats in Japan's parliament only a few years before.
- The group was administered as a miniature government, with "ministers" and sectorial responsibilities. Its leader "apparently envisioned a 'sovereign state' with its own government and the ability to wage war with guns, bacteria, or nerve gas."[119]
- Aum Shinrikyo had a most extravagant access to financial resources, estimated as being between 1.2 and 1.6 billion dollars.
- It maintained several front companies for procuring advanced Western production equipment and extremely large stocks of chemical intermediates.
- It had also recruited a small staff of qualified scientists, ("around thirty. . ."), some of them at the post-doctoral level and with experience in industrial and medical R&D. These people supervised about 100 laboratory technicians. These scientists, with the combination of funds, Western equipment, and industrial intermediaries, had succeeded in producing Sarin.

As stated earlier, despite continual apprehensiveness on the part of experts over the decades, there have been no instances of BW use by terrorists. This has frequently prompted the question of "why not?"

It seems very likely that experts and analysts have been much too "optimistic," and that

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March 29, 1995 (as reported by *Mainichi-Shimbun*).

[118] Kyle Olson, personal communication, May 26, 1995. See also, Ron Purver, op. cit., pp. 153-190; pp. 164-166 and 168-170 pertain in particular to the group's attempts in BW.

[119] Andrew Pollack, "Japanese Sect May Struggle to Get by Without Its Leaders," *New York Times*, May 17, 1995.

BW is not easy for an untrained group to produce. In addition, other actions may be very much easier to do and the materials to carry them out acquired, or more readily provided, by patron states. Sophisticated plastic explosives were available by the ton; digital timing devices are purchasable legally. In some instances, the relative discreetness of effect of an explosive may be what the terrorist group desires. However, if an explosive device is placed in a marketplace or a bus station, it is difficult to imagine that the terrorist group would not be quite satisfied—in fact, would consider it desirable—if it could kill 10 or 100 times as many people in the same act. To produce BW, one does need appropriate knowledge and experience, as well as a laboratory and equipment; the failure of the Japanese Aum group after several years of effort in this respect would indicate exactly that.

Except for the Aum case—in which the effort to produce a BW agent did not succeed—no evidence has appeared over the decades indicating whether BW was considered by terrorist groups: if so, why it was rejected; if not, why it was not. For example, in the case of the quite specific Tamil Elam threat described above, it is not known if the threat was only a bluff, or if there ever was any serious intention and effort to carry it out at any point.

It is frequently argued that the acts of terrorist groups are intended to gain the sympathy of the public for their cause, and that the use of BW would presumably be counterproductive from that viewpoint. However, historical experience undercuts that basic premise. It is clear that terrorist groups do not mind killing people, including innocent civilians in sizable numbers. The sabotage of aircraft (Lockerbie, French airliners over Africa) and bombings (from marketplaces, taverns and department stores, to Oklahoma City and the World Trade Center, the latter carrying the potential of deaths in the thousands) make that clear. They also don't hesitate to assassinate heads of state or other major political figures (Indira and Rajiv Gandhi, Lord Mountbatten, Aldo Moro, attempted assassination of Prime Minister Thatcher, etc.), which earns them no sympathy at all, not even in the eyes of a selected or targeted population to whom the act might be assumed to appeal. They have their own cost-benefit analyses regarding the desirability of particular acts they carry out, and the assumed consideration that they would not do something that would alienate the general public and cost them its sympathy is not substantiated. (Although not a traditional "terrorist" group, the use of CW by the Japanese Aum group would certainly bear this out.) In addition, the aim of some terrorist groups is not to gain adherents or earn public sympathy, but simply to disrupt society, and, in some cases, even to topple the national government.

Biological Weapons Arms Control since 1975

The Biological and Toxins Weapons Convention (BTWC) entered into force in 1975 and currently has over 130 States Parties.[120] The BTWC prohibits the development, production, and stockpiling of microbial or other biological agents, or toxins, of types and in quantities that have no justification or prophylactic, protective or other peaceful purposes, and weapons, equipment, or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict. The BWC was also of unlimited duration, and additionally provided that if a majority of the parties to it agreed, review conferences could be held every five years. These majorities were obtained, and a review conference has been held every five years since the BWC came into force in 1975.

There were, however, two major drawbacks to the Convention. First, there was no prohibition on research; *all* research was permissible. Therefore the development and production of "quantities" that could be justified for "protective," or defensive research, were permitted. There was no mention of "offensive" or "defensive" research—"research" was not mentioned at all—and hence no discussion of a distinction between the two, if any, could be drawn. There was, in addition, no definition of the boundary between research and "development," which is prohibited. For example, the parameters of the "quantities" were not delineated.

Second, there were no provisions for verification of any sort. In 1972, the former USSR was totally opposed to any consideration of on-site verification. In more recent years, once verification could be considered, the first set of problems would pose the greatest difficulty: distinguishing between legitimate "protective" or "defensive" biological research programs and those intended for offensive use.

Following the anthrax accident at a military BW facility in the USSR at Sverdlovsk in 1979, the United States attempted to make use of the consultation provisions under Article

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[120] The history of biological weapons arms control negotiations, before and after the achievement of the Biological Weapons Convention, are documented in, among other sources, Jozef Goldblat, Vol. 4; *CB Disarmament Negotiations, 1920-1970*, in *The Problem of Chemical and Biological Warfare*, SIPRI, Stockholm International Peace Research Institute, Almquist and Wiksell, and Humanities Press, 1971; Robert W. Lambert and Jean E. Mayer, *International Negotiations on the Biological Weapons and Toxin Convention*, U. S. Arms Control and Disarmament Agency, May 1975; Nicholas A. Sims, *The Diplomacy of Biological Disarmament; Vicissitudes of a Treaty in Force, 1975-1985*, MacMillan Press, London, 1988. Annual updates on the state of the negotiations appear frequently, but intermittently, in the *United Nations Disarmament Yearbook*, (Vol. 19 is the 1994 Yearbook), and in the *SIPRI Yearbook World Armaments and Disarmament*, which has been published annually since 1968/1969.

5 of the BWC. The U.S. diplomatic effort was criticized for not having been handled well, but it is inconceivable that the former USSR would have provided valid information under any circumstances, given the nature of the accident and what it would have disclosed. In 1984, the United States declared the USSR in violation of the BWC but did not lodge a complaint with the U. N. Security Council, as it was entitled to do under Article 6 of the BWC, a procedure that could also have been followed in 1979. A Soviet veto of any such U.S. initiative in the Security Council would have been likely in 1979 or 1984, but at the same time it would have impugned Soviet compliance.

The Second Review Conference took place in 1986, following the transition to the Gorbachev administration in the former USSR. There were two important outcomes. First the conference decided on four "confidence-building measures" (CBMs).[121] These were to be "politically binding," but not mandatory, as described below:

(1) *The declaration of all high containment facilities and of defense facilities*: exchange data on high-security containment facilities (all BL-4 laboratories, and BL-3 ones at defense facilities), including providing data on their work programs.

(2) *The declaration of unusual outbreaks of disease:* exchange information on unusual outbreaks of diseases (unusual in terms of the detection of a new, possibly unique disease, and/or a disease at a location where it has never before been observed).

(3) *The encouragement of the publication of the results of research:* encourage the open publication of results from bacteriological and biological research.

(4) *The encouragement of international contacts between scientists*: actively promote international contacts between biological researchers, including promotion of joint projects between them directly related to the BWC.

In addition, to resolve the type of situation brought about by the unresolved allegations of the United States against the former USSR, and to establish a procedure for investigating and evaluating, in general, allegations of non-compliance in a less politicized and confrontational setting than the U.N. Security Council, it was decided that, under Article 5, a consultative

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[121] For summaries of the First and Second BWC Review Conference, see Raymond Zilinskas, "Biological Warfare and the Third World," *Policy and the Life Sciences*, 9:1, August 1990, pp. 59-75. The discussion above follows his presentation. An additional source with a discussion of the First and Second Review Conferences, and the early pressures for strengthening the Convention, is Chapter 3, "Biological Weapons," in J. Christian Kessler, *Verifying Nonproliferation Treaties: Obligations, Process, and Sovereignty*, Washington, D.C.: National Defense University Press, 1995, pp. 51-74. See also, Final Document, Second Review Conference of the Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, BW/CONF. II/13, September 30, 1986.

meeting would be promptly convened at the request of any signatory nation that asked for one in order to consider a specific presumptive violation. The Final Declaration of the Second Review Conference ". . .stresses the need for all States to deal seriously with compliance issues and emphasizes that the failure to do so undermines the convention and the arms control process in general." In April 1987, an ad hoc meeting of experts met and established the procedures for the information exchanges.[122] The first exchange was to be completed by October 15, 1987. Subsequently, submissions were to be provided each year. The Third Review Conference, to take place in 1991, would decide whether to make any changes in the procedure.

When the Third BWC Conference was convened in September 1991, there had been several significant intervening developments:

- The Gulf War had just ended, and in it there had been the possibility of use of both biological and chemical weapons by Iraq. Moreover, Iraq had been a signatory of the BWC.
- For the above reason, as well as for others, there was greater interest in BW proliferation.
- The former USSR was being extremely cooperative in strategic arms control negotiations, and for the first time, provisions for on-site inspection had been written into the Stockholm CBMs in 1986 and into the INF Treaty by the end of 1987.
- It was by then more or less clear that the Chemical Weapons Convention, then under negotiation, was going to have rigorous verification provisions, including on-site inspection.
- The record of submission of the voluntary declarations was poor. As it turned out, only 13 states submitted CBM declarations in 1987, 24 in 1988, 28 in 1989, 36 in 1990, 41 in 1991, and 35 in 1992. Many of these were no more than a single line stating compliance. It took five years before a third of the States Parties to the BWC provided declarations.

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[122] Ad Hoc Meeting of the Scientific and Technical Experts from States Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, BW/CONF. II/EX/2, April 21, 1987.

All of these factors combined to produce a significant interest in stronger verification provisions in the BWC on the part of a substantial number of the State Parties attending the Review Conference in 1991. Seeing both the obvious need for strengthening and the opportunity provided by the changed international political circumstances, there had been a good deal of thinking and preparation both by governments and NGOs in advance of the Review Conference.[123]

The Third Review Conference first reaffirmed the four CBMs established in 1986. It then added three more: the declaration of national legislation related to the BTWC; the declaration of past activities in offensive/defensive biological research and development programs; and the declaration of human vaccine production facilities.[124] But as the head of the U.S. delegation to the Review Conference explained,

> "The issue of verification became the single most contentious question at the 1991 BWC Review Conference. The majority of States Parties argued that they should incorporate verification measures into the BWC even if those measures were not completely effective since such measures would contribute to deterring BW proliferation. The United States, however, argued that the BWC was not verifiable and it had not identified a way to make it so. In simplistic terms the argument was between those who contended that 'some verification was better than none' and the United States argued that 'bad verification was worse than none.'"[125]

The irony was very great. The United States had always been the major proponent of verification procedures in U.S.-USSR arms control negotiations since the late 1950s. The

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[123] Symposium on Improving Confidence-Building Measures for the BW Convention, National Defense Research Establishment, Umea, Sweden, May 1990; Erhard Geissler (ed.), *Strengthening the Biological Weapons Convention by Confidence-Building Measures*, SIPRI Chemical and Biological Warfare Studies, No. 10, Oxford University Press, Oxford, 1990; "Proposals for the Third Review Conference of the Biological Weapons Convention," (Federation of American Scientists), *Arms Control.* 12:2, September 1991, pp. 240-254; Jozef Goldblat and Thomas Bernauer, *The Third Review of the Biological Weapons Convention: Issues and Proposals*, Research Paper No. 9, UNIDIR, United Nations, New York, 1991; Collected Papers, Seminar on the Biological Weapons Convention, Noordwijk, the Netherlands, Ministry of Foreign Affairs, The Netherlands, February 1991; S.J. Lundin (ed.), *Views on Possible Verification Measures for the Biological Weapons Convention*, SIPRI Chemical and Biological Warfare Studies, No. 12, Oxford University Press, Oxford, 1991.

[124] Third Review Conference of the Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, BW/CONF. III/22 Add. 2, September 27, 1971.

[125] Michael Moodie, "Bolstering Compliance with the Biological Weapons Convention; Prospects for the Special Conference," *Chemical Weapons Convention Bulletin,* No. 25, September 1994, pp. 1-3.

succeeding U.S. ambassador to the conferences that followed explained the position of the Bush administration in greater detail. While noting that "Adequate and effective verification is an essential element of all arms limitation and disarmament agreements," he continued,

> "Many governments, especially in the West. . . wanted to amend the BWC by adding more restrictive, intrusive measures. . . the United States delegation opposed these measures. However, the United States did agree to formation of a working group of experts whose mission is to evaluate any verification measures proposed by States Parties from a scientific and technical standpoint.
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> "Verification measures are included as part of an arms control agreement to enhance the national capability of parties to monitor compliance and to detect violations in a timely fashion. In addition, verification measures are included to deter violations of an arms control agreement. Of course, judgments about compliance are a national prerogative, and each party must rely on the information it has available to assess the compliance of the other parties.
>
> "The United States draws a clear distinction between confidence-building and verification. Confidence-building measures provide participants with access to information that encourages a climate of openness and transparency. They also allow participants to demonstrate how their activities should not be considered threatening to others."
>
> "Effective verification measures, singly or in combination, should:
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> - Provide confidence that the States Parties are in compliance with treaty provisions;
> - Deter violation of treaty provisions by significantly increasing the risk of detection and thereby raising the costs of cheating;
> - Enable the States Parties, individually or collectively, to detect a violation in a timely fashion before it poses a military risk and/or places a State Party in a position where it is too late or too difficult to take countermeasures.
>
> "Given this understanding of verification, our own analyses indicate that the BWC cannot be made more effective by adding verification measures known to us. The small size and complex structure of microorganisms, and the dual-purpose nature of many items used in biological production, make verification of a ban on biological weapons problematic, to say the least. Our concerns about the verifiability of the BWC are the primary reason the United States opposed the proposals for specific verification regimes made at the September 1991 review conference. But it should also be noted that the United States opposes any measure that would limit our ability to pursue a biological defense program or unduly burden American industry."[126]

[126] Dr. Edward J. Lacey, Address to the Biological and Biotechnology Section of the Pharmaceutical Manufacturers Association, September 29, 1992.

Ambassador Lacey reiterated that "It is. . . our view that any proposed regime must not have an unacceptable impact on United States industry. . . CBMs should not pose an undue burden on . . . workers or harm the competitiveness of U.S. companies."

A "verification protocol" had actually been proposed at the Review Conference and was supported among others by Sweden, the Netherlands, France, Germany and Russia.[127] All—including Russia—favored some sort of on-site or challenge inspections, and made specific proposals regarding various degrees of frequency and intrusiveness. All explicitly understood that an inspection regime would not produce absolute certainty of the absence of violation, but all felt that it was impossible to conceive of circumstances in which less information could be better than having more information. In the mid-1980s with no verification possible, the Reagan administration, in addition to having provided for a 500-plus percent increase in funding for BW research in six years, felt that the utility of the Treaty was limited and placed little emphasis on it.[128] In 1991-1992, with on-site verification conceivable—albeit unquestionably difficult—the Bush administration decided *in advance* that it could not work, that it could not produce a level of *absolute* confidence, and therefore opposed it entirely. It is not even clear if this was the primary policy determinant, or if the other two stated concerns—the protection of proprietary information of U.S. commercial biotechnology and pharmaceutical firms, and the safeguarding of U.S. defensive research from formal international monitoring—were the driving policy determinants, or if the administration had seriously attempted to draw a balance between them. Whether a verification protocol was achievable in 1991-1992 on a par with the Chemical Weapons Convention is unknown, but the U.S. opposition was essentially responsible for the stretched out process that began in 1992 and will extend through 1996. Ironically, just halfway through that period, the U.S. government's position changed entirely, and favored what it had opposed in 1991-1992.

The U.S. opposition resulted in the creation of an Ad Hoc Group of Governmental

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[127] "Implementation of the Proposals for a Verification Protocol to the Biological Weapons Convention," (Federation of American Scientists), *Arms Control*, 12:2, September 1991, pp. 255-278.

[128] This attitude was expressed in papers such as Douglas J. Feith's "Biological Weapons and the Limits of Arms Control," *The National Interest*, Winter 1986/1987, pp. 80-84, and Joseph Finder, "Biological Warfare, Genetic Engineering, and the Treaty That Failed," *Washington Quarterly*, 9:2, Spring 1986, pp. 5-14. See also, Lynn M. Hansen, "Arms Control in Vitro," *Disarmament* (United Nations) 10:1, Winter 1986/1987, pp. 59-65. The same issue has articles on the BWC Review Conference by Winfried Lang, Jorge Pando, and Mikhail Kokeiev.

Experts which subsequently came to be known as the VEREX exercise, with membership drawn from States Parties to the BWC. It was charged with adopting a consensus report on additional verification measures before the end of 1993, which would then be considered by BWC members. The charge to the expert group was to do the following:

> ". . . identify measures which would determine whether a State Party is developing, producing, stockpiling, acquiring or retaining microbial or other biological agents or toxins, of types and in quantities that have no justification for prophylactic, protective or peaceful purposes; and whether a State Party is developing, producing, stockpiling, acquiring or retaining weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict."

To do this, they were directed to use the following criteria to guide the examination of potential verification measures:

> (1) Their strengths and weaknesses based on, but not limited to, the amount and quality of information they provide, and fail to provide;
>
> (2) Their ability to differentiate between prohibited and permitted activities;
>
> (3) Their ability to resolve ambiguities about compliance;
>
> (4) Their technology, material, manpower and equipment requirements;
>
> (5) Their financial, legal, safety and organizational implications;
>
> (6) Their impact on scientific research, scientific cooperation, industrial development and other permitted activities; and their implications for the confidentiality of commercial proprietary information.

The measures could be examined singly or in combination. When the experts had completed their work and their report had been circulated to BWC States Parties, if a majority of them requested a Special Conference to consider it and to decide on what to do next, that would take place. There had never been a Special Conference held under the Treaty before, but it would obviate having to wait for the next Review Conference, which was not scheduled until 1996, to decide on further steps.

The U.S. administration's guidance to the U.S. delegation to the first VEREX meeting in March-April 1992 was described in a report by the U.S. Government Accounting Office:

> "The U.S. strategy for the first meeting of the Ad Hoc Group of Governmental Experts called for the U.S. delegation to be open to constructive suggestions, but

> to oppose any ineffective verification provision and any measures that would limit the U.S. government's ability to pursue its biological defense programs and impair the U.S. biotechnology industry's competitive edge now held in the world. The U.S. delegation was to explain to the other delegations the nature, diversity, and complexity of biological research, including its dual-use nature, the small size of some equipment, and its widespread existence. Furthermore, the delegation was to explain that because of legitimate commercial and defense activities requiring biological items, evidence of an offensive BW program is therefore not easily identifiable. The United States did not make any verification proposal during the meeting."[129]

That guidance and U.S. administration policy changed in 1993.

The Ad Hoc Group agreed in 1992 to examine 21 potential verification measures under the three broad areas of a BW program: development, acquisition or production, and stockpiling or retention. They did this in three subsequent meetings: the first, to analyze the technologies that would be associated with proposed measures on the list; the second, to evaluate proposed measures according to the agreed criteria; and the last, to compile a final report for BWC members. The 18-month VEREX exercise would evaluate the 21 measures singly and in combinations in an attempt to find the best possible combination within the constraints of the cost to carry them out, coupled with the problems of commercial industries.[130] The final report was to be an analysis which would compare the various measures, and not a draft verification regime. The measures were divided into two categories, off-site and on-site. Off-site measures included remote sensing and various types

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[129] *Arms Control: U.S. and International Efforts to Ban Biological Weapons,* GAO/NSIAD-93-113, December 1992, p. 19.

[130] As indicated, the first VEREX meeting took place on 3/30/92 to 4/10/92 with 53 participants; the second from 11/23/92 to 12/4/92 with 46 participants; the third from 5/24/93 to 6/4/93 with 42 participants; and the fourth and final session on 9/13/93 to 9/24/93 with 41 participants.

of information monitoring, primarily by a variety of instrumentation. The 21 potential verification measures were the following:[131]

Off-site measures:

a. Information monitoring
- Publication surveillance
- Legislation surveillance
- Data on transfers and transfers' requests
- Multilateral information sharing
- Exchange visits

b. Data exchange
- Declarations (including notification)

c. Remote sensing
- Satellite surveillance
- Aircraft surveillance
- Ground-based surveillance

d. Inspections
- Sampling and identification
- Observation
-Auditing

On-site measures:

a. International arrangements

b. Inspections
- Interviewing
- Visual inspection
- Identification of key equipment
- Auditing
- Sampling and identification
- Medical examination

c. Continuous monitoring
- Instruments
-Personnel

[131] Report, including Final Report, Ad Hoc Group of Governmental Experts to Identify and Examine Potential Verification Measures from a Scientific and Technical Standpoint, BWC/CONF.III/VEREX 9, Geneva, September 1993.

Measures in combination:

The following five combinations were studied as examples to illustrate the evaluation of enhanced capabilities and limitations of measures in combination:

- Declarations/multilateral information sharing/satellite surveillance/visual inspection
- Information monitoring (surveillance of publications/surveillance of legislation/data on transfers, transfer requests and production/multilateral information-sharing/exchange visits)
- On-site inspection (interviewing/visual inspections; identifications of key equipment/auditing/sampling and identification)
- Declarations/multilateral information-sharing/on-site visual inspection
- Declarations/information monitoring

The VEREX final report was not particularly a blaze of enthusiasm. It noted ". . . that capabilities and limitations existed for each measure," and that ". . . reliance could not be placed on any single measure by itself to determine whether a State Party is developing, producing, stockpiling, or retaining. . . ." It noted that the group had "most frequently identified for application" a group of declarations, as well as the entire subset of on-site inspections, and concluded,

> "Based on the examination and evaluation of the measures described above against the criteria given in the mandate, the Group considered, from the scientific and technical standpoint, that some of the potential verification measures would contribute to strengthening the effectiveness and improve the implementation of the Convention, also recognizing that appropriate and effective verification could reinforce the Convention."[132]

The required majority of BWC States Parties did request a Special Conference, which led to another cycle of conferences. The Special Conference met in September 1994, received the VEREX report favorably, and established a new Ad Hoc Group that would now "examine appropriate measures, including verification measures, and draft proposals to be included, as appropriate, in a legally binding instrument." The Ad Hoc Group met three times in 1995, with two sessions in 1996, the last to be coordinated with the Fourth Review Conference of the BWC in September 1996.[133]

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[132] Ibid.

[133] The Special Conference took place September 19-30, 1994, with a preceding Preparatory Committee

During this drawn-out, five-year period of conferences of experts and negotiations, there was one other intervening event with important arms control significance. In June 1993, the Australia Group—a group of nations that in the past had drawn up and agreed to a target list of items to aid in controlling the export of materials that could lead to the production of chemical weapons—did the same for biological agents and the manufacturing equipment that could be used to produce BW.[134] The 26 members of the group agreed to follow the same export restrictions. Their meeting took place jointly with the European Commission, and again evolved from an earlier policy decision in 1990 that the group would extend its efforts from the chemical weapons area to develop export control guidelines in the biological area as well. Notably, Iran has expended a good deal of diplomatic effort, so far unsuccessfully, to have the Australia Group abolished. In 1996 meetings, Iran has demanded that all existing export control regimes—obviously including the Australia Group—should be abolished once a verification protocol is agreed to. Iran's leverage is provided by the operational principle of decision by consensus in U.N. deliberations, and that leverage is increased the closer the great majority of nations comes to agreeing on the desirability, importance, and fundamentals of a verification protocol.

What has the process of strengthening the BWC by providing additional verification capability achieved? At the September 1994 Special Conference, several nations—Iran above all—wanted to see nothing further take place. However, by September 1994, the United States was interested in seeing that a series of "transparency measures" be extended on an international basis to all States Parties of the BWC. These measures would be similar to those that the United States, Russia, and the UK had agreed on in the trilateral process in September 1992. That included *mandatory* data exchanges, or declarations, and *mandatory* on-site visits. Both aspects were essential: whatever was decided on must be mandatory, and there had to be some on-site inspection capability. The United States and all European

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meeting on April 11-15, 1994. The 1995 Ad Hoc Group meetings were on January 4-6, 1995, July 10-21, 1995, and November 27- December 8, 1995. An administrative meeting was held on January 1996, another brief meeting April 9-12, 1996, and the remaining 1996 meetings will be in July and September.

[134] Australia Group Meeting: Fact Sheet, U.S. Arms Control and Disarmament Agency, July 28, 1993, 2 pages, and Australia Group, Export Controls on Materials Used in the Manufacture of Chemical and Biological Weapons; Control List of Dual-Use Biological Equipment, List of Biological Agents for Export Control Core List, Control List of Plant Pathogens, Control List of Animal Pathogens. Fact Sheet, U.S. Arms Control and Disarmament Agency, October 25, 1993. The list included seven categories of equipment: (1) BL-3 and BL-4 containment facilities; (2) Fermenters; (3) Centrifugal separators; (4) Cross flow filtration equipment; (5) Aerosol inhalation chambers; (6) Freeze-drying equipment; (7) Equipment to be included inside BL-3 or BL-4 containment. Each of these categories of equipment was defined by specific technical parameters.

states had also hoped that the new Ad Hoc Group established by the Special Conference would function as a drafting group, to prepare a protocol to the BWC that would be ready in time for consideration at the Fourth Review Conference in 1996. It is now apparent that that schedule will not be met, as had earlier been anticipated. The opposition of Iran and two or three other countries appears to be sufficient to promise an anticipated delay of perhaps two-to-three additional years.

The purpose of the mandatory declarations would be to provide a database on the facilities that were of the greatest potential danger to the BWC, the most convertible, and the easiest to disguise: all facilities with high containment, all that used listed organisms, and all national biological defense programs.[135] Over a period of years, such declarations would presumably provide a profile of "a national pattern of activity." If that profile changed, it could provide reason for an on-site visit. Such visits would have to take place on relatively *short* notice, and they would be to any declared or *un*declared site, or to a site of alleged use of BW. The requirement for a greater number of declarations and for mandatory ones meant that the question of an international directorate would have to be resolved. The most likely solution would be an addition to, and colocation with, the OPCW, the organization responsible for verification of the Chemical Weapons Convention (in full, the Provisional Technical Secretariat of the Organization for the Prohibition of Chemical Weapons). Finally, the existing BWC would be left intact so as not to run the risk of loosing any current States Parties, and in order for a new protocol to be legally binding, it would have to undergo a separate ratification process. As there were already signatories to the BWC that had not yet ratified it, very likely many in that group would not ratify the new protocol, or even sign it.

The July 1995 meeting of the Ad Hoc Group, in fact, divided its work program into four areas, the first two of which appear to be somewhat redundant and are both an outgrowth of

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[135] See the following very useful papers on recent efforts and proposals to strengthen the BWC: Graham S. Pearson, "Forging an Effective Biological Weapons Regime," *Arms Control Today*, 24:5, June 1994, pp. 14-17; Graham S. Pearson, "Strengthening the Biological and Toxin Convention: The Outcome of the Special Conference," *Chemical Weapons Convention Bulletin*, Issue No. 26, December 1994, pp. 1, 3-6; Jonathan B. Tucker, "Strengthening the Biological Weapons Convention," *Arms Control Today*, 25:3, April 1995, pp. 9-12; Michael Moodie, September 1994, op. cit.; Graham S. Pearson, "Improving the Biological Weapons Convention," Proceedings of the First Moscow Conference on Chemical and Biological Disarmament, Demilitarization and Conversion, Chemical and Biological Arms Control Institute, 1993. See also brief papers by Edward Lacey, H. Mash'hadi, and Nikolai Pietkov; Edward J. Lacey, "Tackling the Biological Weapons Threat: The Next Proliferation Challenge," *Washington Quarterly*, 17:4, Autumn 1994, pp. 46-53. Susan Wright, "Prospects for Biological Disarmament in the 1990s," *Transnational Law and Contemporary Problems* 2:2, Fall 1992, pp. 453-492.

the VEREX process:

- Measures to promote compliance: declarations, on-site measures, including short notice and challenge inspections, etc.;
- Other confidence-building and transparency measures;
- Lists of agents and toxins, definitions, criteria;
- "Article 10 issues."

The last, under pressure from Iran and several other participants, refers to increasing technology transfers to developing nation member states.

Problems and Possibilities of Verification

It is crucial to understand the nature of past programs in order to establish a baseline for subsequent credibility and control. The last six years have provided the experience with the former USSR/Russia and Iraq in which partial and limited degrees of inspection have not been sufficient to wholly determine the past or present status of either nation's BW program. Neither nation was willing to disclose the details of their past programs. As one of the UNSCOM inspectors commented regarding Iraq, "They only tell us what we find out about; if there is a chance to hide anything, deceive something, they do so. The biological area was the one most lacking in cooperation, the one that they engaged in with the greatest reluctance." Both nations have been determined to hide their activities, and both were and are controlled societies to a major degree. Access to Russian facilities is still limited.

The verification problem is simply the ability to *find* and then to *distinguish* prohibited from permitted activity, to distinguish offensive from defensive research programs. In BW this is complicated by the fact that the facilities—at least in theory—need not be very large, and the equipment is usually dual-purpose. Nevertheless, all the national facilities identified to date have been sizable.

What would one look for? The director of biological research at a French military laboratory listed the following in 1992 as "indicators of strategic BW development:"

> ". . . large scale production of an agent, the existence of certain storage facilities, the use of certain equipment such as fermenters and freeze drying equipment, and the safety protection being provided personnel."[136]

[136] Government Accounting Office, 1992, op. cit., p. 21.

When U.S. satellite intelligence photo interpreters in the mid-1970s identified tall incinerator stacks, large cold storage facilities, animal pens, sentries and double barbed wire fences in a Soviet military compound in Sverdlovsk, they suspected it of being a BW laboratory—which it was. Both groups of characteristics, however, are at the high end of the indicator spectrum. Of course, the use of fermenters alone would not be indicative; all would depend on what was being grown in them. In addition, more recent technology could reduce the need for large stockpiles that were previously held in readily recognizable storage facilities, depending on the procedures that a nation chose to implement. Raymond Zilinskas wrote the following:

> ". . . verifying that no BW-related work is taking place in a given nation's P-4 (BL-4) research laboratories is probably the single best measure indicating that the nation in question is indeed not involved with BW."[137]

However, it appears that Iraq had no BL-4 facility (i.e., laboratories with enhanced security).

The Russian Foreign Intelligence Service produced a remarkable indicator list in 1993 saying this:

> "The development, production, stockpiling, and possible use of biological weapons may . . . be identified on the basis of the following specific indications:
> - The existence of programs for training troops, special subunits or intelligence and sabotage groups, for operations involving the use of biological weapons;
> - The presence or purposeful search for highly qualified specialists in immunology,
> - biochemistry, bioengineering, and related fields, who have experience in the
> - development of biological weapons and means of protection;
> - The building of laboratories with enhanced security [according to international
> - classification P-3 (BL-3) or P-4 (BL-4)];
> - The development of secret research programs and secret special and military
> - facilities of biomedical orientation;
> - Large-scale production of vaccines (against especially dangerous infections) and the existence of stocks of these vaccines which exceed real peacetime requirements;
> - Creation of a production base, specifically of bioreactors and fermenters with a capacity of more than 50 liters or a total capacity of more than 200 liters;
> -Outbreaks of especially dangerous infectious diseases not typical of specific regions;
> -The purchase of starting biomaterials and equipment for the production of biological weapons, a

[137] Raymond Zilinskas, "Verification of the Biological Weapons Convention," Chapter 7 in Erhard Geissler (ed.), *Biological and Toxin Weapons Today*, SIPRI, Stockholm International Peace Research Institute, Oxford University Press, Oxford, 1986, pp. 85-107.

- Activity related to microorganisms and toxins which cannot be explained by civilian requirements, activity involving agents of especially dangerous infections not endemic to a given area;
- The existence of biotechnological equipment and conduct of work to create vectors of various c culturing them;
- The existence of equipment for microencapsulation of live microorganisms;
- The existence of equipment for studying the behavior of biological aerosols in the
- environment."[138]

Not the least interesting aspect of this list is that it would always have served as an indicator of the former Soviet BW program. But the list is even more "superindicative" than the group of items provided by the French official. It, of course, identifies the maximum of everything in a large and ambitious national program, even including a potential disease outbreak due to a BW installation accident, such as actually took place in the former USSR in 1979.

The former director of USAMRIID, Colonel David Huxsoll, presented a scheme in his 1989 testimony to Congress that attempted to explain the differences between offensive and defensive research, as well as between the development of vaccines and other defenses and biological weapons. *(See Figure 1 on page 72.)*

> "From the outset, defensive research is based on different postulates and hypotheses than is research directed toward offensive ends, and the rationales for data collection and analysis are different.
>
> "At the basic research level, the laboratory techniques used would be very similar, but the objectives are markedly different. Beyond the basic research level, there is a marked divergence in the type of work that would be done.
>
> "If a vaccine were to be produced, one that would pursue ways of crippling, weaken, or lessening the virulence of the agent in question so that it could be used in humans without fear of inducing disease[; i]n fact, it may be completely inactivated, a killed vaccine.
>
> "A vaccine would be produced under the stringent guidelines of the Food and Drug Administration regulations and would have to receive FDA approval before use. This type of work is permitted by the Biological Weapons Convention."
>
> "If, however, the goal were to create a weapon, the opposite objectives would be pursued. Efforts to enhance virulence or toxicity and to produce enormous quantities of agent far larger than those required for vaccine production would be undertaken. In addition, the issues of stability, dissemination, and weapons

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[138] "Proliferation Issues: A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction," Russian Federation Foreign Intelligence Service Report, March 3, 1993, JPRS-TND-93-007, pp. 15-16.

delivery systems would have to be addressed. These activities are clearly prohibited by the Biological Weapons Convention."[139]

[139] *Global Spread of Chemical and Biological Weapons Hearings*, Committee on Governmental Affairs, U.S. Senate, 101st Congress, 1st Session, May 1989; testimony of Dr. David Huxsoll, pp. 199 to 203.
In questioning by the Senate committee staff, Dr. Huxsoll appeared, however, also to rely on the presence of BL-4 facilities and "program intent" as two key discriminanda. "Intent" is, of course, inferred by an outside observer, and that key concept will be returned to below in a discussion on differentiating research programs.

Senate, 101st Congress, 1st Session, May 1989; testimony of Dr. David Huxsoll, pp.199 to 203. In questioning by the Senate Committee staff, Dr. Huxsoll appeared, however, also to rely on the presence of BL-4 facilities and "program intent" as two key discriminada. "Intent" is , of course, inferred by an outside observer, and that key concept will be returned to below in a discussion on differentiating research programs.

His argument was seconded by a U.S. Army Medical Intelligence officer who similarly identified four key factors: the *amount* of agent produced, the *attenuation* of the organisms used for vaccine production, *process difference* between vaccine and weapons production, and the *openness* of a defensive program.[141]

This analysis was carried further in a set of tables *(see next three pages)* prepared by the Armed Forces Medical Intelligence Center in 1993 entitled "Signatures for Biological Warfare Facilities."[142] It divided indicators into five categories:

(1) Funding and personnel
(2) Facility design, equipment, and security
(3) Technical considerations
(4) Safety
(5) Process flow

Under each of these categories, it listed a series of common—or quite dissimilar—characteristics in a "BW facility" and in a "legitimate facility" (e.g., the location of refrigerated bunkers, facility security, the nature of waste treatment, location of air filters, air pressure gradients, etc.) Forty such characteristics were evaluated and appeared to provide quite a good differentiation between the BW facility and the presumptive pharmaceutical or other commercial site.

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[141] Ibid., Dr. Barry Erlick, pp. 33-40.

[142] Signatures for Biological Warfare Facilities, Armed Forces Medical Intelligence Center, 11 pages, (unclassified).

SIGNATURES FOR BIOLOGICAL WARFARE FACILITIES

(Armed Forces Medical Intelligence Center)

I. FUNDING AND PERSONNEL

	BW FACILITY	LEGITIMATE FACILITY
1	Military funding	Private enterprise or nonmilitary
2	High salary	Salary within normal limits
3	Funding exceeds product/research output	Average or underfunded for expected output
4	Scientists/technician ratio high	Average ratio
5	Limited ethnic diversity	Integrated work staff
6	Elite workforce/foreign trained	Local trained workforce
7	Foreign language competency	Limited foreign language capability
8	High ratio of military to civilian	Military personnel unlikely

II. FACILITIES, SECURITY, AND EQUIPMENT

	BW FACILITY	LEGITIMATE FACILITY
1	Access control: high walls, guard towers, motion detectors, video cameras, elite security force, badges and clearances	Average security, badges at most
2	Transportation provided	Public/private transport
3	Quarantine facilities on compound	No quarantine
4	Foreign travel restricted, highly available	Unrestricted but not readily available
5	Refrigerated bunkers secure area	Cold rooms in facility
6	Advanced software, external database access ADP security high foreign access	Open information except for proprietary information
7	Static aerosol test chambers	No aerosol test chambers
8	Military with weapons expertise	No need
9	Rail or heavy truck required for weapons filling facility	Only light truck transportation

III. TECHNICAL CONSIDERATIONS

	BW FACILITY	LEGITIMATE FACILITY
1	Pathogenic or toxic strains	Non-pathogenic or non-toxic strains
2	Test aimed at killing animals	Test aimed at protecting animals
3	Facilities for large animals such as monkeys	Facilities for smaller animals, specific inbred strains
4	Negative air flow	Positive air flow
5	No commercial products	Commercial products
6	Weapons filing equipment	Bottle filling equipment

IV. SAFETY

	BW FACILITY	LEGITIMATE FACILITY
1	Physical barriers to prevent animal-to-animal and animal-to-human transmission	Physical barriers designed to prevent animal-to-animal and human-to-animal transmission
2	HEPA filters present, exhaust	HEPA filters possible, intake
3	Dedicated biosafety personnel	May or may not be present
4	Infectious and toxic agent trained medical staff	Dedicated highly trained staff not likely
5	Decontamination equipment and showers	Not needed on large scale
6	Large capacity pass through autoclaves	Small bench top autoclaves
7	Dedicated waste treatment	Waste treatment common with local facilities
8	Special sterilization of waste	May or may not exist
9	Test animals sterilized before final disposal	Animals may not need to be sterilized before final disposal

V. PROCESS FLOW

	BW FACILITY	LEGITIMATE FACILITY
1	Raw material consumption doesn't equal output	Raw material consumption relates to output
2	Large volume fermenters (greater than 500 liters) cell cultures (1000s of culture flasks/ rollerbottles) embryonated eggs (100s thousands)	Large or small scale fermentation but cell culture and eggs in smaller volume
3	Air pressure gradients keep microbes in vessel	Air pressure gradients keep contaminants out of vessels
4	Finished product—wet stored at low temperature in sealed (often double packaging) containers—not readily identifiable	Labelled by product, batch number, date, etc.
5	Milling equipment operated in biohazard protective suits	Milling equipment is not operated in biohazard areas
6	Storage—low temperature, high security, bunkers with biocontainment	Storage in temperature controlled environment, clean warehouse conditions
7	Munitions—special filling buildings and/or explosives handling facilities	Non-issue

To address the problems of verification, one must examine and learn from the post-World War II BW inspection regimes or trial inspection exercises. There have been several, and cumulatively, they do provide extremely useful information.

Under the terms of the Brussels Treaty and Paris agreements that established the Western European Union (WEU) in 1954, a WEU Armaments Control Agency (ACA) was established. The terms of the Treaty were to remain in effect at least until the year 2005, and under them the Federal Republic of Germany (FRG) agreed never to manufacture chemical,

biological, or nuclear weapons. The ACA was to monitor the FRG's compliance via non-production controls. It was to do that by examining "statistical and budgetary information," and by "test checks, visits and inspections at production plants, depots, and forces."[143] In 1959 a list of biological products (agents) to be controlled was approved. Although chemical production sites were visited in subsequent years, formally biological ones were not, ". . . due to the absence of any legal guarantees to protect private interests," that is, the problem of commercial secrecy. However "technical information visits" were made to biological facilities in the FRG and in other WEU countries. In addition, an economic accounting procedure was established. A group of WEU military and biological experts met in 1959; for each of the BW agents on the control list they established a "threshold" amount, corresponding to the amount reckoned to be needed in order to obtain "direct military effect" over an area of one square kilometer. The WEU/ACA then asked the FRG to provide the following information each year:

(1) The names of West German production plants[144] capable of producing pathogenic organisms or toxins.

(2) The biological products on the Agency's list that were produced within the FRG during the previous

(3) The names of the plants which produced or processed these products.

(4) The names of plants which could have produced them but did not.

(5) The quantities produced by each plant, and the quantities consumed for civilian purposes.

(6) The quantities of civilian end-items made from these products during the previous year, together with production estimates for the next year.

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[143] "The CB Weapons Controls of the Western European Union Armaments Control Agency," Appendix 3 in *The Prevention of CBW, Vol. 5* in *The Problem of Chemical and Biological Warfare,* SIPRI, Stockholm International Peace Research Institute, Almquist and Wiksell and Humanities Press, 1971.

[144] The ACA defined "production plants" as "every unit suitable for producing in such amounts as are covered by the definition of a biological weapon (i.e., the threshold amounts that were established for each BW agent) those biological products which are to be controlled, regardless of its ownership, legal position, size and number of workers employed." The thresholds, however, were established in an extremely inadequate manner.

(7) The quantities of the products in stock at each plant.

The information was supplied by the FRG each year.

The first "east-west" BW trial inspection exercise was carried out in the mid-1960s by the Pugwash BW study group. It visited four laboratories in Stockholm, Vienna, Prague, and Copenhagen. This was greatly expanded upon in 1968-1969 in a trial inspection exercise carried out by the Stockholm International Peace Research Institute (SIPRI), as part of its major study on chemical and biological weapons arms control.[145] Twenty-two laboratories or production facilities were approached, of which 14 accepted site visits: eight research laboratories, three of them in Warsaw Treaty Organization (WTO) countries; and six production establishments, none in the WTO, but one of them in Eastern Europe (the former Yugoslavia). The 22 facilities solicited were not, however, selected at random, but depended on personal contacts known to the research team. Twenty-five scientists from Western, Eastern, and neutral states were involved in the teams that made the inspection visits. A reasonably elaborate protocol and questionnaire were developed for the site visits, whose purpose was defined as locating sufficient BW agent production to be deemed to be "militarily relevant." That was defined as 10 kilograms (around 20-25 pounds) of microbial paste or spores, of a half kg (one pound) of botulinum toxin. It should be noted that, at the present time, an inspection team would be looking for orders of magnitude of larger

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[145] "The Problems of Inspection Concerned with BW Agents," Chapter 2, in *Technical Aspects of Early Warning and Verification,* Vol. 6 in *The Problem of Chemical and Biological Warfare,* SIPRI, Stockholm International Peace Research Institute, Almquist and Wiksell and Humanities Press, 1975, pp. 39-60, 89-103.

See also Appendix 2, "Verification of CB Disarmament," in *Vol. 5, The Prevention of CBW,* op. cit., 1971, pp. 137-163. The institutions or laboratories that accepted visits in this exercise were the following:

Research laboratories:

(1) The Medical Research Council Group for Bacteriological Bioengineering, Stockholm.
(2) The Institute of Microbiology of the Czechoslovak Academy of Sciences, Prague.
(3) The Institute of Virology for the Czechoslovak Academy of Sciences, Bratislava.
(4) Bundesforschungsanstalt fur Viruskrankheiten der Tiere, Tubingen, West Germany.
(5) The Lister Institute of Preventative Medicine, London.
(6) The State Institute of Hygiene, Warsaw.
(7) The University Institute of Microbiology, Copenhagen.
(8) The Institute of Hygiene, Graz, Austria.

Production establishments:

(9) The Institute of Immunology, Zagreb, Yugoslavia.
(10) The Lister Institute of Preventative Medicine, Elstree Laboratories, Elstree, England.
(11) Wellcome Research Laboratories, Beckenham, Kent, England.
(12) Institut Merieux, Lyon, France.
(13) LEO Pharmaceutical Products, Copenhagen.
(14) Aktiebolaget ASTRA, Sodertalje, Sweden.

quantities. It is also understood that the 14 facilities that participated in the exercise did so with the knowledge of their relevant national authorities. The visits, however, were *not* on short warning.

Following all the visits, the protocol records were distributed to some 70 professionals who were asked to judge what the chances would have been of finding the defined, militarily relevant quantity. Fifty replied, with a consensus that there would have been about a 50:50 chance of doing so. The study concluded this:

> ". . . that a substantial measure of on-site verification would be possible provided certain conditions were fulfilled: documentation, free access to all facilities and personnel, the possibility of visits at short notice or of permanent inspection by resident inspectors or by exchange scientists cooperating with them."

A crucial assumption was that there was no falsification of production records at the production sites—perhaps a weak link in the exercise. Otherwise, it is interesting to note the similarity in the three basic conditions outlined in the conclusion and the ones that would be assumed as necessary today.

In the 1990s two circumstances gave rise to a substantial group of BW inspections—some as national exercises, and some on an international and official level:

- The U.S.-Russia-UK "Trilateral" process led to U.S.-UK inspection visits to Russian facilities, and to Russian inspections of facilities in the United States and UK;
- And as part of the VEREX process, three Western governments—the UK, the Netherlands, and Canada—ran trial inspections of commercial facilities in their respective countries.

There had, in fact, been Soviet visits to U.S. military BW sites in previous years. Soviet government officials at the ministerial level had visited Fort Detrick in 1972 at U.S. government invitation, since the United States was interested in demonstrating the conversion of the site. Former Soviet officials again visited Fort Detrick—now USAMRIID—in 1988. U.S. and Soviet delegations also visited each other's BW facilities in 1991, before the trilateral series of exchange site visits began. In addition, representatives of Western pharmaceutical firms—from the United States, UK, Austria, France, and Finland, as well as from Japan, Taiwan, and South Korea—have been visiting Russian microbiological research institutes that were formerly affiliated with the Soviet Biopreparat organization to explore the feasibility of establishing joint venture commercial partnerships. When Russian teams have visited U.S. facilities, they have shown themselves to be highly

meticulous inspectors: they have known what to look for, what might be hidden, and how it would be hidden, and at times they have clearly used their own former BW program as a model for searches.[146]

In the course of the VEREX process, the Netherlands and Canada carried out a two-day trial inspection at a large vaccine production facility. Its purpose was to evaluate potential BW verification measures that had been identified by VEREX. It concluded that "the combining of measures would be essential to effective on-site inspection. During the trial inspection, issues relating to commercial confidentiality did not stand in the way of effective conduct of the inspection. Some sensitivities were noted, but solutions were at hand."[147] In particular, "Removal of live samples from the site would have been of great concern to the company, but removal of inactivated samples was not perceived to be a problem."

In conjunction with VEREX, the UK carried out four practice inspections of plants in the biotechnology, pharmaceutical, and vaccine industries. The UK inspections were particularly focused on issues of the compatibility of verification procedures in large multipurpose facilities capable of working with pathogens and the requirements of commercial confidentiality. The UK reports concluded this:

> "In-depth inspections are practicable: auditing, interviews and visual inspection of key equipment are all essential and mutually reinforcing. Any measure on its own is of little or no value.
> "Provided the sites being inspected make preparations and use managed access, the risks to commercially sensitive information can be reduced. On many occasions the amount of access that can be granted without unduly risking proprietary data can be extensive.
> "The standards of evidence for an effective inspection are high. This is a qualitative problem as unambiguous evidence of non-compliance is difficult to acquire, but indicators of such activity can be identified. Given the potential dual-use nature of biological agents and much related equipment, inspection teams need evidence from all aspects of the site under investigation if they are to form a judgment on its compliance. The main burden on industry is largely one of diversion of management time to hosting the inspection; there should be no need to disrupt plant operations or enter sterile area provided alternative means can be found to satisfy inspector

[146] A Soviet team on a December 1991 U.S. site visit was composed of members of the Soviet Ministry of Defense, Ministry of Foreign Affairs, and their biotechnology industry.

[147] The Netherlands-Canada; Bilateral Trial Inspection in a Large Vaccine Production Facility; A Contribution to the Evaluation of Potential Verification Measures, BWC/CONF. III/VEREX/WP. 112, May 24, 1993, 19 pages.

concerns."

* * * *

> "The IT [inspection team] was able to gather sufficient information to do its job effectively without compromising commercial confidentiality or Intellectual Property rights. It was possible for the HT [Facility or "Home" Team] to protect such information: for example, the deletion of critical data from the facility's Genetic Manipulation Safety Committee submissions to the national regulatory body before revealing the documents to the inspection team. There may however be different problems in a production plant and this will be addressed in future practice inspections, but it is encouraging to note that it is possible to conduct an intrusive inspection at an R&D and pilot plant facility without unacceptable compromise of commercial confidentiality. That an inspection can be carried out at an R&D plant is in itself highly significant.
>
> "This practice inspection demonstrated the feasibility of on-site inspections. Furthermore, it is clear that they are worthwhile and can be conducted in Western countries without too much disruption to activities. Given the nature of health, safety, environmental, and other regulatory provisions that govern the pharmaceutical and biotechnology industries in the West, demonstrating compliance with Article 1 of the BWC is comparatively straightforward."[148]

Finally, the Federation of American Scientists carried out an inspection exercise in the United States with the cooperation of a commercial pharmaceutical plant.[149] Undoubtedly of great value to any international BW inspection agency or regime would be the verification protocols established by UNSCOM for its site visits to biological facilities in Iraq. These, and the experience gained from them, as well as from the series of trilateral site visits, would all undoubtedly be transferred to any new international BW agency.[150] The British, Canadian, Dutch, and U.S. inspection exercises were all

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[148] United Kingdom BTWC Practice Compliance Inspection (PCI) Programme, Summary Report, BWC/SP/CONF/WP. 2, September 20, 1994; UK Practice Inspection: Pharmaceutical Pilot Plant, BWC/CONF. III/VEREX/WP 141, May 24, 1993; UK Practice Inspection: Pharmaceutical Pilot Plant, BWC/CONF. III/VEREX/WP 147, (undated); Commercial Confidentiality Concerns Associated with Sampling and Analysis During On-Site Inspections Under the BWC, BWC/CONF. III/VEREX/NON. 28, (undated).

[149] *Beyond VEREX: A Legally Binding Compliance Regime for the Biological Weapons Convention,* Report of the Federation of American Scientists Working Group on Biological and Toxin Weapons Verification, July 1994. See also, " Implementation of the Proposals for a Verification Protocol to the Biological Weapons Convention," (FAS), September 1991, op. cit., for the protocol of off-site and on-site data which the group proposed.

[150] For other major sources on BW verification, see the following: Barbara Hatch Rosenberg and Gordon

informally criticized by representatives of the U.S. Biotechnology Industry Organization as having been too "tame" and captive, and not as severe as they would have had to face from international inspectors. They submitted a study to the U.S. Arms Control and Disarmament Agency before the July 1995 meeting of the Ad Hoc Group, essentially arguing that they wanted *no* on-site inspections of their facilities. Difficulties therefore remain in reconciling the thoroughness of on-site inspections and the concerns of pharmaceutical manufacturers to safeguard commercial proprietary information. It remains to be seen how difficult it will be to reconcile the two goals. A resolution may be arrived at indirectly, through the criteria that an inspection directorate would use to select and authorize on-site inspections.

One important question remains: Can one distinguish microbiological *research* that is being carried out for "civil" purposes from that which is for military purposes? In research carried out some years ago, this author became confident that if one could not unequivocally answer "yes," there were reasonably good indicators which could be gathered from scientific work to help make the distinction.[151] However, that task was made immeasurably more difficult once U.S. BW R&D managers made the argument that in order to anticipate the nature of future BW threats that U.S. military forces might encounter, they had to produce novel surface antigens on pathogens, test organisms with increased virulence, or any of the many other parameters that an offensive BW program might develop against U.S. vaccines and defenses. This problem was described in a paper by Barbara Hatch Rosenberg in 1988,

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Burck, "Verification of Compliance with the Biological Weapons Convention," Chapter 14 in Susan Wright, (ed.), *Preventing a Biological Arms Race,* MIT Press, Cambridge, 1990, pp. 300-329; Oliver Thranert, (ed.), *The Verification of the Biological Weapons Convention: Problems and Perspectives,* Fri edrich Ebert Stiftung, Bonn, May 1992; Susan Berger, "The Challenges of Chemical and Biological Weapons Arms Control Treaty Verification," in Elizabeth Kirk, *et. al.* (eds.), *Trends and Implications for Arms Control, Proliferation, and International Security in the Changing Global Environment,* AAAS, American Association for the Advancement of Science, Washington, D.C., 1993, pp. 175-189; Amb. Tibor Toth, *et. al*., "Verification of the BWC," and Nicholas A. Sims, "Control and Cooperation in Biological Defense Research: National Programmes and International Accountability," Chapters 6 and 7 in E. Geissler and J.P. Woodall (eds.), *The Control of Dual-Threat Agents: The Vaccines for Peace Programme,* SIPRI, The Stockholm International Peace Research Institute, Oxford University Press, Oxford, 1995, pp. 77-105; M. Meselson, *et. al.*, "Verification of Biological and Toxin Weapons Disarmament," in *Verification, Monitoring Disarmament,* F. Caloger, *et. al.*, (eds.), Westview Press, Boulder, 1990, pp. 149-163.

[151] I have attempted to resolve this question on two earlier occasions: in a study "Research and Development in (C)BW; An Examination of the Possibility of Distinguishing Between Civil and Military, Offensive and Defensive," that was written in 1970 as part of the SIPRI CBW project and presented at the International Congress of Microbiology in Mexico City in 1970, and then in an expanded version for a book manuscript on *Military Research and Development* for the Ministry of Foreign Affairs of Sweden, in 1983-1984.

> "Military insistence upon testing detection and protective devices against bona fide weapons agents means that information on offensive use of weapons agents will inevitably be obtained.
> "According to the U.S. Department of Defense (DoD): 'Current requirements in biological defense include testing equipment against known and suspected threat agents. . . . We especially need more information about protection against novel agents.' Because these agents do not exist, they will have to be created in order to study the threat they could pose. Threat evaluation also requires detailed information on 'new production and processing technologies as they apply to conventional and novel biological agents.'"The military is also interested in protective vaccines, which are useful not only as defense against an enemy attack, but are also required to protect aggressors. Such vaccines cannot be developed without possessing the agents themselves. Thus, defense without the potential for offense is essentially impossible, and all these 'defensive' activities are actually inconsistent with the convention's aim to exclude the possible use of biological and toxin agents as weapons."[152]

The same counterproductive effects of maximizing the requirements of "defensive" research were pointed out by several other microbiologists writing on BW arms control, and they are a major theme of the book edited by Susan Wright in 1990, *Preventing a Biological Arms Race*.[153] Once one takes this position as a requirement for *defensive* research (omitting the issue of protective vaccines being required for the attacker), there is virtually nothing that cannot be done in a defensive research program. Everything then hinges on *quantities*, *weapons development*, and "*intent.*"

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[152] Barbara Hatch Rosenberg, "International Biological Weapons Update," *Genewatch*, July-October 1987, pp. 6-7, 15. (The DoD references are to U.S. Department of Defense testimony to the House Committee on Appropriations, May 1986.)

[153] Susan Wright (ed.), *Preventing a Biological Arms Race*, The MIT Press, Cambridge, 1990. See in particular the following chapters: Susan Wright and Stuart Ketcham, "The Problem of Interpreting the U.S. Biological Defense Program," pp. 169-196; Charles Piller and Keith R. Yamamoto, "The U.S. Biological Defense Research Program in the 1980s: A Critique," pp. 133-168; Jonathan King and Harlee Strauss, "The Hazards of Defensive Biological Warfare Programs," pp. 120-132; Richard Novick and Seth Shulman, "New Forms of Biological Warfare?", pp. 103-119; "Recombinant DNA Projects Funded by U.S. Military Agencies," Appendix L, pp. 413-420. Also, pp. 80-84, 87-97, 335-337, 340-351. See also, Jonathan King and Harlee Strauss, "The Fallacy of Defensive Biological Weapons Programmes," in *Biological and Toxin Weapons Today*, Erhard Geissler (ed.), SIPRI, Stockholm International Peace Research Institute and Oxford University Press, 1986, pp. 66-81; Susan Wright, "Biowar Treaty in Danger," *Bulletin of the Atomic Scientists*, 47:7, September 1991, pp. 36-40.

An excellent example of this was demonstrated by the U.S. Army request in 1984 to build a large aerosol test chamber at the Dugway Proving Ground ". . . to generate amounts of infectious agents that could potentially be used as biological weapons. The chief purpose of the facility would be to test whether the agents penetrate protective clothing and filters."[154] After several years of debate, the Army cancelled its request in 1988 due to opposition precisely on the grounds that the facility would blur the distinction between defensive and offensive research. The U.S. government had inactivated precisely such a large aerosol test chamber when it dismantled the offensive BW R&D program at Fort Detrick in the years 1969 to 1972. Even more to the point, when U.S. inspectors found precisely the same kind of aerosol test chamber at the former Soviet Biopreparat facility at Obolensk in 1992-1993, the presence of the test chamber was given as evidence of the *offensive* nature of the former Soviet BW program. The same was true of the Iraqi BW program when UNSCOM inspectors found that another aerosol test chamber had been a part of the Iraqi facility at Al-Hakam, but had been destroyed by Iraq before the inspectors got there.

When Soviet BW inspectors visited USAMRIID in 1991, officials there felt confident that precisely because of the expertise of the Soviet team they would understand how far the USAMRIID program was from one that intended weapons development. Nevertheless, the visitors found portions of the U.S. research program troubling; in this case, what looked like an entirely open program to U.S. research managers still posed problems for an outsider. One such aspect was USAMRIID research on toxins, precisely a portion of the former Soviet basic research program that was frequently raised as a problematical issue in the 1980s. It is problems such as these dealing with "intent" that suggest that looking for production and weaponry might be more useful for an international BW inspection regime than examining research. And it is here, too, that formal aspects—such as secrecy, the occurrence of covert BW programs run by military or intelligence agencies, and the role of military agencies in funding and operating BW research programs and institutions—are shown to be highly important considerations.

Nevertheless, researchers have been able to prepare lists of indicators which quite usefully separate "civilian" from "military," and "offensive" from "defensive" microbiological research. As early as 1963, Morton prepared such a categorization which distinguished various aerobiological techniques according to their utility for "medicine,"

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[154] Colin Norman, "Army Shifts on Dugway Lab," *Science*, 241:4874, September 30, 1988, p. 1749; Colin Norman, "Biological Defense Defended," *Science*, 240:4855, May 20, 1988, p. 981; R. Jeffrey Smith, "Under Pressure, Army Scales Back Plan for Germ Warfare Lab," *Washington Post*, September 20, 1988.

"defense," and "theory."[155] More recently, several additional lists were included in the 1990 volume edited by Wright.[156]

[155] J.D. Morton, table on "Relationship of Aerobiological Techniques to Useful Situations," in "Remarks from the Chair: A Critique," *First International Symposium in Aerobiology*, Berkeley, 1963, p. 186.

[156] Tables that differentiate BW R&D into military and civil, offensive, and defensive programs: M. Lappe, "Criteria for judging the likelihood of misuse of potential biological warfare research," in Susan Wright, (ed.), *Preventing a Biological Arms Race*, p. 88; Susan Wright and Stuart Ketcham, "Pathogens studied under DoD sponsorship as potential biological warfare agents compared with pathogens identified by the Institute of Medicine as the leading cause of disease in developing countries," in Susan Wright, (ed.), 1990, pp. 178-179; C. Piller and K.R. Yamamoto, "U.S. BW program development—offensive development implications," (during the 1980s) in Susan Wright, (ed.), 1990, p. 143; Susan Wright and Stuart Ketcham, "Present activities conducted under the Biological Defense Program and related activities conducted under the Chemical Warfare Program," in Susan Wright, (ed.), 1990, p. 189. See also, Barend ter Haar, *The Future of Biological Weapons*, The Washington Papers, No. 151, Center for Strategic and International Studies, Washington and Praeger, New York, 1991, particularly pp. 54-75, and the table "Activities permitted or prohibited in the Biological Weapons Convention," p. 63; USAMRIID; United States Army Research Institute of Infectious Diseases, 1995; FOA 4; In the Service of the Swedish Total Defense and of the Entire Community, 1986.

Concluding Remarks

Unfortunately, biological weapons were not laid to rest in the years since 1972. Several nations have gone on to develop the capability to produce BW at short notice and have done so precisely in the years since the Biological Weapons Convention came into force in 1975.

The former USSR's—and presently Russia's—continuing delinquency in putting a certain and definitive end to its own BW program has been a severe impediment to international efforts to stop and to reverse any further trends toward BW proliferation. First, Russia inherited one of the two major post-World War II offensive BW programs—and one which the former USSR had continued despite signing and ratifying the BWC—that established an extremely damaging precedent. Moreover, the continued resistance to making a determined show of reparations by doing away with the remainders of the program once and for all only add further damage to the BWC. It is important that Russia remove whatever secrecy remains surrounding its BW establishments, both military and civilian. Second, Russia's delinquency weakens the combined efforts of the major powers in applying pressure on those nations that have more recently developed BW programs to begin reversing and expunging them.

Nations that have developed BW programs in recent years, such as Iran and Libya, are not particularly open to persuasion. The major institutional indicators—secrecy and the role of military or intelligence agencies in funding and managing BW programs—are constant indicators of problems, and most certainly when all three occur together. Much more thought should be given to the pressure of sanctions by the international community. Following the additional example of Iraq, a state that had gone on to develop BW despite having signed (although not ratified) the BWC, much more thought needs to be given particularly to the circumstances in which a State Party to the BWC shows evidence of developing and producing biological weapons, and the sanctions that should be applied in such instances. The suggestion has also been made that there should be prior international agreement to automatically impose severe sanctions on any nation identified as having used biological weapons.[157] It has been pointed out that the lack of any serious international response to Iraq's use of chemical weapons in 1984 against Iran was the stimulus for Iran's development and production of chemical weapons, as well as for its biological weapons program.

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[157] Mark L. Wheelis, "Strengthening Biological Weapons Control Through Global Epidemiological Surveillance," *Politics and the Life Sciences*, 11:2, August 1992, pp. 179-189.

It had been hoped that 1996 would see the proposal of an international verification regime as a protocol to the BWC. It would require an international monitoring organization, probably similar to that which has been established under the Chemical Weapons Convention. It was considered likely that such a regime would provide for the opportunity for both routine and challenge on-site inspections to facilities or locations in member states. That will now be delayed further.

Domestically, the U.S. government runs the risk of having impeded its current efforts to defeat the spread of biological weapons of mass destruction by exaggerated concerns several years ago regarding corporate commercial secrecy. Trial inspections carried out by several Western nations in recent years as a contribution toward producing a strengthened verification regime for the BWC showed that this was a manageable concern. It will be important for the U.S. government to maintain its focus on stemming BW proliferation as its first and overwhelming priority. Other considerations that relate to that effort can be adapted to aid in that endeavor.

In that regard, Senate ratification of the Chemical Weapons Convention would be a crucially important step, establishing the U.S. interest in a serious verification regime in the chemical and biological areas. Getting the CWC out of the Senate Foreign Relations Committee to the floor of the Senate for a vote took two years. This required ending the ability of a single U.S. senator to prevent a major arms control treaty on one of the three categories of weapons of mass destruction—a treaty that the Bush administration had championed, that the United States signed, and that took over 20 years of international negotiation to achieve—from being sent to the U.S. Senate for ratification. It now appears that opposition by an almost equally small number of countries in the international arena will delay the achievement of a verification regime for the BWC for an additional two or more years.

Author's Note:

A second edition published in December 1997 afforded the opportunity to add three brief comments regarding important events in 1997 pertaining to Biological Weapons Arms Control.

1. In regard to the final paragraph above, the Chemical Weapons Convention was approved by the US Senate on April 24, 1997. However, this success required extraordinary exertions by the administration, and the outcome was in doubt until the

final day or two prior to the Senate vote. Given that experience, should a verification protocol to the BWTC reach the Senate with a continuing Republican majority, it is likely that its passage would be severely contested.

2. In 1997 the Ad-Hoc Group of nations that are parties to the BWTC turned to preparing a rolling text for the verification protocol. It is hoped that this might be completed in 1998. However, with continuous impediments being placed in its way by Iran, and increasingly also by Russia, it is impossible to say if this process will succeed. It is *not* likely that on-site inspection provisions will be at all comparable to those in the Chemical Weapons Convention.

3. Iraq continued in material breach of its obligations under United Nations Security Council Resolutions, and increasingly impeded and interfered with UNSCOM operations in the spring, summer, and fall of 1997. By November 1997 Iraq had forgone approximately $130 billion in oil export earnings since 1991 in order to retain portions of its biological, chemical and ballistic missile programs. After Security Council debates in June and October 1997, Iraq demanded the alteration of UNSCOM procedures, which led to a crisis in November 1997. However, France, Russia, and China refused to agree to Security Council measures to increase pressure on Iraq to comply. In those circumstances Iraq is able to maintain its violation, and to maintain portions of its weapons of mass destruction programs, most particularly its BW programs. Affairs deteriorated to the point that the integrity and credibility of the UN Security Council and its measures were at stake.

About the Author

Milton Leitenberg is a senior fellow at the Center for International and Security Studies at the University of Maryland. Trained in the sciences, after six years as an academic he was the first American recruited to work at the Stockholm International Peace Research Institute (SIPRI) in 1968. Following that, he worked at the Swedish Institute of International Affairs, and at the Peace Studies Program at Cornell University.

In the years since 1966, Leitenberg has authored or edited six books and has written over 100 papers, monographs, and book chapters. These cover a wide range of topics in the traditional subjects of arms control—such as nuclear, biological, chemical and conventional weapons, military expenditure, arms transfer, the defense industry, and weapons research and development—as well as the subjects of actual wars and conflicts, and foreign military intervention since the end of World War II. His first papers on biological weapons were published in 1967, and he was a member of the team that produced the set of six volumes on *The Problem of Chemical and Biological Warfare* at SIPRI between 1969 and 1973.

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Other Publications

- Ivo H. Daalder, *Cooperative Arms Control: A New Agenda for the Post-Cold War Era*, CISSM Paper No. 1 (College Park, MD: CISSM, October 1992).
- John Hawes, *Arms Control: A New Style for a New Agenda*, CISSM Paper No. 2 (College Park, MD: CISSM, January 1993).
- Ivo H. Daalder and Terry Terriff, eds., *Rethinking the Unthinkable: New Directions for Nuclear Arms Control* (London: Frank Cass & Co., 1993).

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