CSIS | CENTER FOR STRATEGIC & INTERNATIONAL STUDIES | Burke Chair in Strategy

IRANIAN WEAPONS OF MASS DESTRUCTION:

BIOLOGICAL WEAPONS PROGRAMS

Anthony H. Cordesman
Arleigh A. Burke Chair in Strategy
acordesman@gmail.com

With Adam C. Seitz
ASeitz@csis.org

Working Draft for Review and Comments:
October 28, 2008

Table of Contents

IV. Iran's Biological Weapons Programs

Any analysis of Iran's biological weapons effort must be even more speculative than an analysis of its chemical and nuclear weapons efforts, and the details of its missile programs. Many claims can be traced back to hard-line opponents of the regime that have uncertain to dubious credibility. Others provide important insights into Iran's potential capability, but do not prove Iran has an active program, or that it has ever produced such weapons.

As is the case with Iran's other potential efforts to develop weapons of mass destruction, Iran denies that it currently has such programs, although – as is the case with chemical weapons – some statements imply it may have had such programs in the past. Similarly, the statements of the US government have the same internal problems and contradictions as those relating to chemical weapons, while too little data is available from other governments to get a picture of their official position or the judgments of their intelligence communities.

Another problem in trying to gain insight into Iran's biological weapons programs is that these types of programs are easy to conceal due to the small-scale equipment and dual-use raw materials needed in the production process. Biological agents are easier and cheaper to produce than either nuclear materials or chemical warfare agents, and the necessary technology is widely available and relatively easy to acquire. The fact of the matter is that any nation with even modestly sophisticated biopharmaceutical industrial capabilities is capable of producing biological agents. But weaponizing and storing weaponized biological agents is a much more complex process.

A number of NGOs have made considerable contribution to the analysis of Iran's programs, but they are forced to rely on uncertain reports and unreliable sources. Biological weapons also present the problem that there is no meaningful separation between defensive and offensive efforts. Effective defense requires access to effective biological agents. The facilities necessary to develop, and produce, such weapons can be very small compared to those for chemical and nuclear weapons.

Biological weapons activities can easily be concealed in organizations, facilities, and even universities; which serve medical, biological manufacturing, and research purposes – although sometimes at the cost of a significant risk in safety. Moreover, the steady expansion of civil biotechnology, food processing, and pharmaceutical activities makes dual-use equipment commercially available that can be used to produce even the most advanced biological agents and a combination of Iran's use of covert purchasing networks and steadily weakening controls – particularly over used and surplus equipment – have further weakened already weak export control efforts.

A History of Uncertain Judgments and Indicators

There have been reports that Iran has had biological weapons programs ever since the first years of the Iran-Iraq War. For example, US officials began to provide background briefings 1982 that Iran had imported suitable type cultures from Europe and was working on the production of mycotoxins -- a relatively simple family of biological agents that require only limited laboratory facilities for small-scale production. One of the first research facilities was established in 1986 under the Iranian Pasteur Institute, and

around the same time a similar research program on producing myotoxins began at Vira Laboratory.

Many experts believed that an Iranian biological weapons effort had been placed under the control of the Islamic Revolutionary Guards Corps (IRGC), which had elements and subsidiaries known to have tried to purchase some equipment that could be used for the development and production of such weapons.

Actual Programs or Potential Capability

A long chronology of reports surfaced from 1982 onwards, many in the form of official, unofficial, and opposition group background briefings. For example, U.S. and British intelligence sources reported in August 1989 that Iran was trying to buy two new strains of fungus from Canada and the Netherlands that can be used to produce mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.

Some universities and research centers were linked to the biological weapons program. The Imam Reza Medical Center at Mashhad University of Medical Sciences and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.

These reports intensified in the early 1990s, after the post-Gulf War discovery of Iraq's massive BW program. It is not clear, however, whether these reports describe real or potential activities, and whether the increase in reports since the early 1990s was the result of increases in Iranian activity or the assumption that Iran either had paralleled Iraq's efforts or was reacting to their disclosure.

Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified agents. Similar reports indicated that agents had destroyed German biocontainment equipment destined for Iran. More credible reports by U.S. experts indicate that Iran might have begun to stockpile anthrax and botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.

As is the case with chemical weapons, the fact some reports were relatively specific did not mean that they proved accurate. But Iran does have increasingly sophisticated industries, and there sophisticated research facilities and universities could easily serve as a front for illicit BW-activities, and offer legitimate excuses for dual-use imports, as was the case in Iraq prior to 1990. It can also be reasonably assessed that except for Pakistan, Iran is the most advanced nation in the Muslim world in the production and use of industrial chemicals and biotechnology. All of this information compounds the uncertainties and ambiguities associated with Tehran's biological warfare intentions and capabilities.

Uncertain and Ambiguous Intelligence Judgments

Once again, US and other official intelligence reporting has been so summary in form, and so ambiguous or contradictory in character , that one must be as cautious about whether Iran has an effort as cautious about the dangers such an effort can pose. The US intelligence community has always limited its unclassified judgments to summary statements. Some have been little more than repetitions of past states. Others have had serious potential contradictions.

For example, the CIA reported in 1996, "We believe that Iran holds some stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance." It also reported that Iran has "sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use," and that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran's effort to "weaponize" and produce biological weapons.

Iran continued to deny that it had such programs, but its imports continued to raise intelligence concerns. Iran again announced in June 1997 that it would not produce or employ chemical weapons including biological toxins. However, the CIA reported in June 1997 that Iran had obtained new dual-use technology from China and India during 1996.

At the same time, one element of the US government did not always seem to be talking to another, and some statements by given intelligence agencies became self-contradictory over time. In 1997, the U.S. DOD asserted that the Iranian biological warfare (BW) program "is in the research and development (R&D) stage, [but] the Iranians have considerable expertise with pharmaceuticals, as well as the commercial and military infrastructure needed to produce basic biological warfare agents."[i]

The CIA reported in January 1999 that Iran continued to pursue dual-use biotechnical equipment from Russia and other countries, ostensibly for civilian uses. Its BW program began during the Iran-Iraq War, and Iran may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials and equipment being sought and the many legitimate end uses for these items.

The Department of State updated its findings in 2001 as follows:[ii]

> Iran has a growing biotechnology industry, significant pharmaceutical experience and the overall infrastructure to support its biological warfare program. Tehran has expanded its efforts to seek considerable dual-use biotechnical materials and expertise from entities in Russia and elsewhere, ostensibly for civilian reasons. Outside assistance is important for Iran, and it is also difficult to prevent because of the dual-use nature of the materials and equipment being sought by Iran and the many legitimate end uses for these items.
>
> Iran's biological warfare program began during the Iran-Iraq war. Iran is believed to be pursuing offensive biological warfare capabilities and its effort may have evolved beyond agent research and development to the capability to produce small quantities of agent. Iran has ratified the BWC [Biological Weapons Convention].

A detailed chronology prepared by the NTI shows that the State Department has announced sanctions on 13 foreign companies and individuals under the Iran Nonproliferation Act of 2000 for transferring items that could be used in chemical weapons, biological weapons or long-range missile programs.[iii] The CIA reported in 2004 that, "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 that could be used in Tehran's BW program. Iran probably has the capability to produce at least small quantities of BW agents."[iv]

In 2006, Lt. General Michael D. Maples, Director of the Defense Intelligence Agency, stated: "we believe that Iran maintains offensive chemical and biological weapons capabilities in various stages of development."[v] That same year, a CIA report to Congress stated that, "As of 2004, the status of Iran's biotechnology infrastructure indicated that at a minimum, Iran probably had the capability to produce at least small quantities of BW agents for offensive purposes. Iran continued to seek dual- use biotechnology materials, equipment, and expertise that is consistent with its growing legitimate biotechnology industry but could benefit Tehran's BW program."[vi]

Lt. General Maples modified his judgment in 2007 in ways that stressed that Ian might have a biological program, but which did not state that it did: "Iran has a growing biotechnology industry, significant pharmaceutical experience and the overall infrastructure that could be used to support a biological warfare program. DIA believes Iran is pursuing development of biological weapons."[vii] He repeated a statement with these qualifications again in 2008: “Tehran continues to seek dual-use biotechnical materials, equipment and expertise which have legitimate uses, but also could enable ongoing biological warfare efforts.”[viii]

J. Michael McConnell, the Director of National Intelligence, provided a somewhat different interpretation in his comments, which implied that Iran had had an active program but might no longer have one: "We assess that Iran has previously conducted offensive BW agent research and development. Iran continues to seek dual-use technologies that could be used for biological warfare."[ix]

The US Office of the Director of National Intelligence (ODNI) provided yet another view. in its Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions for the period 1 January to 31 December 2005. This report was issued in March 2008, and lagged years behind the normal reporting date. It stated that, “As of 2005, the status of its [Iran’s] biotechnology infrastructure indicated that at a minimum, Iran probably had the capability to produce at least small quantities of biological warfare (BW) agents for offensive purposes. Iran continued to seek dual-use biotechnology materials, equipment, and expertise that are consistent with its growing legitimate biotechnology industry but could benefit Tehran’s assessed probable BW program.”

Oddly enough, ODNI released its update of the same report for the period 1 January to 31 December 2006 at virtually the same time, and this report stated that, “Our assessment of Iran's biotechnology infrastructure indicates that Iran probably has the capability to produce large-quantities of some Biological Warfare (BW) agents for offensive purposes,

if it made the decision to do so. Iran continues to seek dual-use biotechnology materials, equipment, and expertise consistent with its growing legitimate biotechnology industry but these components could also advance Tehran's BW capability."

As is the case for US intelligence reporting on chemical weapons and nuclear weapons, the US intelligence community seems to find it extraordinarily difficult to decide exactly what it is trying to communicate. It simply is not clear such statements reflect any knowledge that there was of is an actual program, and whether the judgments involved reflect suspicion, potential capability, a strong probability, or a fact.

As might be expected, Iran has also continued to deny that it has biological weapons programs, and is a party to the Biological Weapons Convention (BWC), which Iran signed in 1972, ratified in 1973, and went into force on March 25, 1975. Iran has not however, provided full disclosure of two statements under the BWC: A-2, the Declaration of national biological defense research and development programs and F, the Declaration of Past activities in offensive/defense biological research and development programs.[x]

The same work by the NTI shows that the Iranian position has not changed in recent years.[xi] For example, the Iranian delegation issued a statement in July 2004 as part of the preparations for the Second Meeting of the States Parties to the BWC in Geneva in December 2004: "although the BWC lacks a verification mechanism, we do believe that assigning security and politically oriented responsibilities, such as investigation of suspicious cases of use of biological weapons, to certain international organizations such as WHO, puts the humanitarian and fundamental objectives and mandate of these organizations in jeopardy." In regard to the issue of alleged use of biological or toxin weapons; "even though according to the Geneva Protocol of 1925, the 'Use' is prohibited, but [...] regrettably some States Parties have still kept their reservations to that effect, that is keeping the right of retaliation for any case of use against them."[xii]

Several weeks later, however, the chairman of the Iranian Supreme National Security Council Foreign Policy Committee, Seyyed Hoseyn Musavian, stated that Iran had taken defensive measures against chemical, biological and nuclear attacks since the Iran-Iraq War. He also said that the Ministry of Defense and Armed Forces Logistics is responsible for enforcement of the policy.[xiii] Later that year, an officer in the IRGC was also quoted as saying that a military exercise, "Ashura-5," showed that Iranian armed forces could operate even against invaders equipped with "the most destructive bacteriological and chemical weapons."[xiv] These statements are important because the only way to develop defenses against biological agents is to do research using biological weapons, and the only way to create defenses against advanced militarized agents is to possess them.

Iranian officials responded by continuing to deny that Iran had biological weapons, and have criticized other countries for their lack of transparency and compliance with the terms and spirit of the BWC. They also, however, continued to describe control regimes like the Australia list, and other export controls as ineffective.

For example, in August 2007, the Iranian representative to the Biological Weapons Convention Meeting of Experts in Geneva, Switzerland, warned about the lack of any legally binding compliance mechanism: "the Fifth and Sixth Review Conferences decided by consensus on the follow-up mechanism aiming at promotion of common

understanding among the States Parties with the hope that real multilateralism would be revived and the negotiations on the Protocol on strengthening the Convention would be resumed in a foreseeable future. We strongly believe that the present follow-up mechanism which is of limited scope and nature cannot be considered as a substitute to afore-mentioned negotiations."[xv]

Other countries governments and intelligence services also raised questions about Iran's efforts, although they have not been as explicit in making summary judgments. For example, in February 2005, the German Customs Office of Criminal Investigations (ZKA) reported that Iran is engaged in biological weapons programs being conducted "in small laboratories of universities, strictly guarded from the outside world." The ZKA also observed that "Iran has long-standing experience in the field of bio-technology so that is has the necessary know-how for operating biological combat agent programs."[xvi]

In September 2006, the United Kingdom's Department of Trade and Industry issued an updated list of Iranian entities that had raised concern that they might be developing weapons of mass destruction, and that had been denied licensed exports. These included the Amir Kabir University of Technology; M/S Iran Electromotor; and Oil Industries Engineering and Construction aka LG/OIEC/IOEC. At least one was suspect for biological activities.[xvii]

A 2006 staff report by a subcommittee of the House Intelligence Committee just further adds to the complexity of assessing Iran's CBW programs. In the report the subcommittee complained that the intelligence regarding potential Iranian chemical and biological weapons was, neither voluminous nor conclusive," while the US intelligence reports that their findings were based on concluded that, "Iran likely is pursuing chemical and biological weapons."

The available open-source information from the Iranian Science and Technology Group neither proves nor disproves the allegations that have been made regarding its biological research and suspected weaponization programs. The ambiguity and uncertainty of intelligence judgments has made it increasingly difficult to assess the true nature of Iran's biotechnology programs.

Opposition Claims

Most non-governmental organizations do not go beyond describing Iran's potential programs and capabilities. At least one Iranian opposition group, however, has made very detailed claims. The National Council of Resistance in Iran has long been a major source of information and misinformation on Iran's WMD efforts. It provided the following description of Iran's programs in a press conference at the Willard Hotel in Washington on May 15, 2003:[xviii]

> The activities of the clerical regime with respect to acquiring biological weapons began in 1985, during the Iran-Iraq War. In 1985 and 1986, the regime established a secret research complex in Teheran's Pasteur Institute to work on toxic fungus and microbial substances.
>
> The center succeeded in producing toxic fungus, including aflatoxin. At the same time, similar research was being undertaken at Vira Laboratory under the supervision of Mr. Gholamhossein Riazi. In subsequent years, as the regime succeeded in mass production of microbial material, it moved the production centers to a military facility. Centers such as Pasteur Institute are now being used for research purposes.

Under then-President Rafsanjani, these activities took on new dimensions in the 1990s. The regime originally imported fermenters from European countries, particularly France and Switzerland. Due to international restrictions and major needs on the part of the regime, domestic production of fermenters was put on the agenda.

In June 2001, a plan called Comprehensive National Microbial Defense Plan was adopted by the Supreme National Security Council chaired by Khatami. A senior cleric, Hassan Rowhani, the SNSC secretary, personally pursued the implementation of this plan and reported directly to Khamenei, the supreme leader.

In addition to the principal members, the relevant ministers and competent officials from the armed forces command headquarters also took part in that SNSC meeting. The Comprehensive National Plan for Microbial Defense is prepared in four pages and kept in the secretariat of the SNSC. It contains an introduction and specific task of each ministry.

On the basis of this plan, the biological weapons capacity of the regime must be increased three-fold in the next two years. The biological weapons activities are centered around the following elements: Anthrax, produced at the Revolutionary Guard Imam Hussein University in Teheran; next, aflatoxin, also produced at the Imam Hussein University; production of microbial bombs using anthrax; production of microbial bombs using smallpox virus; production of microbial bombs using typhoid fever; production of microbial bombs using high dosage of aflotoxin; production of microbial bombs using plague microbes; production of microbial bombs using chloromicrobes.

Genetic cloning or alteration is being carried out at Malek Ashtar University, which is headed by Maqsudi, the head of Center for Scientific and Growth Technology.

Agencies involved in the plan: The Armed Forces Command headquarters, the Ministry of Defense, the Revolutionary Guard Joint Command headquarters, the Revolutionary Guard Imam Hussein University and Ministry of Intelligence and Security are involved in acquiring and stockpiling of microbial weaponry.

New warhead directorate. A senior Revolutionary Guards commander, Nasser Toqyani, is in charge of the directorate pursuing weapons of mass destruction in the Armed Forces Command headquarters. He is coordinating the biological activities of all relevant organs. Major General Hassan Firouzabadi, the chairman of the Joint Command headquarters, takes part in these meetings.

Special chemical, biological and nuclear industries in the Ministry of Defense. A special organization dubbed Special Chemical, Biological and Nuclear Industries has been set up in the Ministry of Defense. This entity is also involved in chemical and biological activity. Brigadier General Seyyedi is in charge of this organization. His predecessor was named Dr. Abbass-pour, who had been appointed by Rafsanjani.

This organization is in charge of arming the regime with microbial and chemical bombs and has been strengthened during Khatami's presidency. The organization is also responsible for procuring technological needs of microbial and chemical weapons as well as chemical and microbial bombs.

A number of foreign microbial weapons experts from China, North Korea, India, and Russia are cooperating with the Ministry of Defense of the Iranian regime. A number of them have been hired by this organization. The Biological Research Center of Special Industries Organization is located at Shahid Meisami, Martyr Meisami complex on Special Karaj Highway, 27 kilometers near the steel factory.

During the Khatami's presidency, the Ministry of Defense formed a new biological weapons center to expand biological bomb. That was called Malek Ashtar University and is based in Lavizan Shian Technological Research Center.

Dr. Maqsudi heads this center, which is the most important research center for biological WMD. Imam Hussein University has been a bio-technology section which works on microbial bombs

with aflatoxin. Major investments have been made in this university to acquire weapons of mass destruction, including chemical, biological and missile warheads.

Students are given foreign scholarships to study abroad and use western technology. The Revolutionary Guards' Baqiyatollah Research Center, affiliated with the Guards' Baqitollah Hospital, is another Revolutionary Guard Baqiyatollah center which works on microbial bombs.

Dr. Karami is the head of this center. He's a member of the Guard Corps Imam Hussein University scientific staff and has been working on biological weapons for 18 years. He is also a member of the national body of Biological Weapons Disarmament Convention and travels to Geneva regularly.

The Revolutionary Guards Joint Command headquarters has started new activities dealing with microbial weaponry. Brigadier General Abroumand is heading the activities and organized them in different committees.

At the Ministry of Intelligence, the directorate to access weapons of mass destruction is run by Asgari. Its task is to steal foreign technology on WMD, especially biological weapons. The directorate has planted its spies on foreign countries.

Next, the Research Center for Direct Biotechnology is headed by San'ati. This center does not directly work on microbial bombs, but it's used as the research supplement for biological weapons and actively works with Malek Ashtar and Imam Hussein University, as well as the Guards' Baqiyatollah Biological Research Center.

Experts. On the basis of the decisions reached by the Supreme National Security Council, the regime intends to increase the number of experts in biological field from current 3,000 to 11,000 in the coming years. Dr. Maqsudi, head of Centers for Science and Technological Growth of the Biological Research Center of Malek Ashtar, affiliated with the defense industries, are in charge of mass production of biological weapons.

Dr. Mirza'i. He supervises all Defense Ministry plans on biological weapons. He has been active in this field since the 1980s.

Dr. Hossein San'ati. He is the head of the National Center for Genetic Technology and Growth Technology. He has been working on biological weapons since the war and, along with Mirza'i and Karami, are known as the architect of the regime microbial bombs. San'ati has allocated the capabilities of the National Center for Genetic Technology and Growth Technology to the development of microbial bomb and is using this center as cover.

Gholamhossein Rizai. He is among the founders of the regime's weapons-of-mass-destruction program. Due to his age, he has become the dean of the university, but actively advises the regime.

Dr. Mirza Khalil Bahmani. He has been working on defensive and offensive plans at Imam Hussein University.

Dr. Toula'i. He is an expert on biotechnology and works at the Ministry of Defense and Biological Research Center at Imam Hussein University.

… in addition…the Sina Industry, SINA, Sina Industry, that are concentrated on production of the biological materials…The head of this Sina Industry is Dr. Yousefi. This is a center that was previously named Vira Laboratories -- Vira Laboratories. This is one of the most important biological and chemical laboratories of the Iranian regime. This basically was used as a front, as a cover for doing their research and their activities on biological weapons under the cover and the name of medical research.

In this center, the Sina Industry Center, the microbial tests are done on animals. This is a center that has been active since the early '90s. The previous head of this laboratory was Dr. Riazi, Gholamhossein Riazi. You mentioned the name earlier. And his deputy was Dr. Yousefi, who is now heading the Sina Industry.

During the time of presidency of Khatami, obviously the regime has escalated their efforts in the field of weapons of mass destruction, particularly in the field of biological weapons. And as a

> result, the organizational structure of the Defense Ministry went through significant changes to be able to comply with the rising demands of Iranian regime in this field. And they formed -- they call it Special Industry Group headed by a brigadier general whose name is -- the Revolutionary Guards' brigadier general, Farmanesh, F-A-R-M-A- N-E-S-H. So that's the purpose.
>
> Now, what they do in the Special Industry Group, which deals with different aspects of what they need for their biological weapons program, and depending on the issue and the subject, they have distributed the work in different centers and industrial places in the country. I give you -- I name a few for you.
>
> One is the Milad Industry, M-I-L-A-D, Milad Industry that is located in Mard-Abad. The second one is called Be'ethat Industry, Be'ethat Industry, which is located in the city of Qom. And the next one is Sard-Shimi Industry or Sard Chemical Industry, which is located in Shiraz, which is located in the central part of the country.
>
> The next one is Raja-Shimi Industry, which is located in Malard, near Karaj, which is west of Teheran.
>
> The next one is Shahid Salehi Industry, which is also located in the city of Qom.
>
> Next is the Shahid Meysami Industry that Ms. Samsami referred to earlier, which is located close to Karaj; and then the Sina Industry itself, which is located in Karaj, and then the Valasr Industry, Valasr Industry, that is located in Teheran.
>
> … Dr. Yousefi, given the extensive many years of working first under Dr. Riazi and then in other parts, he has really concentrated and moved all the experience he had had to this Sina Industry now. In other words, the Sina Industry is now a consolidation or concentration of all the experiences that the regime had built over the years, both in biological and chemical weapons program.

The practical problem with such statements is that the Middle East is filled with extremely detailed conspiracy claims that cannot be validated. The National Council also has a history of attacking and killing Americans during the time of the Shah, conducting terrorist operations during the power struggles after his fall, and acting as an Iraqi proxy to oppose the regime for Saddam Hussein. It has also been designated as a terrorist organization by the US State Department.[xix] Accusations brought by the NCRI, in the past, have proved to be accurate in regards to Iran's Ashura/Ghadr-110 ballistic missile program, as well as Iran's continuation of its nuclear program after 2003. From the accuracy of some information that has been acquired by the NCRI it should be assessed that National Councils' claims cannot be dismissed; but they also cannot conceivably be trusted.

Suspect Organizations and Facilities

As is the case with Iran's chemical, nuclear, and missile facilities; various sources cite so many different organizations and facilities as being linked to Iran's biological weapons efforts that it is impossible to determine the credibility of any given source – if any is credible. Sheer volume of information and detail do not mean that reports are accurate. Iranian opposition groups, and some US and Israeli groups, have virtually made an industry out of making such claims.

The Federation of American Scientists, Global Security, the Monterrey Institute, and Nuclear Threat Initiative have all done more balanced and objective work in compiling such lists. The NTI list of Iranian institutions that may be involved in Iran's biological weapons program makes a good case study, and one that could just as easily have been

used to explain the list of possible chemical weapons facilities in the previous chapter. The NTI list includes:[xx]

- Amir Kabir University of Technology
- Biotechnology Institute of the Iranian Research Organization for Science and Technology
- Damghan
- Institute for Pestilence and Plant Disease Research
- Institute for Plant and Seed Modification Research
- Iranian Research Organization for Science and Technology (IROST)
- National Research Center of Genetic Engineering and Biotechnology (NRCGEB)
- Pasteur Institute
- Persian Type Culture Collection (PTCC)
- Razi Institute for Serums and Vaccines
- Research Center of the Construction Crusade (Jihad-e Sazandegi)
- Science and Technology Group
- Sharif University of Technology Biochemical and Bioenvironmental Engineering Research Center
- Special Industries Organization (SIO)
- Tehran University Institute for Biochemistry and Biosphysics Research (IBB)
- Vira Laboratory

It is important to note, however, that the NTI and other NGOs make it clear that most of the institutions listed have the capability to contribute to a biological weapons program, rather than any proven track record of action. Moreover, the reason that many are listed is that hard-line opposition groups have made charges that have never been confirmed by other reporting. For example, the Persian Type Culture Center is listed largely because it maintains a stockpile of type cultures of various diseases. In practice, a weapons development center might well obtain more lethal cultures in the field or from a patient.

Iranian opposition groups have been far more categorical. The National Council of Resistance of Iran has indentified Amir Kabir University of Technology in Tehran as a potential center for Iran's programs. The University could play such a role. It has the first major biomedical engineering department in Iran, which was established in October 1993. It has graduate programs in Bioelectrics, Biomaterials, and Biomechanics and its biomaterials laboratory has all of the specialties need to go from biological research to designing and testing the production of weaponized agents. The National Council of Resistance of Iran also claims that it has been used as a cover for purchasing dual-use equipment. It also has a mutual scientific cooperation agreement with Damascus University.[xxi]

Once again, however, these reports cannot be verified, and the long lists of institutions that various NGOs indicate *might* be linked to biological weapons efforts becomes far shorter if one considers only those institutions that are specifically tied to the Iranian military and to actual biological weapon activities. The NTI, for example, includes four such institutions in the above list:

- *Damghan* :A facility in or near the city of Damghan located some 375 miles to the southwest of Mashad, or 300km east of Teheran. It is claimed to be a biological weapons research center under the control of the Islamic Revolutionary Guard Corps, to have been set up with Russian assistance, and be near a similar facility for chemical weapons research. US intelligence sources have mentioned this facility in the past, but no recent mention has occurred.[xxii]
- *Engineering Research Center of: the Construction Crusade, Jihad e-Sazandegi, Jahaad-e Saazandegi, Construction Jihad, Jahad-e Sazandegi, and Jahad; also Jahad Engineering Research Center, Jahad Sazandegi Research Center. Tehran:* According to NTI and the National Council of Resistance of Iran, the Ministry of Jihad-e Sazandegi (Ministry of Construction Crusade and Ministry of Construction Jihad) has 12 divisions and research centers in 20 provinces. It has four affiliated research institutes in the cities of Isfahan, Shiraz, Tabriz, and Mashad that are involved in biological weapons research and production. It should be noted that the Construction Crusade is more a construction group than a research or production group. The National Council of Resistance of Iran claims, however that the Construction Crusade was affiliated with the Islamic Revolutionary Guards Corps (IRGC) during the Iran-Iraq War, was originally supposed to be part of the Defense Ministry, but was established separately by IRGC Minister Muhsin Rafiqdust to avoid detection.[xxiii]
- *Vira Laboratory, Teheran:* The National Council of Resistance of Iran claims that Vira is the chemical laboratory of the Defense Ministry's Special Industries Organization and worked on research, testing, and production of chemical and biological warfare-related materials. Some sources claim it has work on bioagents designed to contaminate soil and affect agriculture.[xxiv]
- *Science and Technology Group, Mahsa Building, Teheran:* The National Council of Resistance (NCR) of Iran claims that STG provides broad oversight for all of Iran's weapons of mass destruction programs. It stays that it, "...oversees the regime's plans and projects in the area of biological, nuclear, and chemical weapons." It also claims that it:
    - formed the Revolutionary Guards' 24th Bessat Brigade for Chemical Attacks,
    - stockpiled huge quantities of nerve agents,
    - expanded biotechnology research centers and the NBC (Nuclear, Biological, Chemical) Special Industries Organization,
    - hired Chinese, Korean, and Russian experts under cover of research projects, and
    - Procured the required materials and technology from European countries through the use of dual-use technology.
- The NCR has also claimed that the STG oversees four major efforts: the Defense Ministry's Special Industries Organization, the Jihad Construction Research Center, the Revolutionary Guards' study center at the Imam Hoseyn University, and the Biotechnology Research Center. The National Council of Resistance on Iran reports that in only one branch of the STG, the regime has already developed three biological agents—VX (though in fact a chemical agent), aflatoxin, and Bacillus anthracis—with the help of at least 18 Russian, Chinese, and Korean experts.[xxv]

What is clear is that Iran has become a country with a relatively advanced base in biotechnology, which has extensive laboratory and research capability, and steadily improving industrial facilities with dual-use production capabilities with all of the equipment necessary to produce wet and dry storable biological weapons. Iran's biological weapons research and production programs are scattered among a number of sites, many of which are at university laboratories. This creates an ambiguity that cannot be resolved by either US claims or Iranian denials, and this is a problem with most current known and potential proliferators.

Many nations now have the biotechnology, the industrial base, and the technical expertise to acquire biological weapons. Not only does most civil technology have "dual use" in

building weapons, but the global dissemination of biological equipment has made control by supplier nations extremely difficult. Even when such controls do still apply to original sellers, they have little or no impact on the sellers of used equipment, and a wide range of sensitive equipment is now available for sale to any buyer on the Internet or to any purchasing effort that closely examines the used and surplus equipment sold or disposed of by university and commercial laboratories.

This makes it almost impossible to disprove a nation's interest in biological weapons. Moreover, there is little meaningful distinction between a "defensive" and an "offensive" capability. Nations can claim to be conducting defensive research, acquiring key gear for defensive purposes, and practicing defensive training and maneuvers.

Required Technology and Manufacturing Capability and the Uncertain Role of Outside Suppliers

The world market in biotechnology, food processing, pharmaceutical, and other related equipment has grown so large, has so many dual-use items, and has such weak controls, that it is impossible to know what Iran has purchased and is purchasing, and from whom they are purchasing such items from. What is clear is that Iran has become a country with a relatively advanced base in biotechnology, which has extensive laboratory and research capability, and steadily improving industrial facilities with dual-use production capabilities with all of the equipment necessary to produce wet and dry storable biological weapons.

Iran was able to enlist plenty of help in acquiring biotechnology and knowhow in the early 1990s. The fall of the Soviet Union – which had been involved in extensive WMD research, development, and production throughout the Cold War – left many unemployed Russian scientists looking for new clients. Tehran was able to lure many of these unemployed scientists with knowledge and experience in weaponizing deadly toxins to its program with its abundant reserve of petrodollars.

According to numerous defected former Soviet scientists, several military biologists were recruited by Iran throughout the 1990s. A London Sunday Times article from August 1995 reported that, "by hiring Russian biological weapons experts, Iran had made a quantum leap forward in its biological weapons program."[xxvi]

In testimony to the Senate Committee on Foreign Relations, John A. Lauder, the Director of the Nonproliferation Center at the CIA, asserted the following in 2000:[xxvii]

> Iran is seeking expertise and technology from Russia that could advance Tehran's biological warfare effort. Russia has several government-to-government agreements with Iran in a variety of scientific and technical fields.
>
> —Because of the dual-use nature of much of this technology, Tehran can exploit these agreements to procure equipment and expertise that could be diverted to its BW effort.
>
> —Iran's BW program could make rapid and significant advances if it has unfettered access to BW expertise resident in Russia.

The CIA has continued to provide virtually the same assessments of sales and technology transfer over time. For example, it reported in November 2003 that, "Even though Iran is part of the 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."[xxviii]

John R. Bolton, then Under Secretary for Arms Control and International Security at the U.S. Department of State, provided a more detailed version of such views in testifying to the following to the House International Relations Committee in 2004:[xxix]

> The U.S. Intelligence Community stated in its recent 721 Report that, "Tehran probably maintains 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."
>
> Because BW programs are easily concealed, I cannot say that the United States can prove beyond a shadow of a doubt that Iran has an offensive BW program. The intelligence I have seen suggests that this is the case, and, as a policy matter therefore, I believe we have to act on that assumption. The risks to international peace and security from such programs are too great to wait for irrefutable proof of illicit activity: responsible members of the international community should act to head off such threats and demand transparency and accountability from suspected violators while these threats are still emerging. It would be folly indeed to wait for the threat fully to mature before trying to stop it.
>
> Iran is a party to the Biological Weapons Convention (BWC) and the 1925 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare. Like the CWC, the central obligation of the BWC is simple: no possession, no development no production and, together with the 1925 Protocol, no use of biological weapons. The overwhelming majority of States Parties abide by these obligations. We believe Iran is not abiding by its BWC obligations, however, and we have made this abundantly clear to the parties of this treaty. It is time for Iran to declare its biological weapons program and make arrangements for its dismantlement.

This creates an ambiguity that cannot be resolved by either US claims or Iranian denials, and this is a problem with most current known and potential proliferators. Many nations now have the biotechnology, the industrial base, and the technical expertise to acquire biological weapons. Not only does most civil technology have "dual use" in building weapons, but the global dissemination of biological equipment has made control by supplier nations extremely difficult. Even when such controls do still apply to original sellers, they have little or no impact on the sellers of used equipment, and a wide range of sensitive equipment is now available for sale to any buyer on the Internet or to any purchasing effort that closely examines the used and surplus equipment sold or disposed of by university and commercial laboratories.

This makes it almost impossible to disprove a nation's interest in biological weapons. Moreover, there is little meaningful distinction between a "defensive" and an "offensive" capability. Nations can claim to be conducting defensive research, acquiring key gear for defensive purposes, and practicing defensive training and maneuvers.

Development and proliferation is made much easier because of the dual-use nature of many of the components necessary for a biological weapons program. According to multiple reports, Chinese, Russian, North Korean, Swiss, Indian, Dutch, German, Italian, Cuba, and Spanish companies – among others – have all provided Iran with biotechnological components and dual-use biological agents that may well have since been incorporated into its biological weapons program.

It is clear, however, that Russia has been a key source of biotechnology for Iran. No US official has ever indicated that Russia has deliberately supplied Iran with technology or equipment for a biological weapons effort. However, Russia's world-leading expertise in biological weapons makes it a particularly attractive target for Iranians seeking technical information and training on BW agent production processes. This has led to speculation that Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads, bombs, and covert devices.

Possible Biological Agents and CBW Warfighting Capability

These factors make it almost impossible to know how Iran is, or may use, any capabilities it does possess. They also create a situation where if Iran has developed agents for defensive purposes they give it a relatively rapid "breakout" capability to produce offensive agents. Iraq, for example, showed it could rapidly convert a pharmaceutical plant to anthrax production several decades ago, although there is no clear way to determine how lethal its agents would have been.

Potential Threats

It is impossible to know what biological agents Iran might actually have weaponized, if only for defensive purposes. Over the years, various sources have cited a range of different possible agents. These included anthrax abotulin toxin, other biotoxins, hoof and mouth disease, Marburg, plague, smallpox, and tularemia. All of these are biological weapons that Iran has long had the technological and manufacturing capability to weaponize, but none has yet been described as having had known tests, as having actually been weaponized, or having been deployed with Iranian forces. Iran also has a sufficiently developed technology base so that it could develop advanced biological agents and weapons, and take advantage of a variety of ways of producing far more lethal weapons than were available during the Cold War.

Figure 4.1 provides a summary overview of some of the agents Iran might use. It draws upon a study by the Chemical and Biological Arms Control Institute that estimates the impact of a line source attack using 50 kilograms of agent along a two-kilometer line upwind of a population center of 500,000:[xxx]

Figure 4.1: Area Coverage and Casualty Impact of Different Types of Biological Attack

Agent	Downwind Area Kilometers	Number of Casualties Dead	Incapacitated
Rift Valley Fever	1	400	35,000
Tick Borne Encephalitis	1	9,500	35,000
Typhus	5	19,000	85,000
Brucellosis	10	500	125,000
Q Fever	20+	150	125,000
Tularemia	20+	30,000	125,000
Anthrax	20+	95,000	125,000

Note: Assumes 50 kilograms of agent along a two-kilometer line upwind of a population center of 500,000.

Source: George Christopher et al, "Biological Warfare: A Historical Perspective," Journal of the American Medical Association, 278, No. 5, August 6, 1997.

There are no empirical data to base such estimates, upon, and they are little more than "guesstimates."[xxxi] It also is not clear Iran would use a single agent. Most US and FSU planning for biological warfare during the Cold War called for a mix of biological agents to be used -- so-called "biological cocktails." At least some study was given to mixes that would create a focus on the first source of lethality, and lead to the wrong response. Other attacks modeled the use of one biological agent to greatly increase the lethality of another. The modeling of simultaneous and sequential attacks with one agent is uncertain enough, but there are no rules that say a sophisticated terrorist group, or one aided by a state actor, could not use similar "cocktails."

Iran might also attack livestock and agriculture. Annual accidental "attacks" on American agriculture in the form of inadvertent transfers of new pests, diseases, etc are the rule rather than the exception, and have often had a major impact. Such "attacks" have consisted of importing the wrong pet, diseases brought in the form of a few infected animals or plants, and insects and parasites that have arrived in on birds, aircraft, cars, and ships. These have all had major impact on given crops, and have affected the ecology of whole states, particularly in the southern and western US and Hawaii.

What is clear is that Iran should be able to deploy weapons with at least the lethality that militarized anthrax had reached during the cold war. Figure 4.2 illustrates typical estimates of how the lethality of such weapons compare to the chemical weapons discussed in the previous chapter. It is clear that such biological weapons *could* be as or more lethal than the fission nuclear weapons Iran is likely to be able to acquire within the next half decade. Unlike radiological and chemical weapons, biological weapons can be true weapons of mass destruction.

Figure 4.2: Comparative Effects of Biological, Chemical, and Nuclear Weapons Delivered Against a Typical Urban Target

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

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

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

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

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

Anthrax as a Case Study

The attacks analyzed by the OTA in Figure 4.2 assumed the use of highly advanced, weaponized, dry storable and coated Anthrax powder of precisely the right particle size, and like many studies of the day ignored many of the major uncertainties affecting the real-world lethality of biological weapons. There is little doubt that Iran has the technology base to achieve at least this level of sophistication, but the data do assume a worst-case in terms of the lethality of such attacks. Even though Anthrax qualifies as the

most studied biological weapon, the effectiveness of any given weaponization of the agent is impossible to simulate or test even by limited use of human subjects. It can only be determined when it is actually used, and that its real world lethality could range from negligible to catastrophic.[xxxii]

While Iraq produced over 8,000 liters of concentrated Anthrax solution before the Gulf War, there is little practical experience with Anthrax as a human disease. Only 18 cases of inhalation have been recorded in the US since 1900 to 1978, two of which were the result of laboratory experiments. In contrast some 2,000 cases of coetaneous Anthrax are reported each year, a total of 224 cases were reported in the US during 1944-1994, and some 10,000 people died during an epidemic in Zimbabwe between 1979 and 1985. This helps explain why estimates of the lethality of weaponized inhalational Anthrax have to be based on primate data, and why the range of uncertainty for a lethal dose of a 1-5 micron dry agent ranges from 2,500 to 55,500 spores.[xxxiii] The Department of Defense Medical NBC Battlebook does not give lethality data per se, but shows a range of 8,000-50,000 spores for an infective dose.[xxxiv]

Unlike nuclear weapons, a weapon like anthrax also is not a prompt killing mechanism and creates large uncertainties over detection and treatment. Soviet experience with a biological weapons accident in Sverdlovsk showed that cases occurred over a period of 2 to 43 days after exposure. Primate data indicates that weaponized spores retained lethal effects for at least 58 to 98 days after exposure, and spores can last for years or decades in a natural environment.

Soviet diagnostics and post mortems at Sverdlovsk fund a wide range of symptoms and effects that made diagnosis difficult. If an attack was covert, it is also unlikely that the disease would be recognized quickly. The limited experience with weaponized forms of disease indicated that the first stage symptoms were similar to those of flu – a problem that could make initial diagnosis difficult. Even if a deliberate early effort is made to use diagnostic testing for Anthrax, it would take 6-24 hours to confirm the disease and the course of the disease normally lasts only three days before death, presenting serious problems in organizing the proper response. A delay of even hours in administering antibiotics can be fatal. [xxxv]

Treatment presents further problems because there are no clinical studies of inhalational Anthrax in human beings. Moreover a weaponized agent can be tailored to both increases its lethality and resistance to treatment, and rapid vaccination would not be practical even if the vaccine was known to be effective against the strain used in the weapon. The US vaccine, which may or may not be effective, normally is given in a six dose series and the US does not regard the human-live attenuated vaccine developed by the FSU as safe. The communicability of a weaponized version of the disease is unclear, and containment and quarantine might be necessary. Serious problems could also arise in dealing with dead bodies since cremation seems to be the only safe form of corpse disposal. [xxxvi]

Smallpox as a Case Study

Iran might be willing to use infectious agents at long ranges against targets like Israel. Smallpox is often used as an example, although there is no practical evidence as yet that Iran has access to smallpox. In theory, smallpox was eradicated in 1977, and only two tightly controlled samples are supposed to exist in the US and Russia. However, the

former Soviet Union (FSU) was still involved in the large-scale weaponization of the agent in 1980, and little data exists on whether any current stockpiles exist or what controls exist.[xxxvii] A number of developing states began their biological warfare programs in the 1960s and they may have retained cultures. Unclassified US statements have indicated that Iran, Libya, North Korea, and Syria may have retained cultures for military purposes but it is unclear whether this is speculation or based on substantive data.[xxxviii]

Other highly infectious diseases present far more practical problems from the viewpoint of handling, "weaponization," and dissemination. An epidemic with a smallpox agent could be far more lethal than anthrax, although far harder to limit in effect and control.

Many games and models have tended to assume that a disease like small pox could be easily used to create highly lethal epidemics and pandemics. This is questionable, but once infection actually takes hold, it is extremely lethal. The WHO notes that in natural outbreaks, "Variola major and variola minor are characterized by similar lesions but variola minor is accompanied by milder symptoms and a case-fatality rate of less than 1%, while the fatality rate of variola major is 20–40%."[xxxix]

There is no real world experience with deliberate efforts to infect, and the natural aerosolized version of variola major is vulnerable to heat and humidity. This could present problems in any agent used by terrorists. However, each generation of infection can also expand the number of cases by 10-20 times. Only a few virons seem to be needed to infect a human being and they are only 200 nm in diameter, but there are still serious questions as to what dose would be lethal and how much agent would be required. The Department of Defense Medical NBC Battlebook does not give lethality data per se, but shows an *assumed* range of 10-100 organisms for an infective dose.[xl]

Like most known biological weapons, smallpox is not a prompt killing mechanism. It could, however, be difficult to detect in time to respond and a covert attack might remain unknown until a major outbreak. Smallpox has an incubation period of 7-17 days, with the normal period beginning around 12 days. It then takes 1-3 days for clear symptoms to appear in the form of typical skin eruptions, followed by a 7-10 day progression of the disease requiring constant isolation and intensive medical treatment.[xli] As a result, warning and detection would be difficult, and death usually occurs five or six days after the appearance of the characteristic rash, leaving limited time for treatment.

Vaccination is only effective through a maximum of 2-4 days after exposure although the first symptoms do not appear for roughly two weeks, supportive therapy has only moderate effectiveness, and cases require isolation to prevent further transmission of the disease. In one case, a single patient infected people on three floors of a hospital because of transmission through the air vents. Decontamination is difficult and must be very thorough. [xlii] The problem of deciding who to contain and/or quarantine would again force largely speculative decisions, and in several simulations where Smallpox is assumed to get out of control, armed force has had to be used to contain fleeing populations because of the inability to characterize infection.

The natural aerosolized version of variola major is vulnerable to heat and humidity, but again there is no way to translate the normal behavior of the disease into the effectiveness of a military agent, or to predict its transmissibility between human beings, although each

generation of infection can easily expand the number of cases by 10-20 times. It is known that only a few virons are needed to infect a human being and they are only 200 nm in diameter. Once again, there are serious questions as to what dose would be lethal and how much agent would be required. The Department of Defense Medical NBC Battlebook does not give lethality data per se, but shows an *assumed* range of 10-100 organisms for an infective dose.[xliii]

Biotoxins as a Case Study

At the other extreme, Iran might employ biotoxins – which are sometimes included in the list of chemical weapons – but these are much less lethal. Ricin, for example, can theoretically be some 30 times more lethal than VX nerve gas by weight. However, it is anything but easy to disseminate in lethal form. Planned and actual ricin attacks to date have involved targeted killings and have had little potential for producing serious casualties. As a CIA report notes, "Terrorists have looked at delivering ricin in foods and as a contact poison, although we have no scientific data to indicate that ricin can penetrate intact skin."[xliv] Some planned or actual attacks have reflected an almost morbid fascination with new killing mechanisms, and most of the efforts involved have probably made the terrorists involved much less lethal than if they had devoted the same effort to conventional explosives.

Simularly, Botulinum toxin, has received extensive attention by a number of terrorist groups, and a CIA study showed that "crude but viable methods to produce small quantities of this lethal toxin have been found in terrorist training manuals." Botulinum, however, is even more difficult to use in large-scale attacks than ricin, and the CIA notes that, "Botulinum toxin would be effective in small-scale poisonings or aerosol attacks in enclosed spaces, such as movie theaters. The toxin molecule is likely too large to penetrate intact skin."[xlv]

This does not mean that even a low-level bioterrorism incident, with minimal casualties, cannot have massive impact in terms of panic, political, and economic effects; and a series of well-distributed low-level attacks might well substitute for one massive attack, or at least produce far more serious effects than a single incident. The anthrax attacks in the US in the fall of 2001 only killed four and infected a total of 18, but still led to widespread panic, closing US government and postal facilities, massive public expenditures, and preventive actions like treating some 20,000 people for possible exposure to anthrax.

The Use of Covert, Proxy, and Low-Level Attacks

Iran can also deliver biological attacks by covert or proxy means. A study of possible attack scenarios, developed for defense and response planning by the Department of Homeland Security (DHS), was inadvertently put on the Internet. Among many other cases, it cited the following examples of real-world, near term possibilities, and ones based on current options that states or non-state actors could actually use.[xlvi]

- Spreading pneumonic plague in the bathrooms of an airport, sports arena and train station, killing 2,500 and sickening 8,000 worldwide.
- Infecting cattle with foot and mouth disease in several places, resulting in hundreds of millions of dollars in losses.

- Exposing an estimated 350,000 people to an anthrax attack by terrorists spraying the biological weapon from a truck driving through five cities over two weeks, according to the report. An estimated 13,200 people could die.

There is a wide range of other agents that Iran might weaponize which differ very sharply in terms of lethality, ease of weaponization, infectiousness, persistence, warning, and treatability. It should also be stressed that lethality is only one measure of the impact of biological weapons, and in most real-world attacks, it may be far less important than the other impacts of such attacks. The immediate and long term effects of the anthrax scare following 9/11, as well as the Japanese subway attacks, are a prime example that lethality isn't the only measure of success in terms of biological attacks. At the same time, great care should be exercised in assuming that biological attacks necessarily become "weapons of mass media" (WMMs), "weapons of mass panic" (WMPs), or "weapons of mass expenditure" (WMEs). Initial attacks may produce such effects, but governments, media, and publics may well have a more rapid learning curve than some analysts expect.

Weaponization Issues

Like chemical weapons, it might well be harder for Iran to effectively weaponize biological weapons than for it to develop and produce the biological agent. A number of studies indicate that the manufacture, weaponization, and dissemination process were technically difficult and required major resources. A report by the WHO summarizes such as follows:[47]

> Extensive research, development and testing by military establishments have shown that large-scale production of certain infective agents and their incorporation into weapons for atmospheric dispersal of pathogens is feasible in suitably designed facilities with specialized equipment and appropriate precautions to protect the workers and prevent accidental release to the environment.
>
> The selection of the agent and strain, its large-scale growth and its further processing present numerous technical problems and require specialized technologies and associated effort in research, development and testing. Several modes of delivery have received attention in military offensive programs but by far the greatest emphasis has been placed on methods of disseminating biological agents as inhalable aerosols.
>
> Numerous additional technical difficulties must be overcome in order to develop munitions or other devices that produce stable aerosols, and specific delivery and atmospheric conditions must be met if the aerosol is to reach the target population. Throughout all these steps, including that of aerosol cloud travel, special techniques and conditions are required to maintain the inhalability, infectivity and virulence of the agent.

This same WHO report notes, however, that,

> Nevertheless, despite the fact that the development of strategic biological weapons within military establishments historically required large-scale efforts over several years, some infective agents could be produced and used as weapons of terror on a smaller scale using relatively simple techniques.

A Department of Defense study, conducted in the early 2000s, makes the following points:[48]

> ...A state might elect to build large-scale facilities unique to this function, as was done in the United States prior to 1969. Such facilities would be, in principle, more susceptible to detection. However, there is no requirement to do this. The lower cost (by a considerable margin) and less readily observable approach would be to employ an in-place civilian facility as the site for agent production.

> Production equipment will vary, depending on the quantity of material desired, the methods selected for production, and the agent selected. Unlike CW agents, where production is measured in the tons, BW agent production is measured in the kilograms to tens of kilograms. Assessments of BW verification sometimes assume that the problem is to detect production of as little as 10 kilograms of BW agent.
>
> There is nothing unique about the types of equipment (or technology) that might be employed in a BW program. For example, biological safety cabinets have been adopted universally for biomedical research as well as commercial production of infectious disease products, reagents, and so forth. Fermenters, centrifuges, purification, and other laboratory equipment are used not only by the biomedical community, but have other academic and commercial applications as well, such as wineries, milk plants, pharmaceutical houses, and agricultural products. Production of beer, antibodies, enzymes, and other therapeutic products, such as insulin and growth hormone, involves the use of fermenters ranging in size from 10,000 to 1 million liters; such fermenters could produce significant quantities of BW agent. Key technologies have an intrinsic dual-use character.

Iran almost certainly has the ability to produce dry, storable, biological agents and agents that can be disseminated through aerosols, either as droplets from liquid suspensions or by small particles from dry powders, is by far the most efficient method.[49] Tests conducted during the 1950s and 1960s showed that an aerosol cloud of fine (2-5 microns) particles behaves more like a gas than a suspension, and penetrates interior spaces as well as exterior spaces. The US found that release from ships, aircraft, and tall buildings could achieve some lethality over distances of 50-100 miles, although without anything approaching uniform density.[50]

Iran also has an advanced enough technology and industrial base to potentially develop "next generation" biological weapons. The National Intelligence Council noted in its study, Mapping the Global Future: 2020, that,[51]

> "Major advances in the biological sciences and information technology probably will accelerate the pace of BW agent development, increasing the potential for agents that arte more difficult to detect or defend against. Through 2020, some countries will continue to try to develop chemical agents designed to circumvent the chemical weapons regime."

Genetic engineering and other new technologies can now be employed to overcome product deficiencies in the classic agents and toxins normally addressed in such discussions. Moreover, toxins that exist in nature in small amounts were once considered not to be potential threat agents because of their limited availability.[52] Studies like those of the Jason project show that genetically engineered pathogens can be designed to have any or all of the following attributes:[53]

- *Safer handling and deployment,* including the elimination of risks from accidents or misuse – the "boomerang effect".
- *Easier propagation and/or distribution* eliminating the need for a normally-hydrated bioagent or any use of aerosols. Microorganisms with enhanced aerosol and environmental stability.
- *Improved ability to target the host,* including the possible targeting of specific races or ethnic groups with given genetic characteristics.
- *Greater transmissivity and infectivity:* Engineering a disease like Ebola to be as communicable as measles. Microorganisms resistant to antibiotics, standard vaccines, and therapeutics.
- *New weapons:* Benign microorganisms genetically altered to produce a toxin, venom, or bioregulator.

- *Increased problems in detection:* Immunologically altered microorganisms able to defeat standard identification, detection, and diagnostic methods. Problems in diagnosis, false diagnosis, lack of detection by existing detectors, long latency, binary initiation.
- *Greater toxicity, more difficult to treat:* Very high morbidity or mortality, resistant to know antibacterial or antiviral agents; defeats existing vaccines; produces symptoms designed to saturate available specialized medical treatment facilities.
- *Combinations of some or all of the above.*

While any such analysis is speculative, scientists postulate that the following new types of biological weapons are now deployable or can be manufactured during the coming decade:[54]

- *Binary biological weapons* that use two safe to handle elements which can be assembled before use. This could be a virus and helper virus like Hepatitis D or a bacterial virulence plasmid like E. coli, plague, Anthrax, and dysentery.
- *Designer genes and life forms,* which could include synthetic genes and gene networks, synthetic viruses, and synthetic organisms. These weapons include DNA shuffling, synthetic forms of the flu – which killed more people in 1918 than died in all of World War I and which still kills about 30,000 Americans a year – and synthetic microorganisms.
- *"Gene therapy" weapons* that use transforming viruses or similar DNA vectors carrying Trojan horse genes (retrovirus, adenovirus, poxvirus, HSV-1). Such weapons can produce single individual (somatic cell) or inheritable (germline) changes. It can also remove immunities and wound healing capabilities.
- *Stealth viruses* can be transforming or conditionally inducible. They exploit the fact that humans normally carry a substantial viral load, and examples are the herpes virus, cytomegalovirus, Epstein-Barr, and SV40 contamination which are normally dormant or limited in infect but can be transformed into far more lethal diseases. They can be introduced over years and then used to blackmail a population.
- *Host-swapping diseases:* Viral parasites normally have narrow host ranges and develop an evolutionary equilibrium with their hosts. Disruption of this equilibrium normally produces no results, but it can be extremely lethal. Natural examples include AIDS, hantavirus, Marburg, and Ebola. Tailoring the disruption for attack purposes can produce weapons that are extremely lethal and for which there is no treatment. A tailored disease like AIDS could combine serious initial lethality with crippling long-term effects lasting decades.
- *Designer diseases* involve using molecular biology to create the disease first and then constructing a pathogen to produce it. It could eliminate immunity, target normally dormant genes, or instruct cells to commit suicide. Apoptosis is programmed cell death, and specific apoptosis can be used to kill any mix of cells.

Storage and delivery of weaponized biological agents is a serious technical challenge that Iran would have to overcome in order to create a serious biological missile arsenal and carry out effective biological attacks. Some of the problems, and possible alternative delivery methods, posed by the weaponization process of biological agents are:[55]

- Biological Agents are far less controllable and predictable in effects than chemical weapons;
- Biological agents are dependent on temperature, weather, and topographical conditions, both for storage and delivery purposes;
- Most biological agents must be inhaled or ingested to be effective, skin contact is unlikely to cause infection, making it easier to defend against a biological attack than a chemical attack, with sufficient warning;

- Most biological agents degrade rapidly – although dry agents such as anthrax spores and some toxins are persistent –making prolonged storage (stockpiling) more difficult, and in some cases making use of the agents less effective;
- Biological agents are best dispersed as low-altitude aerosol clouds and explosive methods may destroy the organisms;
- High stress, gravitational force (G-force) and heat generated by acceleration and re-entry of ballistic missiles make them a less-than-ideal method of delivering live biological agents;
- Considerable technical efforts are required to package live biological weapon agents in missile warheads and ensure that agent is dispersed at correct height and angle of delivery to create airborne aerosol;
- Mounting biological dispersal systems onto cruise missiles may overcome disadvantages associated with aircraft and ballistic missile delivery systems;
- Aerosol dispersal systems mounted on UAV or cruise missiles, creating remote piloted crop dusters, are other possibilities.

When other state and non-state actors perusing biological and chemical weaponization were posed with similar issues they found ways to improvise their existing technology to double as delivery systems. Delivery systems have included – but have not been limited to – spray-tanks, bombs, cluster bombs, and bomblet dispensers. Iraq worked to adapt modified aircraft drop tanks for biological agent spray operations in 1990. The tank could be attached either to a piloted fighter aircraft or a UAV guided by another piloted aircraft, and was designed to spray up to 2,000 liters of anthrax on a target. Similarly, the Japanese Aum Shinrikyo cult planned to use Russian helicopters or radio controlled drone aircrafts with modifications to deliver chemical and biological agents.

However, the past history of Iranian efforts at complex program management and systems integration, however, has shown that Iran has serious problems in translating its technical expertise into practice. The knowledge of how to do things rarely leads to similar capability to actually do them, particularly when programs remain concealed and are largely "mothballed" or have low levels of activity.

Testing biological weapons also presents even more serious problems in determining their actual effects than chemical weapons. Testing requires human subjects, and it is far from clear that limited testing under controlled conditions can be scaled to indicate real world effects. It is possible to determine lethality in rough terms by sampling residues of the agent after dissemination, but this requires repeated testing using actual weapons in a variety of real-world conditions. This is particularly true of missile warheads.

Warfighting: Biological Weapons

Doubts about the military effectiveness of biological weapons in tactical combat have resulted in very limited use in recent history, with the exception of the Japanese biological attacks on China during World War II. Biological weapons do present a wide range of drawbacks in addition to the uncertainties regarding their real-world lethality. But despite the uncertainties about performance of biological weapons some states, such as Iran, continue to research and develop biological agents for the purpose of possible weaponization.

While biological agents in relatively small quantities are theoretically capable of causing massive casualties, their military utility as an instrument of war has long been questioned.

Most biological agents that would be weaponized are too slow-acting and unpredictable for surprise attacks or repelling the immediate attacks of others. Biological attacks may be more suitable for use against fixed defensive positions in long wars of attrition, or against reserve combat units, formations massing in preparation for an offensive, air force squadrons, or rear area support units-where immediate results are not required and the danger to friendly forces is minimal.

Nevertheless, biological weapons were stockpiled during both world wars, and research and development continued throughout the Cold War by the US and the Soviet Union.

The world showed during the Iran-Iraq War that it would tolerate the use of chemical weapons. Any use of biological weapons, however, raises far deeper concerns and fears, particularly any use of biological agents. The level of international reaction – or reaction by Iran's neighbors and the US could include preventive war, invasion, or crippling sanctions. Iranian use of biological weapons could be used to justify virtually any level of escalation or retaliation, including all-out nuclear war against Iran's population centers.

While biological weapons offer a wide range of potential covert or proxy delivery means, this may be as much a threat as an advantage. Iran also would face a serious risk of massive retaliation if any use was made of biological weapons against any potential enemy of Iran unless that use could be clearly and decisively attributed to some other state. Proxy uses by any non-state actor known – or suspected -- to have any association with Iran might also trigger such retaliation. Existential warfare will not be an exercise in international law, or the subject of debates in the Security Council. The suspect can be unilaterally attacked just as easily as the guilty.

At the same time, biological weapons do offer Iran potential advantages. There is no practical way that any power, or combination of powers, can deny Iran the ability to covertly develop and produce such weapons. All of the uncertainties Iran faces in deploying and using such weapons create major problems for its neighbors, the US, and Israel. There is no way, short of an inspection regime that does not now exist and for which there are no plans or precedents, that any outside power can know how far Iran has gone, or the lethality of its weapons.

No potential target can ignore even worst-case scenarios and effects. Short of invasion and occupation, no state or combination of states, can prevent Iran from responding to any preventive attack on its nuclear facilities and other military capabilities, from then going on to a biological option. It is doubtful that intelligence could provide reliable warning that Iran was preparing for or conducting a biological attack, or deploying biological warheads that could give it a sudden launch on warning or launch under attack capability. Dry storable agents could potentially be prepositioned in a target country. The threat of retaliating to a major attack by using infectious agents could not be casually dismissed.

A world whose attention is fixed on nuclear weapons has not yet developed any clear countermeasures to this form of proliferation, or to the fact that Iran could mix biological and nuclear capabilities. At the same time, biological weapons do present many of the same problems in using chemical weapons, and are less suited for tactical use except in year areas that are a substantial distance from the front and friendly territory:

Any broader Iran military use of chemical weapons would present a number of problems:

- While biological weapons have a powerful psychological and political impact, and are be lethal enough to deter or intimidate, they too may well provoke and lead any opponent that can to escalate. Any use also justifies a massive level of escalation, including the use of biological or nuclear weapons in retaliation.
- Arming aircraft or missiles with unitary, cluster, or forms of biological weapons can potentially produce high rates of lethality against exposed troops or populations, but real world lethality is extremely difficult to predict. Actual area coverage can be limited, particularly with a ballistic missile warhead where preserving the integrity of a fully loaded warhead and dissemination at precisely the right altitude presents major technical challenges.
- Cluster munitions and other advanced ways of disseminating chemical weapons from a bomb or warhead offer more potential lethality, but also present more technical challenges.
- Line source dissemination by an aircraft, cruise missile, drone, or UCAV offers a simpler and more lethal way of disseminating biological agents than unitary or cluster weapons, but means flying a large air system to the target area and flying a vulnerable penetration profile.
- Effective air strikes require high confidence in the ability to penetrate enemy air defenses and good IS&R assets. In many cases, a chemical weapon would have only marginally greater lethality than a conventional precision-guided weapon or cluster weapon. Again, such use might do more to provoke than terrify, intimidate, or damage.
- Biological weapons have never been used in combat. They are an abstract and uncertain threat until employed and they achieve proven lethality, or until some form of test or "accident" gives them tangible credibility.
- The time required to achieve incapacitating, lethal, or agricultural effects presents major problems. It may be unimportant in "broken back" or existential exchanges, in avoiding defensive action, and/or in limiting attribution, but it limits the ability to promptly disrupt tactical operations, and deny areas to enemy forces. Rapidly maneuvering ground forces would be a difficult to impossible target. Nations like the United States would have extensive amounts of detection, protection, and decontamination gear. They also would not have large, static, rear area and support operations near the forward edge of the battle area.
- The use of biological weapons against targets at sea presents significant targeting and meteorological problems. These are certainly solvable, but do involve substantial problems, delayed effects, and require exceptional planning and skill. Similarly, firing against coastal targets requires high volumes of CW fire or good meteorological data.
- Covert or proxy use presents serious problems in wartime. Plausible deniability is doubtful, and an opponent simply may not care if it can prove Iran is responsible for any given use of BW. The risk to Iran of having dry storable weapons get out of control or be used against it would also be significant.

None of these problems and issues implies that Iran cannot benefit from deploying biological weapons or creating a level of ambiguity that forces any potential enemy to take these threats far more seriously than they are taken today. It is also clear that Iran has the incentive to use biological weapons under some conditions and that such use might be effective.

Biological weapons also present special problems in terms of deterrence in peacetime and controlling escalation in a conflict. This does not mean that Iranian will act on the basis of ideology or ignore risk. Extreme as some Iranian statements are, Iran tends to be pragmatic in practice. Once again, however, crises create new conditions, perceptions,

misunderstandings, and levels of risk taking. Rational bargainers with perfect insight and all the necessary transparency in terms of full knowledge of the situation and risks are theoretical constructs. It is dangerous to assume that even the most prudent decision maker will not take exceptional risks, overreact, or drastically miscalculate in war.

Appendix A: Key Acronyms

AEOI - Atomic Energy Organization of Iran
AVLIS - Atomic Vapor Laser Isotope Separation
BNPP - Bushehr Nuclear Power Plant
BW - Biological Weapons/Warfare
CAIC - Chengdu Aircraft Industrial Corporation
CBRN - Chemical, Biological, Radiological, and Nuclear warheads
CBW - Chemical and Biological Weapons
CEP - Circular Error Probable
CIA - U.S. Central Intelligence Agency
CSL - Comprehensive Separation Laboratory
CSP - Conference of States Parties
CW - Chemical Weapons/Warfare
CWC - Chemical Weapons Convention
CWD - Chemical Demilitarization Conference
DHS - U.S. Department of Homeland Security
DIA - U.S. Defense Intelligence Agency
DIV - Design Information Verification
EBW - Exploding Bridgewire
EIA - U.S. Energy Information Agency
EMP - Electromagnetic Pulse
ERI - Education Research Institute
FEP - Fuel Enrichment Plant
FMP - Fuel Manufacturing Plant
FSU - Former Soviet Union
GA - Tabun (Chemical nerve agent)
GB - Sarin (Chemical nerve agent)
GLONAS - Global Navigation Satellite System
GPS - Global Positioning System
IAEA - International Atomic Energy Agency
IAF - Iranian Air Force
IAIO - Iranian Aerospace Industries Organization
IAP - Institute of Applied Physics
IISS - International Institute for Strategic Studies
IOC - Initial Operating Capability
IR-40 - Iran Nuclear Research
IRBM - Intermediate Range Ballistic Missile
IRGC - Islamic Revolutionary Guards Corps
IRGCAF - Iranian Revolution Guards Corps Air Force

IS&R - Intelligence, surveillance, and reconnaissance
*I*sp - Specific Impulse
Kgf - Kilogram-force
KM - Kimia Maadan Company
LOW - Launch-on-warning
LRICBM - Limited Range Intercontinental Ballistic Missile
LSL - Laser Spectroscopy Laboratory
LUA - Launch-under attack
MEK - Mujahedeen-e-Khalq
MIX - Molybdenum, Iodine, Xenon Radioisotope Production Facility Reactor
MLIS - Molecular Isotope Separation
MRBM - Medium Range Ballistic Missile
MTRC - Missile Technology Control Regime
NATO - North Atlantic Treaty Organization
NBC - Nuclear Biological Chemical
NCRI - National Council of Resistance of Iran
NGO - Nongovernmental organization
NIOC - National Iranian Oil Company
NPT - Non Proliferation Treaty
NTI - Nuclear Threat Initiative
ODNI - U.S. Office of the Director of National Intelligence
OPCW - Organization for the Prohibition of Chemical Weapons
PFEP - Pilot Fuel Enrichment Plant
PHRC - Physics Research Center
PIT - Physical Inventory Taking
PLC - Programmable Logic Control
PPE - Personal Protective Equipment
PRC - Peoples Republic of China
R&D - Research and Development
SHIG - Shahid Hemat Industrial Group
SLBM - Submarine Launched Ballistic Missile
SRBM - Short Range Ballistic Missile
TEL - Transporter-Erector-Launcher
TERCOM - Terrain Contour Matching
TRR - Tehran Research Reactor
UAV - Unmanned Aerial Vehicles
UCAV - Unmanned Combat Aerial Vehicles
UCF - Uranium Conversion Facility
UO2 - Uranium Dioxide
UF4 - Uranium Tetrafluoride
UF6 - Uranium Hexafluoride
WHO - World Health Organization
WME - Weapons of Mass Expenditure
WMM - Weapons of Mass Media
WMP - Weapons of Mass Panic
ZKA - German Customs Office of Criminal Investigations

[i] Proliferation: Threat and Response, The Office of Secretary of Defense, 1997, available at: http://www.defenselink.mil/pubs/prolif97/

[ii] Proliferation: Threat and Response, caartment of Defensere, P-The Office of Secretary of Defense, 2001, p. 36, available at: http://www.defenselink.mil/pubs/ptr20010110.pdf

[iii] As is noted in the text, this summary of US positions draws heavily on the work of the Nuclear Threat Initiative (NTI) in its chronology of Iranian biological weapons, http://www.nti.org/e_research/profiles/Iran/Biological/2308_4698.html; Transcript: State Department Noon Briefing by Deputy State Department Spokesman J. Adam Ereli, 2 April 2004, <http://www.state.gov/r/pa/prs/dpb/2004/31109.htm>.

[iv] 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: Office of the Director of Central Intelligence, 2004), p. 3, www.cia.gov.

[v] Lieutenant General Michael Maples, Current and Projected National Security Threats to the United States, Statement for the Record before the US Senate Select Committee on Intelligence, 28 February 2006, p. 10, www.dia.mil.

[vi] --Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions for the period 1 January to 31 December 2004, (Washington, DC: Office of the Director of National Intelligence, 2006), p. 3, www.dni.gov. That November, John C. Rood, Assistant Secretary for International Security and Nonproliferation, stated that, "We [the United States] believe that the regime in Iran probably has an offensive biological weapons program in violation of the BWC." Richard Waddington, "Iran probably has germ weapons, possibly N.Korea-US," Reuters, 20 November 2006, www.alertnet.org; Remarks to the Sixth Biological Weapons Convention Review Conference John C. Rood, Assistant Secretary for International Security and Nonproliferation, 20 November 2006, www.state.gov

[vii] Lieutenant General Michael Maples, Current and Projected National Security Threats to the United States, Statement for the Record before the US Senate Select Committee on Intelligence, 11 January 2007, intelligence.senate.gov.

[viii] Lieutenant General Michael Maples, Current and Projected National Security Threats to the United States, Statement for the Record before the US Senate Committee on Armed Services, 27 February 2008, p. 12. <www.dia.mil>.

[ix] J. Michael McConnell, Annual Threat Assessment of the Director of National Intelligence, Statement for the Record before the US Senate Select Committee on Intelligence, 5 February 2008, <www.dni.gov>.

[x] Federation of American Scientists, The BWC Review Conferences and the Verification Protocol, http://www.fas.org/bwc/papers/review/bwcrc.htm.

[xi] Nuyckear Threat Initiative (NTI), "Country Overviews: Iran: Biological Chronology," http://www.nti.org/e_research/profiles/Iran/Biological/2308_4698.html

[xii] --*The CBW Conventions Bulletin*, No. 65 (September 2004), p. 14.

[xiii] The statement was made on August 2, 2004. See *The CBW Conventions Bulletin*, No. 66 (December 2004), p. 35

[xiv] As quoted in the NTI chronology. Also see Tehran Vision of the Islamic Republic of Iran Network, 22 September 2004, translated transcript provided by FBIS as "Guards commander says Iran ready for bacteriological, chemical warfare," FBIS document IAP20040922000086, www.opensource.gov.

[xv] NTI chronology and -*The CBW Conventions Bulletin*, No. 76+77 (October 2007), p. 7

[xvi] --"German intelligence services see Iran possessing biological, chemical weapons," 20 February 2005, FBIS document EUP2005022000035, www.opensource.gov.

[xvii] Interview; NTI chronology; and WMD End-Use Control: License Applications for Iran, Amended May 2006, www.dti.gov.uk.

[xviii] The group maintains an active website at http://ncr-iran.org/content/blogsection/18/154/.

[xix] Designation of National Council of Resistance and National Council of Resistance of Iran under Executive Order 13224; Released on August 15, 2003, http://www.state.gov/r/pa/prs/ps/2003/23311.htm: The Secretary of State has amended the designation, under Executive Order 13224 on terrorist financing, of the Mujahedin-e Khalq, known as the MEK, to add its aliases National Council of Resistance (NCR) and National Council of Resistance of Iran (NCRI). That Executive Order blocks the assets of organizations and individuals linked to terrorism. The decision also clarifies that the designation includes the U.S. representative office of NCRI and all its other offices worldwide, and that the designation of the People's Mujahedin of Iran ("PMOI") as an alias of the MEK includes the PMOI's U.S. representative office and all other offices worldwide.

The Secretary of State designated the MEK as a foreign terrorist organization in 1997 under the Immigration and Nationality Act, and again in 2001 pursuant to section 1(b) of Executive Order 13224. That order (as amended) authorizes the Secretary to designate foreign entities and individuals that he determines – in consultation with the Secretary of the Treasury, the Attorney General, and the Secretary of Homeland Security – to have committed, or to pose a significant risk of committing, acts of terrorism that threaten the security of U.S. nationals or the national security, foreign policy, or economy of the United States.

The action to amend the Executive Order 13224 designation of the MEK to include NCR and NCRI is based on information from a variety of sources that those entities functioned as part of the MEK and have supported the MEK's acts of terrorism.

[xx] NTI, Iran Profile, Biological Facilities, http://www.nti.org/e_research/profiles/Iran/Biological/2305_2380.html.

[xxi] NTI, "biological facilities," http://www.nti.org/e_research/profiles/Iran/Biological/2305.html; and Clerical Remarks to the Press by Soona Samsami, US Representative of the National Council of Resistance of Iran, 26 January 1999, p. 2; Amir Kabir University website, <http://www.aku.ac.ir/>; "Iranian, Syrian Universities Sign Mutual Scientific Cooperation Agreement," Tehran IRNA in English, 20 March 2002; in FBIS Document IAP20020320000059; "Iranian Procurement Fronts," Middle East Defense News (Mednews), vol. 5, no. 17-18, 8 June 1992.

[xxii] See the NTI web site and Federation of American Scientists, <http://www.fas.org/nuke/guide/iran/facility/damghan.htm>; "Special Report: Chemical and Biological Warfare Programs," Jane's Intelligence Review-Special Report, 1 June 1995; Anthony Cordesman, Iran's Military Forces in Transition: Conventional Threats and Weapons of Mass Destruction, p. 236; "U.S. Suspects Iranian CW Facility Damaged in Quake," Middle East Newsline, vol. 4, no. 243, 24 June 2002; Exploring U.S. Missile Defense Requirements in 2010: What Are the Policy and Technology Challenges?, Institute for Foreign Policy Analysis, April 1997, ch. 4; James Adams, "Russia helps Iran's Bio-warfare" Sunday Times, Washington, DC, 27 August 1995.

[xxiii] NTI cites a wide range of sources: Key Sources: Arnold Beichman, "Arsenal of Poison," Hoover Digest, No. 3, 1999; Remarks to the Press by Soona Samsami, US Representative of the National Council of Resistance of Iran, 26 January 1999; Arnold Beichman, "Arsenal of Germs in Iran?" The Washington Times, 26 January 1999, p. A17; Anthony H. Cordesman, Iran's Military Forces in Transition: Conventional Threats and Weapons of Mass Destruction, p. 237; Uzi Mahnaimi and James Adams, "Iran Builds Biological Arsenal: Israelis Warn of Teheran Plan To Poison Europe's Water Supplies," Sunday Times, 11 August 1996; in "Israelis Warn of Teheran's Biological Arsenal," FBIS Document FTS19960811000139, 11 August 1996; Iran Trade Zone, <http://www.irantradezone.com/ministriesdesc.asp?page=3&order=srno>; Chemexcil; "The Internet in Iran: A Survey," Neda Rayaneh Institute, <http://www.iranian.com/WebGuide/InternetIran/; InternetIran-Government.html>, 1997; "Jihad Striving for Development and Construction", Public Relations of Jihad-e-Sazandegi, Summer 1993, pp. 8-45, <http://www.netiran.com/Htdocs/Clippings/DEconomy/930711XXDE01.html>; Paula A. De Sutter, Denial and Jeopardy: Deterring Iranian Use of NBC Weapons, National Defense University Press; FBIS, Tehran Domestic Service, 27 April 1986; The National Council of Resistance of Iran, Paris, 13 August 1997, <http://www.iran-e-azad.org/english/ncr/970813.html>.

[xxiv] NTI cites Remarks to the Press by Soona Samsami, US Representative of the National Council of Resistance of Iran, 26 January 1999, p. 2.; Arnold Beichman, "Arsenal of Germs in Iran?" Washington Times, 26 January 1999, p. A17; "Iran's Chemical Build-Up," Intelligence Newsletter, Indigo Publications, 9 November 1995; "Hungary Reportedly Helped Iran Repaort Parchin Chemical Weapons Facility," Jerusalem Middle East Newsline E-mail Text in English, 22 August 2002; in FBIS document GMP20020822000212.

[xxv] NTI cites *Remarks to the Press by Soona Samsami, US Representative of the National Council of Resistance of Iran, 26 January 1999, p. 2.; Gudio Olimpio, "Khatami to Visit Rome on European Mission," Corriere della Sera (internet version), 4 February 1999; in "Italian Daily Cites MKO Report on Iran's CBW Program," FBIS Document FTS19990204000672, 4 February 1999; Arnold Beichman, "Arsenal of Germs in Iran?" Washington Times, 26 January 1999, p. A17; Rob Swanson, "Iranian Resistance Group Charges Iran Expediting Manufacture of Biological Weapons," Washington Report on Middle East Affairs, March 1999, pp. 111-115; "Iranian Opposition Highlights Regime's Biological, Chemical Projects," Iran Mojahedin WWW-Text in English, 14 August 2002; in FBIS document IAP20020816000037.*

[xxvi] James Adams. "Russia help's Iran's bio-warfare," *Sunday Times*, 27 August 1995.

[xxvii] Statement by John A. Lauder, to the Senate Committee on Foreign Relations on Russian Proliferation to Iran's Weapons of Mass Destruction and Missile Programs, October 5, 2000, available at: http://www.cia.gov/cia/public_affairs/speeches/2000/lauder_WMD_100500.html.

[xxviii] CIA, Unclassified Report: to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, July-December 2003, available at: http://www.cia.gov/cia/reports/721_reports/pdfs/721report_july_dec2003.pdf

[xxix] John R. Bolton, "Iran's Continuing Pursuit of Weapons of Mass Destruction," Testimony Before the House International Relations Committee Subcommittee on the Middle East and Central Asia, June 24, 2004, available at: http://www.state.gov/t/us/rm/33909.htm

[xxx] Adapted from Chemical and Biological Arms Control Institute (CBACI), Fighting Bioterrorism: Tracking and Assessing US Government Programs, Washington, 2004, p. 9.

[xxxi] For an interesting papers on the issue, although now seriously dated, see "Briefing on the Jason 1997 summer study, Study," Lear Steven Block; "Biological Warfare Threats Enabled by Molecular Biology;" and Malcolm R. Dando, "The Impact of Biotechnology," in Brad Roberts, ed., Hype or Reality? The New Terrorism and Mass Casualty Attacks, Alexandria, Chemical and Biological Arms Control Institute, 2000, pp. 193-206. Also see GAO/NSIAD-99-163,

"Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks," p. 12.

[xxxii] The range of uncertainty for a key agent like Anthrax, however, is illustrated in WHO reporting on the risk of the use of such an agent in a "deliberate epidemic:" (WHO, Deliberate Epidemics Annex 3: Biological Agents, http://www.who.int/csr/delibepidemics/biochemguide/en/index.html. , accessed March 18, 2005.)

> Reported estimates of the dose required to infect 50% of a population of non-human primates in experimental studies of inhalational anthrax vary enormously, from 2500 to 760,000 spores, apparently reflecting differences in the many variables involved in such experiments. While doses lower than the LD50 produce correspondingly lower rates of infection, the very large number of experimental animals that would be required makes it impractical to determine doses that would infect only a small percentage of those exposed.
>
> The largest reported outbreak of human inhalational anthrax took place in 1979 in Sverdlovsk (Ekaterinburg), former Soviet Union. Of 66 documented fatal cases, all were more than 23 years in age, suggesting that adults may be more susceptible to inhalational anthrax than younger individuals. The concomitant infection of sheep and cattle as far as 50 kilometers down wind of the apparent source points to the hazard of long-distance aerosol travel of infective spores.

An outbreak of inhalational anthrax and cutaneous anthrax in the United States during October and November 2001 was caused by *B. anthracis* spores intentionally placed in envelopes sent through the post. Of the total of 11 reported inhalational cases, the probable date of exposure could be determined in six, and for these the median incubation period was 4 days (range 4–6 days). Prolonged antimicrobial prophylaxis administered to persons thought to be at greatest risk may have prevented cases from occurring later. All 11 inhalational cases received antimicrobial and supportive therapy and six survived. As in the Sverdlovsk outbreak, there was a lack of young persons among the inhalational cases, whose ages ranged from 43 to 94.

[xxxiii] Thomas V. Inglesby and Others, "Anthrax as a Biological Weapon: Medical and Public Health Management," JAMA, Vol. 281, No. 18, May 12, 1999, pp. 1735-1745, pp. 1736-1737; USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, p. 4-31.

[xxxiv] USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, p. 4-31.

[xxxv] Thomas V. Inglesby and Others, "Anthrax as a Biological Weapon: Medical and Public Health Management," JAMA, Vol. 281, No. 18, May 12, 1999, pp. 1735-1745, pp. 1736-1737.

[xxxvi] Thomas V. Inglesby and Others, "Anthrax as a Biological Weapon: Medical and Public Health Management," JAMA, Vol. 281, No. 18, May 12, 1999, pp. 1735-1745, pp. 1736-1737; USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, p. 4-31.

[xxxvii] Ken Alibek, Biohazard, New York, Random House, 1999, pp. 111-114, 261, 264.

[xxxviii] Washington Post, August 24, 2000, p. E-1.

[xxxix] Immunity develops rapidly after vaccination against smallpox, so that even post-exposure vaccination can prevent or ameliorate the disease so long as it is done within approximately 4 days after exposure and before rash appears.

[xl] USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, p. 4-31.

[xli] Donald A Henderson, Thomas V. Inglesby and Others, "Smallpox as a Biological Weapon: Medical and Public Health Management," JAMA, Vol. 281, No. 18, June 9, 1999, pp. 2127-2137.

[xlii] Donald A Henderson, Thomas V. Inglesby and Others, "Smallpox as a Biological Weapon: Medical and Public Health Management," JAMA, Vol. 281, No. 18, June 9, 1999, pp. 2127-2137; USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, p. 4-37.

[xliii] USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, p. 4-31.

[xliv] CIA, Terrorist CBRN: Materials and Effects, CTC 2003-4005B, May 2003.

[xlv] CIA, Terrorist CBRN: Materials and Effects, CTC 2003-4005B, May 2003. Some US Army experts believe that it takes at least 35 times more Botulinum to create a lethal dose than the US estimates in much of its published lethality data.[xlv] This uncertainty is of some interest because Iraq produced tons of botulism toxin. (The Medical NBC Battlebook does not give a lethal dose, but states that the infective dose is 0.001 *u*g/kilogram (type A). There is virtually no empirical data in normal medicine with aerosolized Botulinum toxin, but it is expected to produce symptoms normal to the food borne version. Symptoms could begin anywhere from 24 hours to several days after exposure. The initial symptoms would be those of the flu or cold until more characteristic motor symptoms appeared. The US Army is still investigating a vaccine which counters five of the seven neurotoxins in the disease, and seems to leave significant antibodies for more than year, and the CDC has a vaccine that deals with three out of the seven neurotoxins. A higher risk heptavalent antitoxin for neurotoxins A-G is available from the USAMIRID, but requires a protocol with informed consent. See USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, pp. 4-31 to 4-32.

[xlvi] Department of Homeland Security, Planning Scenarios, Homeland Security Council, July 2004; AP, March 16, 2005, Lara Jakes Jordan, "Federal officials catalogue possible terror attacks." The details of the scenarios are: summarized as follows:

Scenario: Biological Attack – Aerosol Anthrax

- ***Casualties: 13,000 fatalities and injuries***
- Infrastructure Damage: Minimal, other than contamination
- *Evacuations/Displaced Persons: Possibly*
- Contamination: Extensive
- Economic Impact: Billions of dollars
- *Potential for Multiple Events: Yes*
- *Recovery Timeline: Months*

General Description: Anthrax spores delivered by aerosol delivery results in inhalation anthrax, which develops when the bacterial organism, Bacillus anthracis, is inhaled into the lungs. A progressive infection follows. This scenario describes a single aerosol anthrax attack in one city delivered by a truck using a concealed improvised spraying device in a densely populated urban city with a significant commuter workforce. It does not, however, exclude the possibility of multiple attacks in disparate cities or time-phased attacks (i.e., "reload"). For federal planning purposes, it will be assumed that the Universal Adversary (UA) will attack five separate metropolitan areas in a sequential manner. Three cities will be attacked initially, followed by two additional cities 2 weeks later.

> *Timeline/Event Dynamics – It is possible that a Bio-Watch signal would be received and processed, but this is not likely to occur until the day after the release. The first cases of anthrax would begin to present to Emergency Rooms (ERs) approximately 36 hours post-release, with rapid progression of symptoms and fatalities in untreated (or inappropriately treated) patients. The situation in the hospitals will be complicated by the following facts: The release has occurred at the beginning of an unusually early influenza season and the prodromal symptoms of inhalation anthrax are relatively non-specific. Physician uncertainty will result in low thresholds for admission and administration of available countermeasures (e.g., antibiotics), producing severe strains on commercially available supplies of such medications as ciprofloxacin and doxycycline, and exacerbating the surge capacity problem.*
>
> *Secondary Hazards/Events – Social order questions will arise. The public will want to know very quickly if it is safe to remain in the affected city and surrounding regions. Many persons will flee regardless of the public health guidance that is provided. Pressure may be placed directly on pharmacies to dispense medical countermeasures directly, and it will be necessary to provide public health guidance in more than a dozen languages.*

Key Implications: This attack results in 328,484 exposures; 13,208 untreated fatalities; and 13,342 total casualties. Although property damage will be minimal, city services will be hampered by safety concerns. There is the potential for a huge sell-off in the economic markets; moreover, the stock exchange and large businesses may be directly affected by the attack. There may also be a decline in consumer spending and a loss of revenue for the metropolitan area. An overall national economic downturn is possible in the wake of the attack due to loss of consumer confidence. The costs of the closure of a large section of the city and the decrease in revenue from tourism for an indeterminate period would be enormous, as would the costs of remediation and decontamination.

Mission Areas Activated: Prevention/Deterrence/Protection – This area requires knowledge of those with the ability to grow and aerosolize anthrax, reconnaissance of equipment and laboratories, and public health protection measures.

Emergency Assessment/Diagnosis – It will be necessary to monitor attack impact, determine resource needs, classify the type of event, and identify other events (if any). Environmental sampling for exposure risk assessment, identification of anthrax strain, and determination of any drug resistance will also be required.

Emergency Management/Response – Management and response will require public alerts, mobilization of the Strategic National Stockpile, activation of treatment sites, traffic/access control, special population protection, protective measures (e.g., shelter-in-place), requests for resources and assistance, and public information activities.

Incident/Hazard Mitigation – Mitigation will require PEP and PPE provision, environmental testing/decontamination, care of ill persons, victim treatment, site remediation and monitoring, notification of airlines/transport providers, public information provision, and coordination with public health agencies.

Public Protection – In order to protect the public, it will be necessary to provide symptom/exposure information, warnings, and shelter-in place evacuation notification, as well as to manage traffic/access flow and mobilize the Strategic National Stockpile. Victim Care – Care to the ill must be provided and should include disbursing PEP/vaccinations and establishing treatment/distribution centers.

Investigation/Apprehension – Law enforcement will investigate the attack in collaboration with public health officials working to identify populations at risk of disease. This also requires epidemiological trace-back of victims, parallel

criminal investigations, and laboratory analyses.

Recovery/Remediation – The Environmental Protection Agency (EPA) and the CDC will coordinate this area. Extensive decontamination and cleanup will be required (anthrax is long-lived in the environment) costing billions of dollars. Remediation will also require environmental testing, highly contaminated area closures, and public information provision.

Scenario: Biological Attack – Plague

- Casualties: 2,500 fatalities; 7,000 injuries
- *Infrastructure Damage: None*
- *Evacuations/Displaced Persons: Possibly*
- Contamination: Lasts for hours
- Economic Impact: Millions of dollars
- *Potential for Multiple Events: Yes*
- *Recovery Timeline: Weeks*

Scenario Overview: Plague is a bacterium that causes high mortality in untreated cases and has epidemic potential. It is best known as the cause of Justinian's Plague (in the middle sixth century) and the Black Death (in the middle fourteenth century), two pandemics that killed millions. In this scenario, members of the Universal Adversary (UA) release pneumonic plague into three main areas of a major metropolitan city – in the bathrooms of the city's major airport, at the city's main sport arena, and at the city's major train station.

Timeline/Event Dynamics – Plague cases rapidly occur in the United States and Canada. As a result of foreign and domestic travel, rapid dissemination to distant locations occurs. By Day 3, the plague spreads across both the Pacific and Atlantic oceans and by Day 4, the plague is confirmed in eleven countries other than the United States and Canada.

Secondary Hazards/Events – As the financial world in Major City and elsewhere begins to realize the likelihood of an epidemic, a huge sell-off occurs in the markets. There is a high absentee rate at banks, other financial institutions, and major corporations. Adding to these complications is the fact that bank and other financial customers may be staying home. As a result, the phone systems at financial institutions may become completely tied up, with far fewer transactions than normal occurring. The fear of plague has raised memories of the anthrax incidents of 2001, which may cause many citizens to be afraid to open their mail.

Key Implications: Although the specific assumptions that underlie these totals are not generally available, nor can they be reliably recreated, the parameters affecting these figures include length of incubation period following primary exposure, rate of secondary transmission, incubation period following secondary exposure, and timing and effectiveness of the intervention.

Illnesses and Fatalities by Country:

- United States 7,348/ 2,287
- Canada 787/ 246
- Other Countries 33/ 10
- Total 8,168/ 2,543

Although the actual physical damage to property will be negligible, there will be an associated negative impact of buildings and areas that were or could have been contaminated. Service disruption will be significant for call centers, pharmacies, and hospitals due to overwhelming casualty needs. It will be necessary to close or restrict certain transportation modes. The threat of reduced food supply will cause food prices to rise. A huge sell-off in the economic markets is possible, and loss of life will result in a decline in consumer spending and subsequent loss of revenue in the metropolitan area. An overall national economic downturn is possible in the wake of the attack due to loss of consumer confidence.

Many people will be killed, permanently disabled, or sick as a result of the plague. The primary illness will be pneumonia, although the plague can also cause septicemia, circulator complications, and other manifestations. The long-term effects of antimicrobial prophylaxis in large numbers will require follow-up study. The associated mental health issues relating to mass trauma and terrorism events will also require assessment.

Mission Areas Activated:

Prevention/Deterrence/Protection – This area requires knowledge of persons with the skills to grow and aerosolize plague, reconnaissance of supplies and laboratories, and public health protection measures.

Emergency Assessment/Diagnosis – Although health professionals should rapidly recognize the seriousness of the incident, diagnosis of the plague may be delayed. Detection of the plague should initiate laboratory identification of the strain and a determination of the potentially known antimicrobial drug resistance. Origin of the initial contaminant should be traced back to the source.

Emergency Management/Response – Identification of drug-resistant plague strains would require full utilization of personal protective equipment (PPE) and quarantine measures. Response will require provision of public alerts mobilization of the National Strategic Stockpile, activation of treatment sites, traffic and access control, protection of special populations, potential quarantine measures including shelter-in-place recommendations, requests for resources and assistance, and public information activities. Effective communication between U.S. and Canadian governments is vital.

Incident/Hazard Mitigation – Victims must receive antibiotic therapy within 24 hours to prevent fatality. Exposed victims must be isolated and minimizing disease spread will require epidemiological assessments, including contact investigation and notification.

Public Protection – Victims must be evacuated and treated (and/or self-quarantined), and antimicrobial prophylaxis will be necessary for exposed persons, responders, and pertinent health care workers. Mobilization of the Strategic National Stockpile for additional critical supplies and antibiotics will be necessary. The public should be informed of signs and symptoms of plague.

Victim Care – Victims will require treatment or prophylaxis with ventilators and antibiotics, as well as information measures for preventing spread of the disease. Advanced hospital care will be required for those with pneumonia. The U.S. Department of State's Bureau of Consular Affairs will need to be involved in order to assist foreign populations residing in the United States, or U.S. citizens exposed or ill abroad.

Investigation/Apprehension – Point-of-source exposures and plague strain must be determined using victim trace-back, criminal investigation, and laboratory analyses.

Recovery/Remediation – Extensive decontamination and cleanup will not be necessary because plague cannot live long in the environment and is viable to heat and sunlight exposure. However, some efforts should be undertaken to support political/public confidence.

Biological Attack – Food Contamination

- Casualties: 300 fatalities; 400 hospitalizations
- *Infrastructure Damage: None*
- *Evacuations/Displaced Persons: None*
- Contamination: Sites where contamination was dispersed
- Economic Impact: Millions of dollars
- *Potential for Multiple Events: Yes*
- *Recovery Timeline: Weeks*

Scenario Overview: The U.S. food industry has significantly increased its physical and personnel security since 2001. A successful attack could only occur following the illegal acquisition of sensitive information revealing detailed vulnerabilities of a specific production site. However, in this scenario the Universal Adversary (UA) is able to acquire these restricted documents due to a security lapse. The UA uses these sensitive documents and a high degree of careful planning to avoid apprehension and conduct a serious attack. The UA delivers liquid anthrax bacteria to pre-selected plant workers. At a beef plant in a west coast state, two batches of ground beef are contaminated with anthrax, with distribution to a city on the west coast, a southwest state, and a state in the northwest. At an orange juice plant in a southwestern state, three batches of orange juice are contaminated with anthrax, with distribution to a west coast city, a southwest city, and a northwest city.

Timeline/Event Dynamics –

• November: The biological agent is delivered to terrorists (plant workers).
• December 3: The biological agent is inserted into ground beef and orange juice at production facilities, and the packages are shipped to affected cities.
• December 5: The first signs of patients with unknown illness appear.
• December 5-15: There is a significant influx of affected individuals into hospitals with 1,200 sick, 300 dead, and 400 hospitalized in ICU.
• December 8: Health departments, the CDC, the FDA, and the USDA begin pursuing epidemiological investigations.
• December 30: A contaminated product trace is made to ground beef and orange juice production plants. Decontamination of plants commences.

• January 5: No new cases of illness are reported.

Secondary Hazards/Events –

As a result of news of the contaminated food products, there is general public concern regarding food safety, and the "worried well" are taxing medical and laboratory facilities. The public floods into medical facilities seeking prescription drugs to prevent or recover from sickness. In addition, ground beef and orange juice sales plummet, and unemployment in these two industries rises dramatically.

Key Implications:

The attack results in 300 fatalities, 400 hospitalizations, and 1,200 illnesses. Overall property damage is moderate, and due only to decontamination of affected facilities. However, property and facility disruption (downtime) are significant due to decontamination of affected facilities. Service disruption is significant in ground beef and orange juice industries, and some moderate disruption occurs in other food industries due to the public's concern about food safety in general. Although direct financial impact is significant, initial economic impact on the general economy is relatively low. However, the long-term financial impact on the beef and orange juice marketplace and associated businesses could be significant, and other food industries' income is likely to be negatively affected by the public's overall perception of unsafe food. The societal impact of attacks on the food supply generates demands for increased, costly, federally directed food security programs and other measures to reduce the possibility of future attacks. Anthrax may result in fatality and serious long-term illness.

Mission Areas Activated:

Prevention/Deterrence/Protection – Avoiding the attack is contingent on the prevention of infiltration of two different food production systems. Deterrence and protection require rapid disease diagnosis, and protective measures to assure food safety.

Emergency Assessment/Diagnosis – Determining cause of illness and tracking the contaminated source is critical.

Emergency Management/Response – Disease outbreaks in three cities spread throughout the country, which tests coordination of resources.

Incident/Hazard Mitigation – Once disease outbreak occurs, decisions must be made regarding meat and juice supplies and production.

Public Protection – Public protection will require testing alert and warning mechanisms, providing public information and education, and coordinating human and veterinary services.

Victim Care – Victim care will require diagnosis and treatment of affected population and distribution of prophylaxis for potentially exposed populations.

Investigation/Apprehension – Epidemiology will be critical to trace the source of contamination. Investigation of crime and apprehension of suspects will be needed.

Recovery/Remediation – Contaminated foodstuffs require disposal. Plants and sites where anthrax was dispersed may need to be decontaminated.

[47] WHO, Deliberate Epidemics Annex 3: Biological Agents, http://www.who.int/csr/delibepidemics/biochemguide/en/index.html, accessed March 18, 2005. For similar studies and conclusions see Report of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction, Assessing the Threat, December 15, 1999, http://www.rand.org/organisation/nsrd/terrpanel, pp. 73-88; and GAO/NSIAD-99-163, Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks," p. 12.

[48] http://www.defenselink.mil/pubs/prolif/access tech.html

[49] http://www.defenselink.mil/pubs/prolif/access tech.html

[50] Chris Bullock, "Biological Terrorism," Transcript of a program on biological warfare chaired by Professor D. A. Henderson, Director of the Johns Hopkins Center for Biodefense Studies, August 29, 1999, httI2://www.infowar.com/wmd/99/wmd 091699a j.shtml, September 16,1999.

[51] National Intelligence Council, Mapping the Global Future, Report of the National Intelligence Council's 2020 Project, NIC-2004-13, December 2004, p. 101.

[52] For a good technical summary of the issues involved in making such weapons, see Office of Technology Assessment, "Background Paper: Technologies Underlying Weapons of Mass Destruction," Washington, US Congress, OT A-BP-ISC-115, December 1993.

[53] Briefing on the Jason 1997 summer study, Study Lear Steven Block, "Biological Warfare Threats Enabled by Molecular Biology;" Malcolm R. Dando, "The Impact of Biotechnology," in Brad Roberts, ed., Hype or Reality? The New Terrorism and Mass Casualty Attacks, Alexandria, Chemical and Biological Arms Control Institute, 2000, pp. 193-206.

[54] Briefing on the Jason 1997 summer study, Study Lear Steven Block, "Biological Warfare Threats Enabled by Molecular Biology."

[55] Assessments of *problems, and possible alternative delivery methods, posed by the weaponization process of biological agents* adapted from multiple sources including NTI, Jane's: Iran's Chem-Bio Programmes, and http://www.csis-scrs.gc.ca/pblctns/prspctvs/200005-eng.asp.