

James Martin Center for Nonproliferation Studies (CNS)

<http://nonproliferation.org>

Chemical and Biological Weapons: Possession and Programs Past and Present

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This chart summarizes data available from open sources. Precise assessment of a state's capabilities is difficult because most weapons of mass destruction (WMD) programs were, and/or are, secret and cannot be independently assessed. States have been placed in the following categories:

- **Known**- where states have either declared their programs or there is clear evidence of chemical or biological weapons possession.
- **Probable**- where states have been publicly named by government or military officials as "probable" chemical or biological weapons possessors or as producing chemical or biological weapons.
- **Possible**- where states have been widely identified as possibly having chemical or biological weapons or a CBW program by sources other than government officials.
- **Former**- where states have acknowledged having a chemical or biological weapons stockpile and/or CBW program in the past.
- **Weaponized Agents**- where agents are produced in quantity, and/or filled into munitions in a specialized formulation with enhanced shelflife or dissemination properties. The chart distinguishes between past and current activities.
- **Research**- possible agents studied; no evidence of weaponization.

~ Only when countries are known to have weaponized agents is a distinction made between weapons and non-weapons research. In all other cases, the agents are classified as "possible" agents because not enough information is available to determine whether or not weaponization has occurred.

| Country | Chemical | | | | Biological | | | |
|----------------|-------------------|---------------------------------------|---------------|-----------------|---|--|---------------|-----------------|
| | Program Status | Possible Agents | Signed CWC[1] | Ratified CWC[1] | Program Status | Possible Agents | Signed BWC[2] | Ratified BWC[2] |
| Algeria | Possible[3] | Unknown | 01/13/93 | 08/14/95 | Research effort, but no evidence of production[4] | Unknown | - | 07/22/2001* |
| Canada | Former program[5] | -mustard -phosgene -lewisite[6] | 01/13/93 | 09/26/95 | Former program Started: 1941 Ended: 1945[7] | Past Weaponized Agents -anthrax Research -brucellosis -rocky mountain spotted fever -plague | 04/10/72 | 09/18/72 |

| | | | | | | | | |
|-----------------|--------------------|--|----------|----------|--|--|----------|------------|
| | | | | | | -tularemia -typhoid -yellow fever -dysentery -rinderpest -botulinum toxin -ricin[8] | | |
| China | Probable[9] | Unknown | 01/13/93 | 04/25/97 | Likely maintains an offensive capability[10] | Unknown | - | 11/15/84* |
| Cuba | Possible[11] | Unknown | 01/13/93 | 04/29/97 | Probable research program[87] | Unknown | 04/10/72 | 04/21/76 |
| Egypt | Probable[12] | -mustard -phosgene -sarin -VX[13] | No | No | Likely maintains an offensive program[14] | Unknown[15] | 10/04/72 | No |
| Ethiopia | Probable[16] | Unknown | 01/14/93 | 05/13/96 | - | - | 04/10/72 | 05/26/75 |
| France | Former program[17] | -mustard -phosgene[18] | 01/13/93 | 03/02/95 | Former program Started: 1921 Ended: 1940 (dormant 1927-1934) 1940-1945 (German occupation)[19] | Past Weaponized Agents -potato beetle Research -anthrax -salmonella -cholera -rinderpest -botulinum toxin -ricin[20] | - | 09/27/84* |
| Germany | Former program[21] | -phosgene -hydrogen cyanide -mustard -tabun -sarin -soman[22] | 01/13/93 | 08/12/94 | Former program Started: 1915 Ended: 1945 (dormant 1919-1939)[23] | Past Weaponized Agents -glanders (WW 1) -anthrax (WW I) Research -foot and mouth disease -plague -rinderpest -typhus -yellow fever -potato beetle -potato blight [24] | 04/10/72 | 11/28/72 |
| India | Former program[25] | Unknown | 01/14/93 | 09/03/96 | Research program, but no evidence of production[26] | Unknown | 01/15/73 | 07/15/74 |
| Iran | Known[27] | -mustard -sarin -hydrogen cyanide -cyanogen chloride -phosgene[28] | 01/13/93 | 11/03/97 | Likely maintains an offensive program[29] | -anthrax -foot and mouth disease -botulinum toxin -mycotoxins[30] | 04/10/72 | 08/22/73 |
| Iraq | Former program | -mustard -sarin | No | No | Former program[33] | Past Weaponized Agents | 05/11/72 | 06/19/91** |

| | | | | | | | | |
|------------------------|-----------------------|--|----------------------|------------------------|--|---|----------------------|------------------------|
| | [31] | -tabun -VX -Agent 15[32] | | | | -anthrax -botulinum toxin -ricin -aflatoxin -wheat cover smut Research -brucellosis -hemorrhagic conjunctivitis virus (Enterovirus 70) -rotavirus -camel pox -plague (?) -gas gangrene toxin [34] | | |
| | Chemical | | | | Biological | | | |
| Country | Program Status | Possible Agents | Signed CWC[1] | Ratified CWC[1] | Program Status | Possible Agents | Signed BWC[2] | Ratified BWC[2] |
| Israel | Probable[35] | Unknown[36] | 01/13/93 | No | Research, with possible production of agents[37] | Unknown | No | No |
| Italy | Former program[38] | -mustard -phosgene[39] | 01/13/93 | 12/08/95 | - | - | 04/10/72 | 05/30/75 |
| Japan | Former program[40] | -phosgene -hydrogen cyanide -mustard -lewisite -chloropicrin[41] | 01/13/93 | 09/15/95 | Former program Started: 1931 Ended: 1945[42] | Past Weaponized Agents -anthrax -plague -glanders -typhoid -cholera -dysentery -typhoid -paratyphoid Research -gas gangrene -influenza -tetanus -tuberculosis -tularemia -salmonella -typhus -glanders -tetrodotxin[43] | 04/10/72 | 06/08/82 |
| Libya | Former program[44] | -mustard -sarin -tabun -lewisite -phosgene[45] | - | 01/06/04* | Possible former program Ended: 2003[46] | Unknown | - | 01/19/82* |
| Myanmar (Burma) | Probable[47] | Unknown | 01/14/93 | No | - | - | 04/10/72 | No |
| N. Korea | Known[48] | -adamsite | No | No | Research, with possible | -anthrax | - | 03/13/87* |

| | | | | | | | | |
|---------------------|-----------------------|---|----------------------|------------------------|---|--|----------------------|------------------------|
| | | -mustard -hydrogen cyanide -cyanogen chloride -phosgene -sarin -soman -tabun -VX[49] | | | production of agents[50] | -plague -yellow fever -typhoid -cholera -tuberculosis -typhus -smallpox -botulinum toxin[51] | | |
| Pakistan | Probable[52] | Unknown | 01/13/93 | 10/28/97 | Possible[53] | Unknown | 04/10/72 | 09/25/74 |
| Russia | Probable[54] | -Novichok binary nerve agents[55] | 01/13/93 | 11/05/97 | Research, some work beyond legitimate defense activities likely[56] | Unknown | 04/10/72 | 03/26/75 |
| Soviet Union | Former program[57] | -sarin -soman -mustard -lewisite -phosgene -VX analogue[58] | 01/13/93 | 11/05/97 | Former program Started: 1926 Ended: 1992[59] | Past Weaponized Agents -smallpox -plague -tularemia -glanders -Venezuelan equine encephalitis -anthrax -Q fever -Marburg Research -Ebola -Bolivian hemorrhagic fever -Argentinian hemorrhagic fever -Lassa fever -Japanese encephalitis -Russian spring-summer encephalitis -brucellosis -Machupo virus -yellow fever -typhus -melioidosis -psittacosis -rinderpest -African swine fever virus -wheat stem rust -rice blast[60] | 04/10/72 | 03/26/75 |
| | Chemical | | | | Biological | | | |
| Country | Program Status | Possible Agents | Signed CWC[1] | Ratified CWC[1] | Program Status | Possible Agents | Signed BWC[2] | Ratified BWC[2] |
| S. Africa | Former program[61] | -thallium -CR -paraoxon | 01/14/93 | 09/13/95 | Former program Started: 1981 Ended: 1993[63] | -anthrax -cholera -plague | 04/10/72 | 11/03/75 |

| | | | | | | | | |
|-----------------|--------------------|--|----------|-----------|--|---|----------|-------------|
| | | -mustard[62] | | | | -salmonella -gas gangrene -ricin -botulinum toxin[64] | | |
| S. Korea | Former program[65] | Unknown | 01/14/93 | 04/28/97 | - | - | 04/10/72 | 06/25/87 |
| Sudan | Possible[66] | Unknown | - | 05/24/99* | Possible research interest[67] | Unknown | - | 10/17/2003* |
| Syria | Known[68] | -mustard -sarin -VX | No | No | Research program, with possible production[69] | -anthrax -botulinum toxin -ricin[70] | 04/14/72 | No |
| Taiwan | Possible[71] | Unknown | N/A | N/A | Possible research program[72] | Unknown | 04/10/72 | 02/09/73*** |
| U.K. | Former program[73] | -phosgene -mustard -lewisite[74] | 01/13/93 | 05/13/96 | Former program Started: 1936 Ended: 1956[75] | Past Weaponized Agents -anthrax Research -plague -typhoid -botulinum toxin[76] | 04/10/72 | 03/26/75 |
| U.S.A. | Former program[77] | -mustard -sarin -soman -VX -lewisite -binary nerve agents[78] | 01/13/93 | 04/25/97 | Former program Started: 1943 Ended: 1969[79] | Past Weaponized Agents -Venezuelean equine encephalitis -Q fever -tularemia -anthrax -wheat rust -rice blast Research -brucellosis -smallpox -Eastern and Western equine encephalitis -Argentinian hemorrhagic fever -Korean hemorrhagic fever -Bolivian hemorrhagic fever -Lassa fever -glanders -melioidosis -plague -yellow fever -psittacosis -typhus -dengue fever -Rift Valley fever -Chikungunya virus -late blight of potato -rinderpest -Newcastle disease -fowl plague -staph enterotoxin B | 04/10/72 | 03/26/75 |

| | | | | | | | | |
|---|--------------------|---|----------|-----------|------------------|--------------------------------|----------|-----------|
| | | | | | | -botulinum toxin -ricin[81] | | |
| Viet Nam | Possible[81] | Unknown | 01/13/93 | 09/30/98 | - | - | - | 06/20/80* |
| Yugoslavia, Former Federal Republic of (FRY) | Former program[83] | -sarin -mustard -tabun -soman -VX -lewisite -BZ[84] | - | 04/20/00* | None/Unknown[84] | - | 04/10/72 | 10/25/73 |

*Denotes countries which acceded to the treaty.

** Iraq ratified the BWC following the adoption of U.N. Security Council Resolution 687, which in addition to establishing UNSCOM, also "invited" Iraq to ratify the 1972 Convention (Paragraph 7), 04/08/91, (<http://www.un.org/Docs/scres/1991/scres91.htm>).

*** The U.N. does not recognize Taiwan as an independent entity (from China), so their signature and ratification of the BWC in 1972, 1973 are not considered legitimate.

[[Top](#)]

[1] Organization for the Prohibition of Chemical Weapons, "Membership of the OPCW," (<http://www.opcw.org>).

[2] "Status of the Convention," The Biological and Toxin Weapons Convention Website, (<http://www.opbw.org>).

[3] Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p31.

[4] Algeria is reportedly conducting research into biological weapons, but there is no evidence of a production effort. Cordesman, *The Proliferation of Weapons of Mass Destruction in the Middle East*, 2005, p. 31.

[5] During World War II, Canada manufactured chemical munitions and purchased both lewisite and phosgene from the U.S. Army. In 1946, following the war, Canada destroyed its chemical weapons stockpile. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume II: CB Weapons Today*, (New York: Humanities Press, 1971), p. 187.

See also

John Bryden, *Deadly Allies: Canada's Secret War 1937-1947*, (Toronto, ON: McClelland & Stewart Inc., 1989).

[6] As part of its World War II chemical weapons program, Canada produced mustard gas and phosgene and procured quantities of mustard gas, lewisite, and phosgene from the United States. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume II: CB Weapons Today*, p. 187.

[7] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Donald Avery, "Canadian biological and toxin warfare research, development and planning, 1925-45," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), pp. 197-214.

The Office of Technology Assessment includes Canada in a list of countries that have admitted to having had "offensive [biological] weapon

munition supplies or development programs in the past." U.S. Congress, Office of Technology Assessment, *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, (Washington, DC: U.S. Government Printing Office, August, 1993), p. 63.

In 1942, the Canadians began collaborating with the United Kingdom's biological weapons effort. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons* (New York, NY: Humanities Press, 1971), p. 118-119.

See also

Bryden, *Deadly Allies: Canada's Secret War 1937-1947*.

[8] Donald Avery, "Canadian biological and toxin warfare research, development and planning, 1925-45," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), pp. 203-213.

Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 118-119.

In its work with the United States and the United Kingdom, Canada conducted research on several biological agents, including botulinum toxin, ricin, rinderpest virus, Rocky Mountain spotted fever, plague, and tularemia. The anthrax that Canada weaponized was done in partnership with both the United Kingdom and the United States. However, most of the research was done outside of Canada. John Bryden, *Deadly Allies: Canada's Secret War 1937-1947*, pp.108, 120, 210, 218, 223, 243.

[9] On March 19, 2002, in Testimony before the Senate Committee on Foreign Relations, Assistant Secretary of State for Intelligence and Research, Carl W. Ford, Jr. stated that "I believe that the Chinese have an advanced chemical warfare program, including research and development, production, and weaponization capabilities." Ford also stated that "In the near future, China is likely to achieve the necessary expertise and delivery capability to integrate chemical weapons successfully into overall military operations." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19, 2002.

Rear Admiral Thomas Brooks, Director of Naval Intelligence, identified China as a "probable" chemical weapons possessor in testimony before Congress. Rear Admiral Thomas Brooks, Director of Naval Intelligence, statement before the Subcommittee on Seapower, Strategic and Critical Materials, U.S. Congress, House of Representatives, Committee on Armed Services, "Hearings on National Defense Authorization Act for Fiscal Years 1992 and 1993 before the Committee on Armed Services," 102[nd] Congress, Second Session, March 7, 1991, (Washington, DC: Government Printing Office, 1993), p. 107.

China was referred to by the U.S. Department of Defense as having "the ability to quickly mobilize the chemical industry to produce a wide variety of chemical agents and delivery means." U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 14.

In a report to Congress on international compliance with arms control and nonproliferation agreements, the US Department of State found with respect to a potential Chinese CW program: "The United States judges that China maintains a CW production mobilization capability, although there is insufficient information available to determine whether it maintains an active offensive CW research and development program. Moreover, in violation of its CWC obligations, China has not acknowledged past transfers of chemical weapons and it may not have declared the full extent of its CW-related facilities." U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," Washington, DC, August 30, 2005, (<http://www.state.gov/t/vc/rls/rpt/51977.htm>).

An article in *The Economist* suggests that China might "have destroyed [its] chemical weapons before signing the CWC." "Chemical Weapons. Just Checking," *The Economist* 347 (May 2, 1997), p. 42.

[10] "It is possible that China has maintained the offensive biological warfare program it is believed to have had before acceding to the BWC." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19, 2002.

In testimony before the U.S. Congress in 2006, US officials expressed concern over China's commitment to the nonproliferation of biological weapons. Assistant Secretary of State for Verification, Compliance, and Implementation Paula DeSutter stated, "We maintain reservations about China's current research activities and dual-use capabilities, which raise the possibility that sophisticated BW and CW work could be underway. [...] We also continue to believe that China maintains some elements of an offensive BW capability in violation of its BWC obligations." US Congress, U.S.-China Economic and Security Review Commission, "China's Proliferation to North Korea and Iran, and Its Role in Addressing the Nuclear and Missile Situation in Both Nations," 109th Cong., 2nd sess., September 14, 2006, p. 10.

The U.S. Department of State reported in 2005, "The United States reaffirms its judgment that China maintains some elements of an offensive BW capability in violation of its BWC obligations. Despite China's BWC CBM declarations to the contrary, indications suggest that China maintained an offensive BW program prior to acceding to the Convention in 1984." U.S. Department of State, Bureau of Verification and Compliance, *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments*, Washington, DC, August 30, 2005, (<http://www.state.gov/t/vc/rls/rpt/51977.htm>).

The DOD states that it is likely China possesses infrastructure adequate to develop and produce biological warfare agents. China has reaffirmed its commitment not to develop biological weapons, but China likely retains some elements of an offensive program. China has acceded to the BWC. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 14.

[11] The following are as cited in a chart in Gordon M. Burck and Charles C. Flowerree, *International Handbook on Chemical Weapons Proliferation*, (New York, NY: Greenwood Press, 1991), pp. 168-171.

Thom Shanker, "West underwrites Third World's chemical arms," *Chicago Tribune*, 3 Apr. 1989, pp.1,6; and "Lack of candor blocks chemical arms treaty," 4 Apr. 1989, pp. 1,6 (source given as U.S. government official). Shanker identifies Cuba as probably having chemical weapons.

Harvey J. McGeorge, "Chemical addiction," *Defense & Foreign Affairs*, Apr. 1989, pp. 16-19, 32-33. McGeorge lists Cuba as a possible chemical possessor.

Senator John S. McCain, "Proliferation in the 1990s: implications for U.S. policy and force planning," Table 1, *Congressional Record*, 2 Nov. 1989, p. S14605; "Estimates are based on a variety of sources, including unclassified testimony by CIA Director William H. Webster, Seth Carus, David Goldberg, Elisa D. Harris and others and do not reflect the estimates of the U.S. Government." The report identifies Cuba as a suspected possessor state.

[12] Avner Cohen, "Israel and Chemical/Biological Weapons: History, Deterrence, and Arms Control," *The Nonproliferation Review*, Vol. 8, No. 3 (Fall-Winter), pp. 41-42.

Rear Admiral Thomas Brooks identified Egypt as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, 1991, p. 107.

Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p43.

See also

Dany Shoham, "Chemical and Biological Weapons in Egypt," *The Nonproliferation Review*, 5 (Spring-Summer 1998), pp. 48-58. For further information on Egypt's weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/egypt.htm>).

[13] Egypt likely possesses sarin, VX, mustard, and phosgene. Shoham, "Chemical and Biological Weapons in Egypt," p. 49.

Russian intelligence reports that Egypt has assimilated "techniques for the production of nerve and blister agents." Russian Federation Foreign Intelligence Service, "A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction," in *Proliferation Threats of the 1990's*, Hearing Before the Committee on Governmental Affairs, United States Senate, 103[rd] Congress, First Session, February 24, 1993, (Washington, DC: Government Printing Office, 1993), p. 92.

[14] "The United States believes that Egypt had developed biological warfare agents by 1972. There is no evidence to indicate that Egypt has eliminated this capability and it remains likely that the Egyptian capability to conduct biological warfare continues to exist." Arms Control and Disarmament Agency, *Adherence to and Compliance with Arms Control Agreements: 1998 Annual Report to Congress*, (<http://www.state.gov/www/global/arms/reports/annual/comp98.html>).

A Russian intelligence report cites Egypt as having "a program of military-applied research in the area of biological weapons." It also states that there is no evidence that weapons for military use have been developed. Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, p. 93.

"Egypt appears to have developed several natural pathogens and toxins as warfare agents and has recently taken the first steps to acquire a capability for the genetic engineering of microbial pathogens." Shoham, "Chemical and Biological Weapons in Egypt," p. 56.

Cordesman cites Egypt as having the capability to conduct biological weapons research. Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p43.

[15] Shoham, in "Chemical and Biological Weapons in Egypt," writes that Egypt has conducted research on anthrax, botulinum toxin, plague, cholera, tularemia, glanders, brucellosis, meliodosis, Japanese B. encephalitis, Eastern equine encephalitis, influenza, smallpox and mycotoxins. This list has been disputed and there is no other open source information available to verify the agents listed in the Shoham article.

[16] Rear Admiral Thomas Brooks identified Ethiopia as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

[17] In a 1988 speech to the United Nations, French President, Mitterrand, claimed that France had no chemical weapons, and would produce none. Victor A. Utgoff, *The Challenge of Chemical Weapons: An American Perspective*, (New York, NY: St. Martin's Press, 1991), pp. 123-124.

An article in *The Economist* suggests that France might "have destroyed [its] chemical weapons before signing the CWC." "Chemical Weapons. Just Checking," *The Economist*, p. 42.

[18] At the start of World War II, the French had a stockpile of mustard gas and phosgene. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 117.

Testing of chemical weapons occurred at a site called B2-Namous in Algeria. Vincent Jauvert, "Quand la France Teste des armes chimiques en Algerie," *Le Nouvel Observateur*, (Oct. 23-29, 1997), pp. 10-22.

[19] Olivier Lepick, "French activities related to biological warfare, 1919-45," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), p. 70.

[20] Olivier Lepick, "French activities related to biological warfare, 1919-45," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), pp. 78, 82- 90.

[21] Following World War II, "West Germany unilaterally renounced the manufacture of nuclear, biological and chemical weapons." With the

signing of the revised Brussels Treaty in 1954 and the establishment of the Western European Union, West Germany's pledge not to manufacture NBC weapons became an international commitment subject to verification. Utgoff, *The Challenge of Chemical Weapons: An American Perspective*, pp. 90-91.

[22] Germany's World War II stockpile of chemical weapons included phosgene, cyanide, mustard gas, sarin, and tabun. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume II: CB Weapons Today*, p. 127.

The Germans also reportedly produced soman. Bryden, *Deadly Allies: Canada's Secret War 1937-1947*, p. 181.

[23] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Mark Wheelis, "Biological sabotage in World War I," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), p. 35. Erhard Geissler, "Biological warfare activities in Germany, 1923-45," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), p. 91.

Germany's World War II biological weapons program was not institutionalized until the establishment of a research station at Posen in 1943. As Soviet forces moved toward the Posen facility in March 1945, work at the station ended--"without having accomplished anything very startling." Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 117.

[24] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Erhard Geissler, "Biological warfare activities in Germany, 1923-45," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), pp. 106, 117, 120-121.

Plague, cholera, typhus, and yellow fever were among the agents studied by Germany's biological weapons program. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 117.

Anthrax and glanders were used offensively by Germany during World War I in a veterinary sabotage program. Mark Wheelis, "Biological sabotage in World War I," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), p. 40-57.

[25] India Acknowledged its chemical warfare program in 1997 and stated that related facilities would be open for inspection. India has a sizable chemical industry which could be source of dual-use chemicals for countries of proliferation concern. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 24. India has declared Category 1, 2, and 3 chemical weapons to the OPCW.

[26] India has substantial biotechnical infrastructure and expertise, some of which is being used for biological warfare defense research. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 24.

[27] "Iran is a party to the Chemical Weapons Convention (CWC). Nevertheless, during the reporting period it continued to seek production technology, training, and expertise from Chinese entities that could further Tehran's efforts to achieve an indigenous capability to produce nerve agents. Iran likely has already stockpiled blister, blood, choking, and probably nerve agents—and the bombs and artillery shells to deliver them—which it previously had manufactured." Central Intelligence Agency, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003," (Washington, DC: U.S. Central Intelligence Agency, 2003), (https://www.cia.gov/library/reports/archived-reports-1/jan_jun2003.htm#iran).

Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p70.

Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, 1993, p. 98.

"The United States judges that Iran is in violation of its CWC obligations because Iran is acting to retain and modernize key elements of its CW infrastructure to include an offensive CW R&D capability and dispersed mobilization facilities." U.S. Department of State, Bureau of Verification and Compliance, *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments*, Washington, DC, August 30, 2005, (<http://www.state.gov/t/vc/rls/rpt/51977.htm>).

"In the past Tehran has manufactured and stockpiled blister, blood and choking chemical agents, and weaponized some of these agents into artillery shells, mortars, rockets, and aerial bombs. It is also believed to be conducting research on nerve agents." U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 36.

For further information on Iran's weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/iran.htm>).

[28] Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p70.

[29] "Even though Iran is part of the *Biological Weapons Convention* (BWC), Tehran probably maintained an offensive BW program. Iran continued to seek dual-use biotechnical materials, equipment, and expertise. While such materials had legitimate uses, Iran's biological warfare (BW) program also could have benefited from them. It is likely that Iran has capabilities to produce small quantities of BW agents, but has a limited ability to weaponize them." Central Intelligence Agency, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003," (Washington, DC: U.S. Central Intelligence Agency, 2003), (https://www.cia.gov/library/reports/archived-reports-1/jan_jun2003.htm#iran).

Anthony Cordesman, *Weapons of Mass Destruction in Iran: Delivery Systems, and Chemical, Biological, and Nuclear Programs*, (Center for Strategic and International Studies, April 28, 1998), (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1325/type.1/), pp. 13-14.

In a speech to the Fifth Review Conference on the *Biological Weapons Convention* in Geneva on November 19, 2001, John Bolton, the Undersecretary of State for Arms Control and International Security, accused Iran of operating a clandestine biological weapons program. Jenni Rissanen, Acrimonious Opening for BWC Review Conference, *BWC Review Conference Bulletin*, (Acronym Institute, November 19, 2001), (<http://www.acronym.org.uk/bwc/revcon1.htm>).

"Iran possesses overall infrastructure and expertise to support a biological warfare program. It pursues contacts with Russian entities and other sources to acquire dual-use equipment and technology and is believed to be actively pursuing offensive biological warfare capabilities. It may have small quantities of usable agent now." U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 35.

"The United States judges that, based on all available information, Iran has an offensive biological weapons program in violation of the BWC." U.S. Department of State, Bureau of Verification and Compliance, *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments*, Washington, DC, August 30, 2005, (<http://www.state.gov/t/vc/rls/rpt/51977.htm>).

[30] Anthony Cordesmann, *Weapons of Mass Destruction in Iran: Delivery Systems, and Chemical, Biological, and Nuclear Programs*, (Center for Strategic and International Studies, April 28, 1998), (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1325/type.1/), p15.

[31] Following Operation Iraqi Freedom, the Iraq Study Group, led by Charles Duelfer, concluded that "Iraq unilaterally destroyed its undeclared chemical weapons stockpile in 1991," but "Saddam [Hussein] never abandoned his intentions to resume a CW effort when sanctions were lifted

and conditions were judged favorable." "Iraq's Chemical Warfare Program," *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, Volume 3, p1, (https://www.cia.gov/library/reports/general-reports-1/iraq_wmd_2004/index.html). For further information on Iraq's former weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/iraq.htm>) and CNS's "Special Collection on the Iraq Crisis" web page at (<http://cns.miis.edu/research/iraq/index.htm>).

[32] For more information on Iraq's CW activities, see: Anthony Cordesman, "Weapons of Mass Destruction in Iran and Iraq," Background Paper for Testimony to the Senate Foreign Relations Committee, (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1245/type.1/).

In the past Iraq produced mustard gas, sarin, tabun, and VX. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p 50.

"Agent-15 belongs to the glycollates, a large group of chemicals which also includes the chemical warfare agent BZ. The chemicals block cholinergic nerve transmission in the central and peripheral nervous system...little information is publicly known about Agent-15, except that it is closely related to BZ. The understanding of its physiological effects is based on studies with the latter agent." Stockholm International Peace Research Institute, Agent - 15, (http://www.sipri.org/contents/cbwarfare/cbw_research_doc/cw_doc/Agent-15.html).

[33] Following Operation Iraqi Freedom, the Iraq Study Group, led by Charles Duelfer, concluded that Iraq had abandoned its BW program in the mid-1990s. However, Saddam Hussein retained the requisite technology to reinstate a BW program on relatively short notice, although no evidence was found to suggest this was considered after 1996. "Biological Warfare," *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, Volume 3, p1, (https://www.cia.gov/library/reports/general-reports-1/iraq_wmd_2004/index.html). For further information on Iraq's former weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/iraq.htm>) and CNS's "Special Collection on the Iraq Crisis" web page at (<http://cns.miis.edu/research/iraq/index.htm>).

[34] For more information on Iraq's BW activities, see: U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), pp. 39-40.

Jenni Rissanen, "Acrimonious Opening for BWC Review Conference," *BWC Review Conference Bulletin*, (Acronym Institute, November 19, 2001), (<http://www.acronym.org.uk/bwc/revcon1.htm>).

Anthony Cordesman, "Weapons of Mass Destruction in Iran and Iraq," Background Paper for Testimony to the Senate Foreign Relations Committee, 2000, (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1245/type.1/).

Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

United Nations, United Nations Special Commission (UNSCOM), "Fourth Report under Resolution 1051" (June 10, 1997), (<http://www.un.org/Depts/unscom/unscmdoc.htm>).

According to ACDA, Iraq produced anthrax, botulinum toxin, aflatoxin, ricin, wheat cover smut, and researched *Clostridium perfringens* (gas gangrene), hemorrhagic conjunctivitis virus, rotavirus, and camel pox. *Arms Control and Disarmament Agency, Adherence to and Compliance with Arms Control Agreements: 1995 Annual Report to Congress*, (<http://dosfan.lib.uic.edu/acda/reports/complian.htm>)

[35] Avner Cohen, "Israel and Chemical/Biological Weapons: History, Deterrence, and Arms Control," *The Nonproliferation Review*, Vol. 8, No. 3 (Fall-Winter), pp. 27-53.

"Israel may have the contingency capability to produce at least two types of chemical weapons and has certainly studied biological weapons as well as chemical ones. According to one interview with an Israeli source of unknown reliability, Israel has mustard gas, persistent and non-persistent nerve gas, and may have at least one additional agent." Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance,"

(http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p48.

The *London Sunday Times* reports that Israeli F-16 fighters have been equipped to carry chemical weapons and that their crews have been trained on the use of such weapons. Uzi Mahnaimi, "Israeli Jets Equipped For Chemical Warfare," *London Sunday Times*, October 4, 1998.

"Israel has a store of chemical weapons of its own manufacture...Israel is capable of producing toxic substances of all types, including nerve-paralyzing, blister-producing and temporarily incapacitating substances and so forth. The country has for this a highly developed chemical and petrochemical industry and skilled specialists and also stocks of source material." Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, 1993.

In a 1974 hearing before the Senate Armed Services Committee, General Almquist stated that Israel had an offensive chemical weapons capability. Senate Armed Services Committee, FY 1975 Authorization Hearing, Part 5, March 7, 1974.

For further information on Israel's weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/israel.htm>).

[36] Avner Cohen, "Israel and Chemical/Biological Weapons: History, Deterrence, and Arms Control," *The Nonproliferation Review*, Vol. 8, No. 3 (Fall-Winter), pp. 27-53.

While it is unclear exactly what chemical agents Israel may produce, Dutch officials have identified that an EI Al 747 that crashed in Amsterdam in 1992 was carrying a shipment of DMMP destined for Israel. DMMP is a nerve gas precursor used in the manufacture of sarin gas. Uzi Mahnaimi, "Israeli Jets Equipped For Chemical Warfare," *London Sunday Times*, October 4, 1998.

[37] Avner Cohen, "Israel and Chemical/Biological Weapons: History, Deterrence, and Arms Control," *The Nonproliferation Review*, Vol. 8, No. 3 (Fall-Winter), pp. 27-53.

Israel has conducted research into weapons and defense and has the ability to produce biological weapons; however, there is no indication of a production effort. Cordesman, "Creeping Proliferation Could Mean a Paradigm Shift in the Cost of War and Terrorism," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p48.

A Russian intelligence report indicates that Israel has a biological research program of a general nature "in which elements of a military-applied purpose are present." Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, p. 94.

The *London Sunday Times* reports that Israeli F-16 fighters have been equipped to carry biological weapons and that their crews have been trained on the use of such weapons. Uzi Mahnaimi, "Israeli Jets Equipped For Chemical Warfare," *London Sunday Times*, October 4, 1998.

[38] As part of the 1947 Peace Treaty, Italy is forbidden from possessing chemical weapons, even for deterrent purposes. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume II: CB Weapons Today*, p. 187.

[39] The Italian chemical weapons inventory during World War II included mustard gas and phosgene. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 292.

[40] *The Economist* reports that Japan ended its chemical weapons program "years ago," placing it together with Britain, which ended its program in the 1950s. "Chemical Weapons. Just Checking," *The Economist*, p. 42.

While Japan might have ended its CW program years ago, it remains legally responsible for hundreds of thousands of chemical munitions it abandoned in China during World War II. In an article discussing the problems involved in disposing of the weapons left behind in China, a Japanese newspaper reports that "[s]ince Japan's postwar defense forces do not have chemical weapons, there is no section in the Japanese

government that is completely familiar with neutralization of chemical weapons." Masato Ishizawa, "Chemical Weapons Return to Haunt Japan: Bombs Left in China Pose Dangerous Task of Removal, Disposal," *The Nikkei Weekly*, January 20, 1997, p. 1.

Chinese officials claim that the Japanese left over two million chemical munitions in China, while Japanese officials insist the number is closer to 700,000. "Chemical weapons," *Mainichi Daily News*, July 28, 1998, p.2.

For further information on Japan's abandoned chemical weapons in China, see Hongmei Deng and Peter O'Meara Evans, "Social and Environmental Aspects of Abandoned Chemical Weapons in China," *The Nonproliferation Review*, 4, (Spring-Summer 1997), pp. 101-108.

See also

George Wehrfritz, Hideko Takayama, and Lijia MacLeod, "In Search of Buried Poison," *Newsweek* 132, (July 20, 1998).

[41] Japan's World War II stockpile of chemical weapons included phosgene, chloropicrin (a lung irritant), cyanide, mustard gas, and lewisite. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume II: CB Weapons Today*, p. 127.

[42] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Sheldon Harris, "The Japanese biological warfare programme: an overview," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), p. 127.

Between 1937 and 1945, Japan operated a biological weapons program in occupied Manchuria. United States Army, Medical Research Institute of Infectious Diseases (USAMRIID), "Medical Defense Against Biological Warfare Agents Course: History of Biological Warfare," (<http://www.au.af.mil/au/awc/awcgate/usamriid/bw-hist.htm>).

[43] Sheldon Harris, "The Japanese biological warfare programme: an overview," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), pp. 138, 140, 142-3, 149.

[44] On December 19, 2003, Libya announced an agreement with the U.S. and the U.K. to dismantle its WMD programs and missile programs. Libya pledged to eliminate all its CW stocks and accede to the CWC. Libya acceded to the CWC on January 6, 2004. Libya declared to the OPCW that it had produced and stockpiled 23 tons of mustard. Sharon A. Squassoni and Andrew Feickert, "Disarming Libya: Weapons of Mass Destruction," *Congressional Research Service*, April 22, 2004, (<http://www.fpc.state.gov/documents/organization/32007.pdf>).

[45] For information on Libya's prior CW activities, see:

Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p36.

The U.S Department of Defense has stated that Libya produced blister and nerve agents in the 1980's at Rabta; employed chemical agents against Chadian troops in 1987 and attempted to construct underground chemical agent production facility at Tarhunah. Both the Rabta and Tarhunah facilities are believed to be inactive, although chemical program not completely abandoned. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 46.

"Libya also remained heavily dependent on foreign suppliers for CW precursor chemicals and other key related equipment. Following the suspension of UN sanctions, Tripoli reestablished contacts with sources of expertise, parts, and precursor chemicals abroad, primarily in Western Europe. Libya has indicated—as evidenced by its observer status at the April 2003 Chemical Weapons Convention Review Conference and previous Convention Conferences of States Parties—a willingness to accede to the CWC. Such efforts are consistent with steps that Tripoli is

taking to improve its international standing. Tripoli still appeared to be working toward an offensive CW capability and eventual indigenous production. Evidence suggested that Libya also sought dual-use capabilities that could be used to develop and produce BW agents." Central Intelligence Agency, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003," (Washington, DC: U.S. Central Intelligence Agency, 2003), (https://www.cia.gov/library/reports/archived-reports-1/jan_jun2003.htm - 6).

For further information on Libya's former weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/libya.htm>)

[46] On December 19, 2003, Libya announced an agreement with the U.S. and the U.K. to dismantle its WMD programs and missile programs. According to the CIA, "Libya disclosed past intentions to acquire equipment and develop capabilities related to biological warfare, but it remains unclear if these activities were offensive or defensive in nature." The U.S. has long suspected that Libya may have had a nascent biological weapons program, although to date no concrete evidence of an offensive BW program has surfaced. Central Intelligence Agency, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 2003," (Washington, DC: U.S. Central Intelligence Agency, 2003), (https://www.cia.gov/library/reports/archived-reports-1/july_dec2003.htm).

In a speech to the Fifth Review Conference on the Biological Weapons Convention in Geneva on November 19, 2001, John Bolton, the Undersecretary of State for Arms Control and International Security, accused Libya of operating a clandestine biological weapons program. Jenni Rissanen, Acrimonious Opening for BWC Review Conference, *BWC Review Conference Bulletin*, (Acronym Institute, November 19, 2001), (<http://www.acronym.org.uk/bwc/revcon1.htm>).

"Evidence suggests Libya is seeking to acquire the capability to develop and produce BW agents. Such development or production would violate key provisions of the BWC. Libya has also failed to submit the data declarations stipulated in the CBMs. Evidence indicates that Libya has the expertise to produce small quantities of biological equipment for its BW program and that the Libyan Government is seeking to move its research program into a program of weaponized BW agents." Robert J. Einhorn, Testimony Before the Senate Foreign Relations Committee, Washington, DC, October 5, 2000, (http://www.state.gov/www/policy_remarks/2000/001005_einhorn_sfrc.html).

"There is information indicating that Libya is engaged in initial testing in the area of biological weapons." Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, p. 100.

[47] Rear Admiral Thomas Brooks identified Myanmar as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

[48] "Pyongyang continued to acquire dual-use chemicals that could potentially be used to support Pyongyang's long-standing CW program. North Korea's CW capabilities included the ability to produce bulk quantities of nerve, blister, choking, and blood agent, using its sizable, although aging, chemical industry. North Korea may possess a stockpile of unknown size of these agents and weapons, which it could employ in a variety of delivery means." Central Intelligence Agency, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 2003," (Washington, DC: U.S. Central Intelligence Agency, 2003), (https://www.cia.gov/library/reports/archived-reports-1/july_dec2003.htm).

"North Korea has a long-standing chemical weapons program. North Korea's domestic chemical industry can produce bulk quantities of nerve, blister, choking, and blood agents. We believe it has a sizeable stockpile of agents and weapons." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19, 2002.

Joseph S. Bermudez, Jr., *The Deterrence Series*, "Case Study 5: North Korea," (Alexandria, VA: Chemical and Biological Arms Control Institute, 1998), p. 5.

The Department of Defense reports that North Korea's chemical warfare capabilities include the ability to produce bulk quantities of nerve, blister, choking, and blood agents, using its sizeable, although aging, chemical industry. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 11.

Rear Admiral Thomas Brooks identified North Korea as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

[49] Joseph S. Bermudez, Jr., *The Deterrence Series, Case Study 5: North Korea*, (Alexandria, VA: Chemical and Biological Arms Control Institute, 1998), p. 5. For more information on North Korea's weapons of mass destruction programs, see the North Korea country profile on the Nuclear Threat Initiative website, (http://nti.org/e_research/profiles/NK/index.html).

[50] "North Korea has acceded to the Biological and Toxin Weapons Convention but nonetheless has pursued BW capabilities since the 1960s. Pyongyang acquired dual-use biotechnical equipment, supplies, and reagents that could be used to support North Korea's BW program. North Korea is believed to possess a munitions production infrastructure that would have allowed it to weaponize BW agents and may have some such weapons available for use." Central Intelligence Agency, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 2003," (Washington, DC: U.S. Central Intelligence Agency, 2003), (https://www.cia.gov/library/reports/archived-reports-1/july_dec2003.htm).

Joseph S. Bermudez, Jr., *The Deterrence Series, "Case Study 5: North Korea,"* p. 11-12.

In a speech to the Fifth Review Conference on the Biological Weapons Convention in Geneva on November 19, 2001, John Bolton, the Undersecretary of State for Arms Control and International Security, accused North Korea of operating a clandestine biological weapons program. Jenni Rissanen, Acrimonious Opening for BWC Review Conference, *BWC Review Conference Bulletin*, (Acronym Institute, November 19, 2001), (<http://www.acronym.org.uk/bwc/revcon1.htm>).

North Korea has pursued biological warfare capabilities since the 1960's. Furthermore, North Korea possesses infrastructure that can be used to produce biological warfare agents. North Korea may have biological weapons available for use. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 10.

"North Korea is performing applied military-biological research in a whole number of universities, medical institutes, and specialized research institutes. Work is being performed in these research centers with inducers of malignant anthrax, cholera, bubonic plague and smallpox. Biological weapons are being tested on the island territories belonging to the DPRK." Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, 1993.

[51] In its 2006 Defense White Paper, the South Korean Ministry of Defense stated with respect to North Korea's chemical and biological weapons programs, "It is assessed that North Korea has been producing poison gas and biological weapons since the 1980s. It is believed that 2,500 to 5,000 tons of a variety of agents including nerve agents remain stored in a number of facilities...and that North Korea is able to produce biological weapons such as the bacteria of anthrax, smallpox, and cholera." Ministry of Defense, Republic of Korea, *2006 Defense White Paper* (English translation), May 2007, p. 74, (<http://www.mnd.go.kr/mndEng/DefensePolicy/Whitepaper/index.jsp>).

"The Actual Situation of North Korea's Biological and Chemical Weapons," *Foresight*, February 17, 2001, pp. 24-25, translated in FBIS.

North Korea Advisory Group, Report to the Speaker, U.S. House of Representatives, November 1999.

"Pyongyang's resources include a rudimentary (by Western standards) biotechnical infrastructure that could support the production of infectious biological warfare agents and toxins such as anthrax, cholera, and plague." U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 10.

Russian intelligence reports that North Korea is conducting military applied research on anthrax, cholera, bubonic plague and smallpox. Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, p. 99.

For more information on North Korea's weapons of mass destruction programs, see the North Korea country profile on the Nuclear Threat Initiative website, (http://nti.org/e_research/profiles/NK/index.html).

[52] Pakistan has imported a number of dual-use chemicals that can be used to make chemical agents. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 28.

Rear Admiral Thomas Brooks identified Pakistan as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

"[R]esearch of an applied military nature is being conducted" by Pakistan in the area of chemical weapons. Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, p. 101.

[53] Pakistan is believed to have the resources and capabilities to support a limited biological warfare research and development effort. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 28.

[54] The Department of Defense reports that Russia has acknowledged the world's largest stockpile of chemical agents of 40,000 metric tons, and has developed a new generation of chemical agents. The DOD believes that Russia still has not divulged the full extent of their chemical agent and weapon inventory. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 57.

"Russian officials do not deny research has continued but assert that it aims to develop defenses against chemical weapons...Many of the components for new binary agents developed by the former Soviet Union are not on the CWC's schedule of chemicals and have legitimate civil applications, clouding their association with chemical weapons use." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19, 2002.

[55] Clifford Krauss, "U.S. Urges Russia To End Production of Nerve Gas," *New York Times*, February 6, 1997.

Frank Von Hippel, "Russian whistleblower faces jail," *The Bulletin of Atomic Scientists*, 49, (March, 1993).

Russia's chemical weapons program has reportedly developed a new class of advanced binary chemical weapons, referred to as the Novichok series. A-232 is both a unitary agent and a Novichok precursor. Dr. Vil S. Mirzayanov, "Dismantling the Soviet/Russian Chemical Weapons Complex: An Insider's View," *Chemical Weapons Disarmament in Russia: Problems and Prospects*, (Washington, DC: The Henry L. Stimson Center, 1995), pp. 24-25.

[56] "The United States continues to assess that Russia maintains a mature offensive BW program and that its nature and status have not changed. Russia's BW program builds on capabilities and expertise inherited from the far more extensive Soviet BW program that dates back to the 1920s. Since the Soviet era, elements of that former Soviet BW program have been subject to varying degrees of downsizing and restructuring. There have also been severe cuts in funding and personnel at some key BW facilities. However, some key components of the former Soviet program may remain largely intact and may support a mobilization capability for the production of biological agents and delivery systems." U.S. Department of State, "Adherence to and Compliance With Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," August 2005, (<http://www.state.gov/t/vci/rls/rpt/51977.htm>).

"Key components of the former Soviet program remain largely intact and may support a possible future mobilization capability for the production of biological agents and delivery systems. Moreover, work outside the scope of legitimate biological defense activity may be occurring now at selected facilities within Russia." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19, 2002.

Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

The Department of Defense reports that some elements of large FSU biological warfare program may remain intact and could support future agent production, and that some offensive biological warfare activities may be ongoing (p. 54), with the United States continuing to receive unconfirmed reports of offensive biological warfare efforts (p. 57). U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>).

[57] The Department of Defense reports that Russia has acknowledged the world's largest stockpile of chemical agents of 40,000 metric tons, and has developed a new generation of chemical agents. The DOD believes that Russia still has not divulged the full extent of their chemical agent and weapon inventory. U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 57.

[58] Nuclear Threat Initiative, "Russia: Chemical Overview," (http://nti.org/e_research/profiles/Russia/Chemical/index.html).

[59] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

[60] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

"According to its declaration, Russia maintained an offensive research and development program until March 1992 that worked with anthrax, tularemia, brucellosis, plague, Venezuelan equine encephalitis, typhus, and Q-fever. With respect to toxins, Russia claimed that the only natural toxin studied in its program was botulinum toxin." Richard Boucher, U.S. Department of State, "Joint US/UK/Russian Statement on Biological Weapons," Press Release, Office of Public Affairs (Washington, DC: U.S. Department of State, September 14, 1992), cited in Graham S. Pearson, "The Threat of Deliberate Disease in the 21st Century," *Biological Weapons Proliferation: Reasons for Concern, Courses of Action*, (Washington, DC: The Henry L. Stimson Center, January 1998), p. 29.

Russian defector Kanatjan Alibekov (Kenneth Alibek), a former deputy director of the Soviet/Russian biological warfare development program, lists the following agents as either weaponized or researched by the Soviet/Russian program: smallpox, plague, anthrax, Venezuelan equine encephalomyelitis, glanders, brucellosis, Marburg virus, Ebola virus, Argentinian hemorrhagic fever, Machupo virus, yellow fever, Lassa fever, Japanese encephalitis, Russian spring-summer encephalitis, tularemia, typhus, Q-fever, psittacosis, ornithosis, rinderpest virus, African swine fever virus, wheat stem rust, and rice blast. Dr. Kenneth Alibek, statement before the Joint Economic Committee, U.S. Congress, Joint Economic Committee, "Terrorism and Intelligence Operations: Hearing before the Joint Economic Committee," 105[th] Congress, Second Session, May 20, 1998, (<http://www.house.gov/jec/hearings/intell/alibek.htm>) .

[61] Lynne Duke, "Doubts Arise on Junking of Chemical Arms; S. African Panel Told Some Drugs, Formulas May Have Been Secretly Held Back," *Washington Post*, July 9, 1998, A24.

A government spokesman stated that South Africa's chemical weapons program has been "terminated, and that the material for offensive purposes in government storage has been destroyed." The program was shut down in 1993 and its products dumped at sea. Buchizya Mseteka, "S. Africa Says it Terminated Chemical Weapons Scheme," *Reuters*, June 15, 1998.

[62] Stephen Burgess and Helen Purkitt, *The Rollback of South Africa's Biological Warfare Program*, INSS Occasional Paper 37, (USAF Institute for National Security Studies, February, 2001), (<http://www.usafa.af.mil/inss/ocp37.htm>).

David Beresford, "Mandela on apartheid's poison list," *The Age*, June 11, 1998, (<http://www.theage.com.au/daily/980611/news/news18.html>).

Chris Opperman, "Prosecutors Ecstatic as Basson's Buddy Talks," *Weekly Mail and Guardian* (Johannesburg), June 27, 1997.
"SADF 'made Ecstasy for riot control,'" *Business Day*, June 10, 1998.

Lynne Duke, "Doubts Arise on Junking of Chemical Arms; S. African Panel Told Some Drugs, Formulas May Have Been Secretly Held Back,"

Washington Post, July 9, 1998, A24.

"Apartheid-Era Scientist: Mandela was Target for Poisoning," *Edmonton Journal Extra*, June 10, 1998.

David Beresford, "Apartheid's Lab Rats," *Weekly Mail and Guardian* (Johannesburg), June 12, 1998.

Andrew Maykuth, "Mandela's Government Becomes Ally of Ex-Foe," *Philadelphia Inquirer*, June 20, 1998.

[63] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Stephen Burgess and Helen Purkitt, "The Rollback of South Africa's Biological Warfare Program," INSS Occasional Paper 37, (USAF Institute for National Security Studies, February, 2001), (<http://www.usafa.af.mil/inss/ocp37.htm>).

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[64] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Stephen Burgess and Helen Purkitt, "The Rollback of South Africa's Biological Warfare Program," INSS Occasional Paper 37, (USAF Institute for National Security Studies, February, 2001), (<http://www.usafa.af.mil/df/inss/OCP/ocp37.pdf>).

[65] Rear Admiral Thomas Brooks identified South Korea as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

Citing U.S. government sources, a 1997 article in the *Bulletin of Atomic Scientists* counts South Korea among those states suspected of having chemical weapons. E.J. Hogendoorn, "A Chemical Weapons Atlas," p. 38.

The Economist reports that South Korea is among those countries that, under the Chemical Weapons Convention, have declared possessing chemical weapons. "Chemical Weapons. Just Checking," *The Economist*, p. 42.

See footnote #13. Shanker, "West underwrites Third World's chemical arms"; McCain, "Proliferation in the 1990s: implications for U.S. Policy and force planning," in Burck and Flowerree, *International Handbook on Chemical Weapons Proliferation*, pp. 168-171. Also cited in Burck and Flowerree chart: Elisa Harris, "Chemical weapons proliferation: current capabilities and prospects for control," *New Threats: Responding to the Proliferation of Nuclear, Chemical, and Delivery Capabilities in the Third World*, (Landham, Md: Aspen Strategy Group, 1990), pp.70-72. Harris classifies South Korea as "seeking to acquire CW weapons or a production capability, or as suspected of possessing CW weapons."

[66] There is considerable uncertainty as to Sudan's chemical weapons status. For a well documented discussion of the debate please refer to the CNS Fact Sheet on Sudan, "Weapons of Mass Destruction Capabilities and Programs," (<http://cns.miis.edu/research/wmdme/sudan.htm>).

[67] In a speech to the Fifth Review Conference on the Biological Weapons Convention in Geneva on November 19, 2001, John Bolton, the Undersecretary of State for Arms Control and International Security, accused Sudan of operating a clandestine biological weapons program. Jenni Rissanen, *Acrimonious Opening for BWC Review Conference*, BWC Review Conference Bulletin, (Acronym Institute, November 19, 2001), (<http://http://www.acronym.org.uk/bwc/revcon1.htm>).

[68] "Syria has a long-standing chemical warfare program, first developed in the 1970s...it has a stockpile of the nerve agent sarin and may be trying to develop advanced nerve agents as well." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19,

2002.

The DOD reports that Syria "already has a stockpile of the nerve agent sarin that can be delivered by aircraft or ballistic missiles. Additionally, Syria is trying to develop the more toxic and persistent nerve agent VX. In the future, Syria can be expected to continue to improve its chemical agent production and storage infrastructure." U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 43.

Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p56.

See also

M. Zuhair Diab, "Syria's Chemical and Biological Weapons: Assessing Capabilities and Motivations," *The Nonproliferation Review*, 5, (Fall, 1997), pp. 104-111.

For further information on Syria's weapons of mass destruction programs and capabilities, see the CNS country profile on the "Weapons of Mass Destruction in the Middle East" web page at (<http://cns.miis.edu/research/wmdme/syria.htm>).

[69] CDISS reports that Syria's chemical arsenal contains mustard gas, sarin, and VX. "Devil's Brews Briefing: Syria," Centre for Defence and International Security Studies, Lancaster University, 1996. The CIA reports that Syria has a stockpile of sarin. CIA, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions," 1 January through 30 June 2003, (https://www.cia.gov/library/reports/archived-reports-1/jan_jun2003.htm - 7).

[70] "Syria is pursuing biological weapons. It has an adequate biotechnical infrastructure to support a small biological warfare program. Without significant foreign assistance, it is unlikely that Syria could advance to the manufacture of significant amounts of biological weapons for several years." Carl W. Ford, Jr., Assistant Secretary of State for Intelligence and Research, "Hearing on Reducing the Threat of Chemical and Biological Weapons Before the Senate Committee on Foreign Relations," (Washington, DC), March 19, 2002.

In a speech to the Fifth Review Conference on the *Biological Weapons Convention* in Geneva on November 19, 2001, John Bolton, the Undersecretary of State for Arms Control and International Security, accused Syria of operating a clandestine biological weapons program. Jenni Rissanen, Acrimonious Opening for BWC Review Conference, *BWC Review Conference Bulletin*, (Acronym Institute, November 19, 2001), (<http://www.acronym.org.uk/bwc/revcon1.htm>).

Testifying before Congress in 1991, Rear Admiral Thomas Brooks indicated that Syria had "developed an offensive BW capability." Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

"Syria's biotechnical infrastructure is capable of supporting limited agent development. However, the Syrians are not believed to have begun any major effort to put biological agents into weapons. Without significant foreign assistance, it is unlikely that Syria could manufacture significant amounts of biological weapons for several years." U.S. Department of Defense, *Proliferation: Threat and Response 2001*, (<http://fas.org/irp/threat/prolif00.pdf>), p. 43.

In its annual report to Congress, ACDA states that "it is highly probable that Syria is developing an offensive biological warfare capability." Arms Control and Disarmament Agency, Adherence to and Compliance with Arms Control Agreements: 1997 Annual Report to Congress, (<http://www.state.gov/www/global/arms/reports/annual/comp97.html>).

[71] Anthony Cordesman, "The Proliferation of Weapons of Mass Destruction in the Middle East: The Impact on the Regional Military Balance," (http://www.csis.org/component/option.com_csis_pubs/task.view/id.1441/type.1/), March 25, 2005, p56.

[72] Rear Admiral Thomas Brooks identified Taiwan as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

[73] According to a Russian intelligence report, "Taiwan does not have biological weapons...[however], it has shown signs of conducting biological research of an applied military nature." Russian Federation Foreign Intelligence Service, *A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction*, p. 104.

ACDA reports that Taiwan has been upgrading its biotechnology capabilities, but states that the "evidence indicating a BW program is not sufficient to determine if Taiwan is engaged in activities prohibited by the BWC." Arms Control and Disarmament Agency, "Adherence to and Compliance with Arms Control Agreements: 1997 Annual Report to Congress," (<http://www.state.gov/www/global/arms/reports/annual/comp97.html>).

[74] The United Kingdom renounced its chemical weapons option in 1957 and subsequently destroyed its CW capabilities. Edward M. Spiers, *Chemical and Biological Weapons: A Study of Proliferation*, (New York, NY: St. Martin's Press, 1994) pp. 11, 162.

"Britain decided against building her own nerve-gas factory in the mid-1950s and, having taken that decision, discarded her residual World War II chemical weapons and closed down her chemical weapons research and development program." Julian Perry Robinson, "Appendix C: United States and NATO Chemical Weapons," in *Chemical Weapons and Chemical Arms Control*, Matthew Meselson, ed., (New York, NY: Carnegie Endowment for International Peace, 1978) p. 113.

[75] The United Kingdom's World War II stockpile of chemical weapons included phosgene, mustard gas, and lewisite. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume II: CB Weapons Today*, p. 127.

[76] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

Gradon B. Carter and Graham Pearson, "British biological warfare and biological defence, 1925-45, in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), p. 168.

The Office of Technology Assessment includes the United Kingdom in a list of countries that have admitted to having had "offensive [biological] weapon munition supplies or development programs in the past." U.S. Congress, Office of Technology Assessment, *Proliferation of Weapons of Mass Destruction*, p. 63.

[77] Gradon B. Carter and Graham Pearson, "British biological warfare and biological defence, 1925-45, *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, Erhard Geissler and John Ellis van Courtland Mood, eds., (New York: NY: Stockholm International Peace Research Institute, 1999), pp. 182-4.

The British biological weapons program involved research on anthrax. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 118.

[78] The United States stopped production of unitary chemical munitions in 1969. "Chemical and Biological Warfare," *The Military Balance 1988-1989*, (London, UK: IISS, 1988), p. 244.

In November 1985, Congress passed legislation calling for the destruction of 90 percent of the total U.S. stockpile of unitary chemical agents. On May 13, 1991, the Bush administration announced that U.S. stockpiles of both binary and unitary weapons would be destroyed when the CWC entered into force. Amy E. Smithson, *The U.S. Chemical Weapons Destruction Program: Views, Analysis, and Recommendations*, (Washington, DC: The Henry L. Stimson Center, 1994), pp. 96, 99.

[79] Federation of American Scientists, "Chemical Weapons," (<http://www.fas.org/nuke/guide/usa/cbw/cw.htm>). Included in the U.S. chemical weapons stockpile are 680.19 tons of binary weapons components. Office of Assistant Secretary of Defense, U.S. Chemical Weapons Stockpile Information Declassified, (Washington, DC: Department of Defense, January 22, 1996), (<http://www.defenselink.mil/releases/release.aspx?>

[releaseid=729](#)).

[80] Milton Leitenberg, *Biological Weapons in the Twentieth Century: A Review and Analysis*, (<http://www.fas.org/bwc/papers/bw20th.htm>), 2001.

"In 1969, President Nixon disestablished offensive studies including the destruction of all stockpiles of agents and munitions." Destruction of biological weapon agent stocks and munitions was accomplished between May 1971 and May 1972. The study of biological weapons continued after 1969, but for defensive purposes only. USAMRIID, "A History of Biological Warfare," (<http://www.au.af.mil/au/awc/awcgate/usamriid/bw-hist.htm>).

[81] National Security Archive, "National Security Decision Memoranda 35 and 44," *The September 11th Source Books: National Security Archive Online Readers on Terrorism, Intelligence and the Next War. Volume III: BLOWAR: The Nixon Administration's Decision to End U.S. Biological Warfare Programs*, (<http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB58/RNCBW22.pdf>), July 6, 1970.

Anthrax, brucellosis, Eastern and Western equine encephalitis, Venezuelan equine encephalomyelitis, Argentinian hemorrhagic fever, Korean hemorrhagic fever, Bolivian hemorrhagic fever, Lassa fever, tularemia, and Q-fever are among the biological agents researched by the U.S. program for offensive and/or defensive purposes. All research since 1969 has been for defensive purposes. USAMRIID, "A History of Biological Warfare," (<http://www.au.af.mil/au/awc/awcgate/usamriid/bw-hist.htm>).

According to SIPRI, the U.S. biological program studied the following agents: anthrax, glanders, brucellosis, melioidosis, tularemia, plague, yellow fever, psittacosis, typhus, dengue fever, Rift Valley fever, Chikungunya disease virus, ricin, rice blast, rice brown spot disease, late blight of potato, stem rust of cereal, rinderpest virus, Newcastle disease virus, fowl plague virus. Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons*, p. 122-123.

See also

Bryden, *Deadly Allies: Canada's Secret War 1937-1947*, (Toronto, ONT: McClelland & Stewart Inc., 1989).

[82] Rear Admiral Thomas Brooks identified Vietnam as a "probable" chemical weapons possessor in testimony before Congress. Brooks, statement before the Subcommittee on Seapower, Strategic and Critical Materials, p. 107.

[83] The Pentagon has reported the existence of chemical weapons in the FRY. Judith Miller, "U.S. Officials Suspect Deadly Chemical Weapons in Yugoslav Army Arsenal," *New York Times*, April 16, 1999.

The Federation of American Scientists has confirmed the existence of four chemical weapons facilities in the former Yugoslavia, three in Serbia and one in Bosnia. The three facilities in Serbia are Prva Iskra, in Baric, Serbia; Miloje Blagojevic in Lucani, Serbia; and Miloje Zakic and Merima in Krusevic, Serbia. The fourth facility is the Military Technical Institute in Potoci near Mostar, Bosnia and Herzegovina. The Federation of American Scientists, "Chemical Agents in the Former Yugoslavia," *Nuclear Forces Guide*, (<http://www.fas.org/nuke/guide/serbia/cw/index.html>), April 23, 2000.

[84] "Chemical Agents in the Former Yugoslavia," *Nuclear Forces Guide*, (<http://www.fas.org/nuke/guide/serbia/cw/index.html>), April 23, 2000.

Pentagon officials believe the FRY possesses sarin, mustard gas, BZ, and CS. Judith Miller, "U.S. Officials Suspect Deadly Chemical Weapons in Yugoslav Army Arsenal," *New York Times*, April 16, 1999.

Human Rights Watch reports FRY possession of sarin, sulfur mustard, BZ, CS, CN, LSD-25, chloropicrin, cyanogen chloride, soman, tabun, and VX. Human Rights Watch, "Chemical Warfare in Bosnia?," *Human Rights Watch Report*, Vol. 10, No. 9 (D), November 1998.