

CHEMICAL AND BIOLOGICAL WEAPONS IN EGYPT

by Dany Shoham¹

Dr. Dany Shoham is a researcher at the Begin-Sadat Center for Strategic Studies at Bar-Ilan University, Ramat Gan, Israel, specializing in chemical and biological warfare in Arab countries and around the world. Formerly, he was a senior analyst and lieutenant colonel in Israeli military intelligence. Dr. Shoham received a Ph.D. in medical microbiology from Tel-Aviv University. He has published 16 articles on virology and a monograph on chemical weapons in Syria and Egypt.

While Egypt stopped short of developing nuclear weapons, there is considerable evidence that it has developed chemical and biological weapons (CBW). By the early 1960s, it had begun a project—code-name “Izlis”—that eventually produced weaponized agents.² Egypt was the first Arab state to employ chemical weapons (CW) during the civil war in Yemen in 1963.³ Since then, Egypt has refused to dismantle these systems and is believed to maintain a current stockpile.

This article first analyzes the history of Egypt’s CW program, the evidence of past use of these agents, and the rationale for Egypt’s refusal to sign and ratify the Chemical Weapons Convention (CWC). It then examines the less well-documented but still compelling evidence for an Egyptian biological weapons (BW)

program. The main argument presented here is that Egypt plans to maintain its CBW capability until an agreement is reached on a zone free of weapons of mass destruction (WMD) in the Middle East.

THE 1960s: ORIGINS OF THE CW PROGRAM

In 1963, Egypt opened its first CW production facility at Abu-Za’abal, an industrial zone some 10 kilometers northeast of the city of Cairo, bordering the desert. This facility, called the Abu-Za’abal Company for Chemicals and Insecticides, was secretly known as Military Plant No. 801 and was run by the Egyptian Ministry of Defense under the cover of a commercial factory. Precursor chemicals for CW agent production may have been furnished by the Soviet Union, which provided extensive military assistance to

Egypt at the time.

The outbreak of the Yemen War in 1963 affected Egyptian and Soviet interests directly, since both countries hoped to preserve the republican regime in Yemen. For five years (1963-67), the Egyptian Air Force employed CW in Yemen, delivering them mainly with Soviet-made Ilyushin-28 aircraft.⁴ The chemical attacks were targeted primarily at royalists who had found shelter in the caves of Yemen’s mountains, where conventional warfare was ineffective. A variety of chemical agents were employed, including tear gas (CN), mustard gas, and phosgene asphyxiant.⁵ Egypt’s chemical munitions included Soviet-made KHAB-200 R5 aerial bombs (filled with mustard) and AOKh-25 aerial bombs (filled with phosgene).⁶ Cairo also possessed, but did not employ in Yemen, a large quantity

of mustard-filled artillery shells, which had been abandoned by the British military in Egypt's Western Desert at the end of World War I.⁷

The Yemen war provided an opportunity for Egypt to test the battlefield effects of the CW agents in its arsenal. The relative ease with which Egypt manufactured and employed CW repeatedly during the conflict, its success in targeting unprotected civilians, and the moderate response of the international community all spurred Egypt to expand its CW stockpile. Other Arab states, specifically Iraq and Syria, were positively impressed by Egypt's experience and sought to emulate it.⁸ Although Egyptian President Gamal Abdel Nasser presumably authorized the use of CW in Yemen, he denied Egypt's use of such agents. It was not until 1990 that a senior Egyptian military intelligence official finally admitted that Egypt had employed CW during the Yemen civil war.⁹

Throughout the 1960s, high-ranking Egyptian military officers were trained in the Soviet Union at the Red Army's Academy of Chemical Defense in Moscow,¹⁰ where they presumably acquired technical knowledge relevant to offensive CW use. In addition, West German specialists in missiles and CBW provided assistance to Egypt.¹¹ In particular, two remarkably toxic compounds developed in Germany—fluoroacetate (a lethal substance) and an oxazepine compound (a psychotropic substance)—were studied by Egyptian scientists at Abu-Za'abal during the 1960s.¹²

Contrary to its frequent use of CW in the Yemen civil war, however, Cairo made no attempt to launch chemical attacks during the 1967 Six

Day War, when Israeli forces occupied the Sinai Peninsula and destroyed a large portion of the Egyptian Army and Air Force. Cairo probably did not resort to chemical warfare because it feared Israeli retaliation in-kind. After the 1967 war, however, Egypt expanded its chemical arsenal, particularly in the period leading up to what came to be known as the Yom Kippur War in 1973.

THE 1970s: THE YOM KIPPUR WAR

It is reasonable to assume that when Egypt made the decision to attack Israel in the Yom Kippur War, Cairo viewed CBW as key components of its military strategy, particularly in the absence of a nuclear capability. Thus, a considerable build-up of these weapons preceded the 1973 war. Egypt's increased activity in the CW field focused on technological and scientific aspects relating to the production and improvement of its CW agents. The Central Military Chemical Laboratories of the Egyptian Army studied sulphur and nitrogen mustard and organophosphorus nerve agents (sarin and VX-related compounds).¹³ Other laboratories involved in these studies were the Egyptian National Research Center and Ain-Shams University, and the Technical University of Budapest in Hungary. During the same period, Egyptian chemists studied military-usable hallucinogens such as the glycolates BZ and EA-3443.¹⁴ The institutions involved were the Egyptian National Research Center and laboratories in the United States and West Germany.¹⁵

During the 1970s, based on this accumulating technical knowledge, Military Plant No. 801 manufactured

new CW agents to expand and improve Egypt's chemical arsenal.¹⁶ It appears likely that the first nerve agent produced was sarin. At a later stage, Egypt began manufacturing the persistent nerve agent VX and a military hallucinogen in the glycolate family. These new additions to Egypt's chemical arsenal supplemented its existing supplies of mustard gas and phosgene. The agents were filled into aerial bombs, artillery shells, rockets, mortar bombs, and mines.¹⁷

Before the Yom Kippur War, strategic cooperation between Egypt and Syria expanded into the CW area. At that time, Syria did not have a CW capability, and Egypt initially supplied its ally with technical know-how and small quantities of CW agents for research purposes.¹⁸ In 1972, however, Egypt agreed to supply an entire CW arsenal to Syria for the sum of \$6 million.¹⁹ Such an agreement between two Arab states was unprecedented and was probably part of the two countries' joint reorganization plan (the formation of the United Arab Republic), carried out prior to their joint surprise attack on Israel. The CW that Egypt shipped to Syria included sarin²⁰ and mustard gas²¹ filled artillery shells²² and aerial bombs.²³ This transfer gave the Syrians a strategic offensive CW capability of the first order, should they require it.

During the Yom Kippur War, at least one unit of the Egyptian Air Force was on alert in case a decision was taken to employ nerve gas,²⁴ but no use occurred. After the war, however, Egyptian President Anwar Sadat and Defense Minister Mahmoud Abd El-Rany Gamasi hinted that if Israel launched a military offensive in the hope of revers-

ing Egypt's achievements during the war, Cairo would seriously consider the use of nonconventional weapons.²⁵ In July 1975, General Gamasi, then Egyptian Chief of Staff, declared that Egypt would employ WMD if Israel resorted to the nuclear option.²⁶ This threat was obviously intended as a deterrent.

Shortly after the signing of the 1978 peace treaty between Egypt and Israel, Cairo began secretly to cooperate with Iraq. Baghdad offered considerable financial support to increase Egypt's output of CW agents and chemical munitions, in the hope of reaping some of the rewards.²⁷ Egypt also felt impelled to enhance its strategic-technological cooperation with Iraq through the joint development of a ballistic missile designed to carry, among other payloads, CBW warheads.²⁸ The timing of this cooperation was not coincidental. The secret joint development program was designed to equalize, at least in part, what Egypt and Iraq perceived as a considerable imbalance in their strategic capabilities vis-à-vis Israel.²⁹ Egypt may have viewed this collaboration as a hedge against the possibility that peace with Israel would unravel, and Iraq clearly had the Iranian threat in mind.

THE 1980s: ORGANIZATIONAL CHANGES AND COLLABORATION WITH IRAQ

Throughout the 1980s, Egypt continued to expand its knowledge of CW agents.³⁰ Scientific research on most aspects of organophosphorus substances, including nerve-gas-like pesticides, took place at the National Research Center in Cairo.³¹ Egypt-

tian chemists engaged in joint research with colleagues in Denmark and West Germany, and a high-ranking Egyptian officer, Major General Hussein Ades, received training at the University of Columbus (Ohio) in organophosphate compounds similar to nerve gases.³² Scientists at the Egyptian National Research Center studied the effect of sea water on organophosphates,³³ presumably to assess the feasibility of sea dumping as a means of disposing of old nerve agents. The Military Technical College in Cairo studied the physiological effects of nerve-gas-like pesticides.³⁴ In addition, at an Egyptian facility for formulating pesticides, scientists studied the delayed effects of nerve-gas-like pesticides on the neurological functions of 230 exposed plant workers, in collaboration with Research Triangle Park in North Carolina.³⁵

In 1983 and 1984, news items appeared in the Egyptian press regarding the comprehensive reorganization of Military Plant No. 801 at Abu Za'abal, otherwise known as the Company for Chemicals and Insecticides.³⁶ The division manufacturing CW at Military Plant No. 801 was reorganized to eliminate obsolete manufacturing facilities and to update CW production with the aid of West European companies.³⁷ The Egyptians went to great lengths to carry out this two-stage plan. They established renewed production lines for key nerve-agent precursors, particularly phosphorus trichloride, and then built an enlarged manufacturing facility for nerve gas. This plan, whose official "customer" was the El-Nasr Pharmaceutical Company at Abu-Za'abal,³⁸ used the construction of raw material production lines at the pharmaceutical company as a cover for building an improved

CW manufacturing facility at the neighboring Military Plant No. 801.

Despite a warning from Swiss authorities,³⁹ the Swiss chemical company Krebs AG supplied Egypt in 1987 with a complete facility for producing phosphorus trichloride. Production equipment for this plant was furnished by Stauffer Chemicals, a Pennsylvania-based company. In 1988, Egypt also acquired the main components for a sarin manufacturing facility.⁴⁰ A short time earlier, the Iraqis had concluded a similar deal with the aid of several West German companies.

In March 1989, the Egyptian-Krebs connection came to public attention. After U.S. pressure on the Swiss government to cancel the project, and Egypt's refusal to specify what chemicals would be manufactured at the facility, Krebs abandoned the final stages of the plant, which had nearly been completed.⁴¹ The president of Krebs said that although he believed the Egyptian facility to be a "manufacturing plant for pharmaceutical chemicals," his company was severing all ties with its Egyptian partner.⁴² On the same day, Egyptian President Hosni Mubarak claimed that the facility in question was a pesticide manufacturing plant.⁴³ A few weeks later, U.S. Senator Daniel Inouye arrived in Cairo for talks with President Mubarak. To persuade Senator Inouye that Egypt was not manufacturing CW, the Egyptian government gave him a tour of Abu-Za'abal. The tour focused on a tank manufacturing plant and created a misleading eyewitness account by Senator Inouye that ostensibly disproved the allegations.⁴⁴

Egypt also expanded its CW production capabilities at a number of

other facilities. For example, a CW plant near the Egyptian Air Force base in Bani-Sueff, some 60 kilometers south of Cairo, placed an order with Canadian suppliers for chemicals for the production of nerve agents,⁴⁵ but the request was denied.⁴⁶

Although the reorganization of the Egyptian chemical industry appeared to be entirely civilian in character, it was actually intended to improve Egypt's CW production capabilities. Strong evidence for this conclusion can be found in the doctoral dissertation submitted in 1985 by the head of Egypt's Chemical Warfare Directorate, General Mamdouh Hamed Ateya. His dissertation dealt with the future of nuclear weapons in the Middle East, and one of its central themes was that CW could constitute an important deterrent for the 1980s and beyond.⁴⁷

Strategic Cooperation with Iraq

Cairo's growing cooperation with Baghdad resulted in a secret agreement in 1981 in which Iraq gave Egypt \$12 million to expand its CW capabilities.⁴⁸ In return, Egypt assisted Iraq in the production and storage of CW agents,⁴⁹ the establishment of chemical manufacturing facilities in Iraq through the Egyptian branch of the German company Walter Thosti Boswau (WTB) International,⁵⁰ and the purchase of raw materials for the production of CW agents.⁵¹ For example, 26 tons of hydrogen fluoride were shipped to Egypt from the United Kingdom in 1986. In fact, Egypt was merely a waystation, and the final destination was an Iraqi CW production facility where the hydrogen fluoride was used to produce the nerve agent sarin. This shipment was authorized

by the British government despite concerns that the ultimate recipient was indeed Iraq. At the recommendation of the British foreign minister, the United Kingdom satisfied itself by communicating its concern to the Egyptian government. Later, an additional 34 tons of hydrogen fluoride were shipped to Iraq along the same route.

Another important collaborative effort between Egypt and Iraq was a joint ballistic missile development project. In the late 1970s, as relations between the two countries improved, they decided to co-develop a long-range ballistic missile capable of delivering conventional warheads as well as CBW, with an approximate range of 950 kilometers for a warhead weighing 450 kilograms.⁵² Argentina was selected as a country that could provide the necessary technologies, and it also had the virtue of being located far from the eyes of foreign intelligence services focusing on the Middle East. A trilateral agreement concerning the missile project (named Condor-2 or Badr-2000 in Iraq) was signed in 1984. The goal was to equip Egypt and Iraq each with 200 missiles and to construct the facilities to produce them in both countries.⁵³ With this in mind, Egypt built a missile plant near its CW production facility at Abu-Za'abal.⁵⁴ The Condor-2 project laid the groundwork for Egyptian-Iraqi cooperation on additional missile manufacturing efforts, which were carried out mainly in Iraq. These missiles were also designed to be capable of delivering CBW warheads.

During this period, the Iraqis fought a war with Iran in which they employed blister and nerve agents extensively from 1984 to 1988. It is

possible that the lessons learned by the Iraqis from their own use of CW, and from defending themselves against Iranian retaliatory use in the final years of the war, were shared with Egypt. In this way, Cairo may have gained considerably in both the theory and practice of chemical warfare from its joint venture with Iraq.

At the same time, Egypt cultivated a cooperative relationship with North Korea, a country well-versed in the technology of ballistic missiles and equipped with an impressive CW arsenal, including Scud-B missiles armed with chemical warheads. In 1986, North Korea completed the development of a missile with a somewhat longer range (320 to 340 kilometers) and a series of warheads (standard, cluster, chemical, and biological), which Egypt hoped to emulate.⁵⁵

Official Denials, Unofficial Hints

Even as Egypt moved to improve and expand its chemical arsenal, it continued to deny officially any possession of CW. In 1988 and 1989, the Egyptian representative announced to the Conference on Disarmament in Geneva that Egypt had not produced, developed, or stockpiled CW.⁵⁶ Moreover, in 1989 the Egyptian Defense Minister stated, "We maintain that we do not have any CW in our possession, and that it is not our intention to manufacture CW."⁵⁷

That same year, however, an Egyptian major-general published an article in the *Arab Defense Journal* entitled "Biochemical War," the most comprehensive treatise on the subject of CBW ever published in an Egyptian military journal. Remarkably, the article mentioned Egypt as one of the 16 states that the

U.S. Central Intelligence Agency had assessed as having CW, making no attempt to rebut the allegation.⁵⁸ The article also reviewed various conflicts in which biochemical agents had been used and conspicuously omitted both the Egyptian-Yemen conflict and the Iraq-Iran War.

Also in 1989, a senior Egyptian official, Major-General Esmat A. Ezz, published an article in the U.N. disarmament journal *UNIDIR Newsletter* in which he listed the primary factors driving developing countries to acquire CW. These motivations included the tactical military value of CW, as reflected by the fact that even nations with a nuclear capability continued to improve their chemical inventories, and the need to acquire nonconventional weapons to counter the nuclear threat. Major-General Ezz concluded that given Egypt's inability to secure a nuclear capability of its own, Egypt and other Arab countries were justified in having CW as a counterweight to the nuclear arsenal attributed to Israel.⁵⁹

THE 1990s: THE GULF WAR AND THE CHEMICAL WEAPONS CONVENTION

In March 1990, Egyptian Defense Minister Mahmoud Fauzi, in an interview with a Lebanese military periodical, noted that the deployment of CBW was not a new occurrence and that future political and military circumstances would necessitate the development of ballistic missiles as the principal means of delivering such agents. These weapons would then affect the balance of power in the Middle East.⁶⁰ It is reasonable to assume that the Egyptian Defense Minister was keenly aware of Iraq's

vigorous efforts in this area. Indeed, Egypt was making similar efforts, partly in cooperation with Iraq, but they were concealed from public view to a far greater degree.

On April 8, 1990, returning from a visit to Baghdad, Egyptian President Mubarak declared that Egypt was making every possible effort to demilitarize the Middle East of chemical, biological, and nuclear weapons and called on all the nations in the region to cooperate in achieving this goal.⁶¹ Egypt's ambassador to the United Nations submitted President Mubarak's initiative to the Security Council and stressed that the ban should include all categories of WMD.⁶²

In a seminar on "Disarmament and Security in Africa," held in Cairo in May 1990, the Egyptian representative, Major-General Ezz, argued that "in a situation in which a country cannot obtain nuclear weapons of its own and is under threat of a nuclear attack and has nothing with which to respond to this threat, a nation would be foolish not to turn to the chemical option either as a deterrent or in reprisal to a nuclear attack."⁶³

In June 1990, two months before the Iraqi invasion of Kuwait, former Egyptian Defense Minister General Fauzi was interviewed by a Lebanese newspaper. He had just returned from the Arab States Convention in Baghdad with the aim of helping Iraq to withstand the increasing political pressure from the West. In the interview, he argued that despite the Mubarak proposal, "the Arabs should continue acquiring chemical, biological, and nuclear weapons intended for mass destruction."⁶⁴

In September 1990, an item in the

Egyptian press claimed that some of the CW in Iraq's arsenal had been manufactured in Egypt. These agents had reportedly been used in experiments carried out by Iraq on Iranian prisoners of war and had been found to be lethal.⁶⁵ The report also mentioned an unnamed "high-ranking Egyptian military official" who claimed that Egypt possessed large quantities of CW.

Egypt and the Chemical Weapons Convention

Egypt was involved in the negotiation by the Conference on Disarmament in Geneva of the Chemical Weapons Convention (CWC), a multilateral ban on chemical weapons, particularly during the endgame phase in November 1992. While denying any possession of CW, Egypt insisted on a linkage between chemical disarmament and the elimination of other WMD. The Egyptian delegation also endorsed a French proposal that while the international community should pursue the long-term goal of destroying all CW arsenals, certain countries had a legitimate need to produce CW as a deterrent during the interim period.⁶⁶

In May 1992, Egyptian Foreign Minister Amre Moussa made it clear that although Egypt supported the CWC negotiations and had participated in them, it would not sign the convention because the issue of nuclear weapons had not been addressed.⁶⁷ That same month, at a conference convened to debate arms control in the Middle East, Egypt tried to convince other Arab states to draft a joint position paper on this issue.⁶⁸ Shortly before the CWC was opened for signature in January 1993, Egyptian Foreign Minister Moussa explained why Egypt would

not participate in the regime:

We now have a treaty addressing the issue of CW. We are convinced of its necessity and want to sign our name to it. However, if we do so we will have joined both the convention on nuclear weapons and the convention on CW, unlike Israel. Therefore, we will not join the chemical convention, despite our having participated in drafting it. I hope that the Arab position will remain united in order to maintain a balance in the Middle East with regard to defense.⁶⁹

This statement seemed to reflect the Egyptian-Arab reliance on CW to maintain a rough military-strategic balance in the region. Even if Egypt might not consider itself directly threatened by the nuclear weapons attributed to Israel, it is apparently unwilling to tolerate what it regards as a vast strategic imbalance. This appears to be both a matter of principle and an attempt to prevent other Middle Eastern countries, including Arab states, from acquiring nuclear weapons. Egypt also seeks to prepare itself for whatever political changes might occur in the region, taking into account the possibility of deteriorating relations and uncertainty.⁷⁰

In June 1993, at a Pugwash workshop in Sweden, the Egyptian representative submitted a background paper titled "The Arabs and the Chemical Weapons Convention," in which he argued that Arab states should not be expected to join the CWC as long as there was no concurrent *reduction*—but not necessarily *elimination*—of the nuclear weapons in Israel's possession.⁷¹ He then suggested a series of practical steps whose implementation would gradually bring about the elimination of WMD in the Middle East. In

this way, the Egyptian representative appeared to recognize Israel's need for a strategic nuclear deterrent, which it would be allowed to retain for some time to come. In exchange, Arab states would undertake not to acquire—though not necessarily to destroy—WMD of any kind.

Despite such pragmatic ideas, the Egyptian Foreign Ministry has persisted in its "all-or-nothing" approach to WMD, whether in reference to Egypt alone or to the Arab states.⁷² This approach is presumably driven by the existence of Egypt's chemical arsenal, a reality acknowledged by an unnamed Egyptian diplomatic source in Cairo⁷³ and by a senior Egyptian strategist.⁷⁴

Improved CW Production and Delivery Capabilities

In 1992, Western intelligence agencies identified renewed activity in Egypt with regard to the production of CW.⁷⁵ The Egyptian Company for Dye Stuffs and Chemical Products was expanded to manufacture the pesticide malathion, but was also capable of producing phosphorus pentasulphite,⁷⁶ a key precursor for VX nerve agent. Egypt also began to import CW precursors from India, which had also become a supplier to Iran and Syria.⁷⁷ India supplied CW precursors to Egypt in industrial quantities until at least 1993, totaling at least 340 tons. Egypt also purchased equipment suitable for CW production from the Hungarian company Lampart.⁷⁸

At the same time, Egypt appears to have expanded its industrial infrastructure for the production of nerve gases to diminish its dependence on imports of CW precursors and other raw materials. Two Egyptian pesticide plants, in Kafr El-

Dawar and Kafr El-Zayat, have been suspected of CW agent production.⁷⁹ Published evidence indicates that the Kafr El-Zayat factory handles highly toxic organophosphorus compounds.⁸⁰ Another pesticide plant, located in the area of Manuf-Abu-Rawash and affiliated with the public sector, has been accused by Egyptian critics of illegally producing and storing poisonous materials.⁸¹ It can therefore be assumed that both imported and domestically manufactured precursor chemicals are currently being used to produce CW, with an emphasis on advanced VX nerve gas.

Egypt has also been thought to have the "majority of critical elements of CW systems."⁸² In 1993, a Russian Foreign Intelligence Service report pointed out the existence of information indicating that Egypt intended to acquire missile warheads that it would fill with CW agents.⁸³ This report also stated that while Egypt's CW arsenal could not sustain large-scale operations, its industrial capacity would enable it to produce an additional quantity of agent within a short period of time.

Egypt also upgraded its CW delivery systems. In January 1989, a report was published in Lebanon on the existence of ballistic missiles fitted with chemical warheads in Egypt, Syria, and Iraq.⁸⁴ Further reports of the existence in Egypt of ballistic missiles with chemical warheads also appeared later.⁸⁵ It is plausible that Egyptian Military Industries has acquired the capability to produce submunition warheads for CW delivery, including one containing 1,000 bomblets for the Egyptian-made Sakr-80 rocket, with a range of 80 kilometers.⁸⁶ Egypt has supplied these rockets to Iraq.⁸⁷

A partially owned Arab subsidiary of British Aerospace Dynamics was involved in a joint Egyptian-North Korean project to increase the range of the Scud-B missile and other Egyptian projects involving guided missiles.⁸⁸ In addition, Russian scientists provided assistance to Egypt in the development of 450-kilometer and 1,600-kilometer range missiles.⁸⁹ It is likely that these projects were designed by Cairo to make up for its diminished technological cooperation with Iraq and Argentina on ballistic missiles, and for the difficulties Egypt faced in its attempts to advance the Condor project. Egypt utilized the Condor technologies to develop another ballistic missile called Vector, with a range exceeding 1,000 kilometers, while simultaneously acquiring from North Korea the components needed for Scud-C production.⁹⁰ Egypt has probably attained the technological know-how needed to fit ballistic missiles with chemical warheads.

EGYPT'S BIOLOGICAL WEAPONS PROGRAM

The most detailed published reference dealing with Egyptian activities in the area of biological weapons (BW) is a 1993 report by the Russian Foreign Intelligence Service, which states:

Egypt has a program of military-applied research in the area of biological weapons, but no data have been obtained to indicate the creation of biological agents in support of military offensive programs. The research programs in the area of biological weapons date back to the 1960s. As we all know, in the early 1970s President Sadat confirmed this, announcing the presence in Egypt of a stockpile of biological agents stored

in refrigerated facilities. Toxins of a varying nature are being studied, and techniques for their production and refinement are being developed at the present time by a national research center.

There is information on cooperation between Egypt's research centers in areas of biological research related to biological weapons and certain civilian and military laboratories of the United States, particularly in the field of highly pathogenic microorganisms and dangerous vectors. The functioning in Egypt of a U.S. naval military-medical laboratory for the study and development of means of combating particularly dangerous infectious diseases is also known. The laboratory is one of the leading Near East medical-biological centers, equipped with the latest apparatus and staffed with highly qualified American specialists. Concern is raised by the fact that the subject matter of the research of this laboratory is strictly classified.⁹¹

Otherwise, only the United States has made public allegations about Egypt's BW capability. In 1996, the U.S. Arms Control and Disarmament Agency reported that "The U.S. 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."⁹²

The Soviets appear to have followed Egypt's activities in the BW domain until 1973. From that time onward, the Americans were able to trace those activities, thanks to their deepening cooperation with Egypt. Thus, the two citations above are probably based on reliable informa-

tion. In addition, documents issued within the Egyptian Army throughout the 1960s and captured during the Yom Kippur War indicate the importance that Egypt attributed to the strategic use of BW as well as the operational and tactical utility of these weapons.⁹³

BW Development and Production Facilities

In the late 1950s, the Soviet Union provided assistance to Egypt for the construction of an exceptionally large pharmaceutical complex called the El-Nasr Company for Pharmaceutical Chemicals and Antibiotics. The site selected for this complex was at Abu-Za'abal. This location was justified with the official statement that "consequent to rigorous surveys, the Egyptian and Soviet experts reached the conclusion that this location is preferable since there are general facilities there, it is easy to get rid of the industrial wastes, and the wide area enables further expansion."⁹⁴ Shortly after the completion of the El-Nasr plant, moreover, the Company for Chemicals and Insecticides—alias Military Plant No. 801—was constructed nearby.

The El-Nasr facility consists of two main industrial wings, one devoted to fermentation and the other to chemical synthesis. The fermentative-antibiotic wing (FAW) manufactures industrial quantities of a variety of culture media for cultivating bacteria and fungi. The FAW also specializes in bacterial sensitivity to antibiotics (its principal pharmaceutical products).

Research and Development

Egypt has done applied research on several BW-related pathogens and toxins, including: the bacteria

that cause anthrax, botulism, plague, cholera, tularemia, glanders, brucellosis, melioidosis, and psittacosis; the rickettsia that cause Q fever; and the viruses that cause Japanese B encephalitis, Eastern equine encephalitis, influenza, and smallpox. Research and development efforts on a few of these agents are discussed below.

Botulinum toxin. Various strains of the toxigenic bacterium *Clostridium botulinum* type B have been successfully cultivated (e.g., in infusion broth medium) and used for toxin production.⁹⁵ This research took place even though there was no recorded incidence of botulism in Egypt until 1991, when a major outbreak sickened 91 hospital patients in Cairo, 20 percent of whom died.⁹⁶ Industrial production of some closely related toxins, such as tetanus toxin and various veterinary *Clostridial* toxins, has been operational for several years, and was modernized in the late 1970s by the Public Health Institute of Bilthoven in the Netherlands.⁹⁷

Plague. The causative bacterium of plague has been cultivated industrially in Egypt for vaccine production.⁹⁸ Indigenous outbreaks of this disease have occurred,⁹⁹ and the causative strains have presumably been isolated and studied. Egyptian scientists have also participated in research on plague conducted by the U.S. Navy Medical Research Unit (NAMRU-3) in Cairo, and at Walter Reed Army Medical Research Institute in Bethesda, Maryland.¹⁰⁰ Egyptian studies have included experimentation with a closely related pathogen, *Pasteurella multocida*, with a focus on environmental survivability and intranasal infection, presumably as a model

pathogen for plague and tularemia.¹⁰¹

Anthrax. Although no scientific work has been published in Egypt on this classic BW agent, it is indigenous to the country. The closely related species *Bacillus subtilis* has been cultivated in industrial quantities at the El-Nasr pharmaceutical plant for the production of an enzyme.¹⁰² Another closely related species, *Bacillus brevis*, was used as a model bacterium for a continuous-fermentation system in a study at the University of Kent, England, conducted by an Egyptian scientist affiliated with the Egyptian Military Technical College.¹⁰³

Mycotoxins. In work supported in part by the U.S. Army, Egyptian researchers have extensively studied trichothecene mycotoxins, a class of potent toxins produced by the fungal mold *Fusarium*, including T-2 toxin, vomitoxin, and fusariotoxin.¹⁰⁴ Since the 1960s, a closely related fungal mold (*Gibberella fujikuroi*) was routinely used at the El-Nasr pharmaceutical plant for industrial fermentation.¹⁰⁵ It has also been alleged that the Egyptian Air Force employed trichothecene mycotoxins as a biochemical weapon during the Yemen civil war.¹⁰⁶ Some 15 years later, Major-General Ezz, the head of the Egyptian Chemical Corps, led an inconclusive U.N. investigation into the alleged use of *Fusarium* trichothecenes ("yellow rain") as a biochemical weapon during the late 1970s and early 1980s by the Soviet Union and its communist allies in Afghanistan, Laos, and Cambodia. Another class of fungal toxins known as aflatoxins have also been studied.¹⁰⁷

Rift Valley Fever virus. The causative virus of Rift Valley Fever (RVF) was isolated for the first time in Egypt in October 1977, during a fatal epidemic in Belbeis, El-Khanka, and Cairo that afflicted a large number of people.¹⁰⁸ Several strains of the RVF virus indigenous to Egypt have been characterized.¹⁰⁹ Extensive studies have been conducted in Egypt on this deadly virus, including the development of improved methods of virus production and research on natural and experimental airborne infection.¹¹⁰ Mosquito-borne infection has also been studied experimentally in collaboration with the U.S. Army Medical Research Institute of Infectious Diseases at Fort Detrick, Maryland.¹¹¹

Public References to the BW Program

During the 1970s, President Sadat and the Egyptian Ministry of Defense hinted repeatedly at Egypt's possession of BW. After Sadat's death, the Egyptian representative to the 1980 Review Conference of the Biological Weapons Convention (BWC), which Egypt had signed but not ratified, stated that Egypt had never developed, produced, stockpiled, or otherwise acquired or retained BW.¹¹² At the next Review Conference in 1986, the Egyptian representative stated that Egypt supported the framework and content of the BWC but viewed it as an integral part of a comprehensive agreement for the elimination of all WMD.¹¹³ As a result, Egypt has refused to ratify the BWC to the present day.

In 1989, the military correspondent of the Egyptian newspaper *Al Gumhuriya* noted that Egypt and

Iraq had agreed to conduct joint projects, the first of which was to assist Iraq in producing defensive measures against CBW.¹¹⁴ The Egyptian Minister of Military Industries vigorously denied that Egypt was in any way cooperating with Iraq to produce CBW or ballistic missiles.¹¹⁵ Nevertheless, the ambiguity between defensive and offensive research and development on BW is well-known, and the documented cooperation between Egypt and Iraq in the CW field may have extended to BW as well. In 1991, Major-General Ezz published some views about BW agents and their handling that appeared to be based on a degree of practical experience.¹¹⁶

In summary, 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. Egypt's extensive collaboration with Iraq may have yielded additional BW agents. To date, Egypt has provided only limited information to the United Nations Special Commission (UNSCOM) on its collaboration with Iraq in the CW field,¹¹⁷ and it has revealed nothing about possible joint activities in the BW field.

In light of the delivery systems in the Iraqi BW inventory, it is possible that Egypt has adapted aerial bombs and missile warheads for BW delivery. Modified CW agent delivery systems could plausibly serve this purpose. Improved dispersion of agent could be achieved through the development of cluster warheads and aerosolization systems.

CONCLUSIONS

Aware of its inability to acquire nuclear weapons, and believing Israel to possess chemical, biological, and nuclear weapons, Egypt has acquired its own CBW capabilities primarily as a strategic counterbalance, an objective clearly reflected in Egyptian policy and statements. The nonconventional arms race among the other Arab countries and Iran creates additional proliferation incentives. Indeed, the near-simultaneous start in 1963 of the Yemen civil war and the Egyptian CBW program appears to have been no accident. Since the Soviets were providing extensive military assistance to Egypt at the time, direct field-testing of CBW in Yemen may have been a joint Egyptian-Soviet initiative. Given this historical background, Egypt's CBW doctrine probably includes the option of first use as well as retaliation in-kind.

Already, Egypt has relied on its CBW arsenal for deterrence purposes, both before and after the 1973 Yom Kippur War, in an apparent attempt to neutralize Israel's nonconventional retaliatory option. The essential supporting role of a BW capability is evident in the Egyptian strategic concept. Egypt officially denies that it possesses CW or BW, apparently calculating that its undeclared capability is already well-known and hence exerts a deterrent effect without exposing Cairo to international opprobrium.

Finally, Egypt conceives of its CBW program as a means to pressure Israel to reach a comprehensive agreement banning all WMD in the region. To this end, Cairo has sought to influence the policies of the three other Arab CBW-possessor states (Syria, Libya, and Iraq), particularly

with respect to their participation in the CWC, based on shared strategic interests. Thus, it is not surprising that Egypt has cooperated with those countries in upgrading the strategic profile of their CBW capabilities.¹¹⁸

¹ The author's address is: Helsinki Street #8, Tel Aviv, Israel; e-mail: shoham_d@netvision.net.il. The author thanks Alona Cherkassky for technical assistance.

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