

**Prepared Statement  
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With America on the precipice of war with Iraq, a country known to have used chemical weapons in its war with Iran and believed to be in possession of considerable biological and chemical weapons capabilities, this committee's inquiry into the status of efforts to retard the proliferation of unconventional weapons could not be more timely. Even if a war with Iraq unfolds without the use of unconventional weapons and comes to a swift conclusion, the struggle to thwart the proliferation of chemical, biological, and nuclear arms will endure indefinitely. Unlike nuclear weapons, which can be developed from scratch only at considerable cost and technical skill, chemical and biological weaponry can be acquired at significantly lesser cost, using equipment and materials commonly employed in commercial industries. While there are appreciable technical hurdles involved in the manufacture and dispersion of biological and chemical agents, poison gas remains the lowest on the weapons of mass destruction food chain, with germ weapons coming next and nuclear weapons at the top. Nations seeking unconventional weapons have traditionally scaled the ladder, starting with chemical weapons. Moreover, when unconventional weapons have been employed, mankind has turned most frequently to poison gas, as World Wars I and II and more recently the 1980s Iran-Iraq War, have demonstrated. Therefore, it is vital that the US government and the international community spare no effort to reduce the chemical and biological weapons threat at the nation state level. Hindering terrorist acquisition of these weapons will require even more ingenuity, collaboration, and determination.

In my testimony, I will provide an overview of chemical and biological weapons proliferations concerns, followed by an accounting of the tools that can be employed to stem the proliferation tide. The good news is that such tools are relatively plentiful; the bad news is that none of them will do the job in its entirety and several of them enjoy lackluster support, including from various decisionmakers in this capital.

**An Overview of Chemical and Biological Weapons Proliferation Concerns**

A review of the status of chemical weapons programs worldwide would begin with the stipulation that four nations, namely Russia, the United States, India, and South Korea, have declared possessing chemical arsenals and are in the process of destroying those munitions under the supervision of international inspectors who monitor compliance with the treaty that bans poison gas, the 1997 Chemical Weapons Convention (CWC). According to the US government, an additional sixteen countries are involved in some level of offensive chemical weapons activity. Besides Iraq, North Korea and Syria have reportedly stockpiled chemical weapons, as Israel may have done. While Egypt is described as having chemical agent production capabilities, Taiwan and Myanmar may not have progressed past research, development, and testing. Several additional countries that the US government cites as being of proliferation concern are members of the CWC, namely China, Ethiopia, Iran, South Africa, Sudan, Pakistan, Vietnam, and Yugoslavia. Another country with a checkered past regarding chemical weapons is Libya, which reportedly is on the verge of acceding

to the CWC. Upon joining the CWC, as Table 1 shows, six of these nations declared having former chemical weapons production facilities. Since mid-1997, CWC inspectors have systematically padlocked and begun certifying the destruction of these facilities or their conversion to peaceful purposes.

**Table 1: Chemical Weapons Status of Select Countries.**

	<i>CWC Signatory</i>	<i>CWC Member</i>	<i>Declared Former Production Facilities</i>	<i>Declared Arsenal</i>	<i>Non-CWC Signatory, Non-CWC Member</i>
Egypt					
Iraq					
Libya					
North Korea					
Syria					
Taiwan					
Israel					
Myanmar					
Pakistan					
South Africa					
Sudan					
China					
Iran					
Yugoslavia					
India					
Russia					
South Korea					
United States					

When the USSR collapsed, Russia inherited the world’s largest and most sophisticated chemical weapons capability. Moscow is a member of the CWC and has declared a 40,000 metric ton arsenal. Slightly over eighty percent of that stockpile consists of nerve agents, which are stored at five different facilities. Two other storage sites house mustard and lewisite. In December 2002, Russia began destroying mustard gas at its Gorny storage site. Russia also declared 24 production facilities to the CWC’s international inspectorate, of which six have been destroyed and another seven converted to peaceful uses under the watchful eye of inspectors. US- and European-funded programs, which will be discussed later, have propelled these destruction and conversion activities.

Actual weapons materials aside, another proliferation problem concerns human expertise. “Brain drain” is linguistic short hand for the possibility that governments or terrorists attempting to acquire nuclear, biological, chemical, or missile capabilities might siphon off the human expertise behind the USSR’s weapons of mass destruction. A 26-year veteran of the Soviet chemical weapons program, Dr. Vil Mirzayanov, estimates that at its height the USSR employed roughly 6,000

scientists and technicians to conduct research, development, and testing of chemical weapons. Of that number, the US government conservatively estimates that 3,500 would pose a serious proliferation risk if they were to collaborate with proliferating governments or terrorists. That proliferation dilemma is underscored by the unparalleled amount of chemical weapons expertise that resides in Russia. In 1991, Dr. Mirzayanov blew the whistle on an ultra-secret Soviet program that successfully developed, tested, and produced in small quantities an entirely new generation of nerve agents, known as the *novichok* agents.

In my view, the US government and the international community have yet to reward Dr. Mirzayanov's valor by bringing Moscow to full account for the *novichok* program. The reasons for this sad state of affairs are complicated and perhaps better discussed another day, but when considering chemical weapons proliferation concerns, one must be mindful that a proven design exists for a turn-key chemical weapons production capacity that could be buried in the agro-chemical industry and within a relatively short period of time begin churning out chemical agents five to eight times as deadly as VX and ten times as lethal as soman.

Given the fact that the formulas of chemical weapons have been in public literature for over half a century and the necessary equipment and ingredients are the backbone of a global chemical industry, terrorists could obtain several essential components of a chemical weapons capability without too much trouble. However, should they attempt to produce the large quantities of chemical agent necessary to cause massive casualties, they could be tripped up by the same technical complexities that apparently foiled the efforts of the Japanese cult Aum Shinrikyo to inaugurate sarin production at its \$10 million, state-of-the-art production facility near Mount Fuji. Briefly, Aum Shinrikyo was the group that released the nerve agent sarin on Tokyo's subway in mid-March 1995, killing a dozen commuters, seriously injuring several dozen more, and frightening thousands who rode the subway that day. After this attack, which garnered headlines around the world, predictions of mass casualty chemical terrorist attacks abounded. Many of the initial assessments of Aum Shinrikyo's activities failed to appreciate that while the cult's corps of scientists successfully produced several chemical agents in beaker quantities, as one might expect, they subsequently experienced serious mishaps when they attempted to ramp their sarin production facility up to full speed. The technical difficulties associated with full-scale production and aerosolization and delivery of agents may explain why only governments have overcome those technical hurdles.

When it comes to biological weapons, the proliferation picture is also grim. For quite some time, the number of nations suspected of harboring biological weapons programs has hovered at a dozen. As with chemical weapons, much of the equipment, ingredients, and know-how needed to make biological weapons is integral to the pharmaceutical and biotechnology industries. Therefore, governments can mask a biological weapons program in an industrial setting, as did the USSR and Iraq. These two cases aside, public statements from US officials about the individual countries on its proliferation watch list tend to be light on specifics. Of the countries named in Table 2 below, however, the US government has asserted that Iran may have crossed the line from offensive research and development to production and stockpiling of germ weapons. Depending on which report one consults, Libya and North Korea may also have crossed that line.

Other than Iraq, the country listed below that generates especially pressing proliferation concerns is Russia. In blatant violation of the international treaty outlawing biological weapons, the Biological and Toxin Weapons Convention (BWC) for over two decades, the USSR redefined the horizons of

germ warfare with a massive bioweapons effort that involved approximately 65,000 scientists and technicians at over fifty research, development, testing, and production sites. The Soviets harnessed over fifty diseases for military purposes. Not only did the USSR harden some anti-human agents against medical treatment, it weaponized contagious diseases such as plague, smallpox, and Marburg, a hemorrhagic fever. The Soviets also put some 10,000 scientists to work on anti-crop and anti-livestock bioweapons. Nonproliferation programs need to reach into this vast bioweapons complex to secure key assets and to ensure that the bioweaponeers have viable peaceful alternatives to continued weapons work, perhaps at the behest of other governments or terrorist groups proliferating germ weapons.

**Table 2: Possible Government Sources of Biological Seed Cultures and Weapons Expertise.**

Country	Status as a State Sponsor of Terrorism*	Overview of Biowarfare Capabilities
China	No	<ul style="list-style-type: none"> <li>• Suspected offensive weapons program involving acquisition, development, production, stockpiling of biological agents</li> <li>• Possesses infrastructure necessary for biological warfare program</li> </ul>
Egypt	No	<ul style="list-style-type: none"> <li>• Military-applied research program</li> <li>• National research center investigating agent production and refinement techniques</li> <li>• Research centers engaged in cooperative biological research with US civilian and military laboratories</li> <li>• No evidence of significant or widespread research or activity</li> </ul>
India	No	<ul style="list-style-type: none"> <li>• Five military centers thought to be involved in biological program</li> <li>• Research and development efforts geared mainly to defense</li> <li>• Possesses biotechnology infrastructure</li> </ul>
Iran	Yes	<ul style="list-style-type: none"> <li>• Military-applied research program, including possible possession of small stocks of biological agent</li> <li>• Documented attempts to acquire dual-use equipment and materials</li> <li>• Mycotoxins received initial research attention; research subsequently expanded to other biological agents</li> <li>• Program anchored in biotechnology and pharmaceutical industries, an infrastructure sufficient to mask and support a significant program; medical, education and scientific research organizations also used for agent procurement, research, and production</li> </ul>
Iraq	Yes	<ul style="list-style-type: none"> <li>• Five key sites affiliated with research, development, and production</li> <li>• United Nations Special Commission monitored five vaccine or pharmaceutical facilities; thirty-five research or university sites with relevant equipment; thirteen breweries, distilleries or dairies; eight diagnostic labs; five acquisition and distribution sites for biological supplies; four facilities associated with biological equipment development; and four product development organizations</li> <li>• Worked with anthrax, botulinum toxin, aflatoxin, ricin, Clostridium perfringens, trichothecene mycotoxin, wheat cover smut</li> <li>• Declared production of 19,000 liters of botulinum toxin; 8,500 liters of anthrax; and 2,200 liters of aflatoxin; all quantities declared destroyed but not verified</li> <li>• Filled bombs and missile warheads with anthrax, botulinum toxin, and aflatoxin; spray tanks also developed as delivery mechanism</li> </ul>

Israel	No	<ul style="list-style-type: none"> <li>• Conducting biological defense research</li> <li>• Robust civilian biotechnology sector</li> <li>• Program likely to mimic former US and Soviet programs</li> </ul>
Libya	Yes	<ul style="list-style-type: none"> <li>• Engaged in initial testing and research; trying to develop agent weaponization capacity</li> <li>• Possible production of laboratory quantities of agent</li> <li>• Interested in funding joint biological ventures with international partners</li> <li>• Program slowed by inadequate biotechnology infrastructure</li> <li>• Has capacity to produce small quantities of biological equipment</li> </ul>
North Korea	Yes	<ul style="list-style-type: none"> <li>• Conducting military-applied research at universities, medical and specialized institutes</li> <li>• Research involves anthrax, cholera, bubonic plague</li> <li>• Possible testing on island territories</li> <li>• Likely able to produce limited quantities of biological warfare agents</li> <li>• Wide means of delivery available</li> </ul>
Pakistan	No	<ul style="list-style-type: none"> <li>• Infrastructure might be able to support a limited biological program</li> <li>• Conducting research and development with potential application for a biological warfare program</li> <li>• Research at scientific centers includes work in microbiology</li> </ul>
Russia	No	<ul style="list-style-type: none"> <li>• Over fifty research, testing, and production facilities</li> <li>• Roughly 65,000 weapons scientists and technicians; at least 7,000 deemed critical weaponeers</li> <li>• Weaponization of smallpox, Marburg, anthrax, plague, and many other diseases</li> <li>• Genetic engineering of diseases to strengthen them against medical treatments, vaccines</li> <li>• Crossing of diseases to create new, more deadly weapons</li> <li>• Advanced dissemination and weapons delivery capabilities</li> </ul>
Syria	Yes	<ul style="list-style-type: none"> <li>• Sufficient biotechnology infrastructure to support small program</li> <li>• Robust program would require foreign assistance</li> </ul>
Taiwan	No	<ul style="list-style-type: none"> <li>• Significant biotechnology capabilities and sophisticated equipment from abroad</li> <li>• Possible military-applied research in biology</li> </ul>

As 1992 began, tens of thousands of former Soviet bioweaponeers also found themselves without a source of income. Like their chemical counterparts, these skilled scientists and technicians are the living legacy of the prodigious Soviet biological weapons programs and constitute no less a proliferation threat than the actual weapons that they developed and produced. Many are under the impression that terrorists could easily cause massive casualties with disease. Should terrorists persuade former Soviet bioweaponeers to accept lucrative payoffs in exchange for their knowledge or bioweapons seed cultures, such deals could jumpstart terrorists' biological weapons programs. While fermenting biological agents is not that difficult, major technical hurdles arise in the post-production and dispersal processes, where the technical intricacies are such that the USSR mustered a virtual army of scientists and technicians to master biological weaponry. According to the conservative estimates of US government officials, some 7,000 of those scientists would pose a grave proliferation risk were they to cooperate with other governments or terrorist groups.

The challenges facing potential bioterrorists are further illustrated by Aum Shinrikyo's biological weapons failures. This cult is erroneously credited with having successfully dispersed anthrax and

botulinum toxin, when in fact the cult's scientists came nowhere near that feat. Aum Shinrikyo's bioweapons program was not nearly as large as its chemical weapons program, but it was nonetheless very well funded and involved roughly a dozen scientists who worked for several years to conquer the technical obstacles of bioweaponing.

From this overview, it should be clear that a successful prosecution of a war with Iraq would not bring to an end the chemical and biological threats facing the United States. Seen in this light, nonproliferation efforts should be a priority, not an afterthought. According to one adage, recognition of a problem is half of the solution to it. Surely, with all of the words uttered by US policymakers about the chemical and biological weapons threat since 11 September 2001, the problems have been recognized. What remains to be seen is whether the Washington will press forward with a panoply of nonproliferation tools. The safety of US soldiers and citizens will depend on the determination with which Washington approaches this task.

### **A Menu of Nonproliferation Options**

Aside from international legal mechanisms, such as the CWC and the BWC, a number of tools can be applied to reduce the chemical and biological weapons threat. An array of proliferation problems reside in the former USSR, so this discussion will turn first to the tools that apply principally to that area of the globe, followed by a review of nonproliferation tools that have a wider geographic applicability, such as enhanced disease surveillance, strengthened regulations overseeing biological safety, security, and oversight of genetic engineering research, and export controls like those administered by the Australia Group.

### Cooperative Threat Reduction Efforts Related to the Safety, Security, and Dismantlement of the former Soviet Chemical and Biological Weapons Complexes

A decade ago, when policy makers around the world were scrambling to comprehend the security implications of the USSR's collapse, Senators Richard Lugar (R-Indiana) and Sam Nunn (D-Georgia, ret.) moved boldly forward to inaugurate the Cooperative Threat Reduction (CTR) Program. The purpose of CTR was to help the fledgling governments that materialized out of the former Soviet empire to secure and dismantle their nuclear, biological, chemical, and missile capabilities. CTR's accomplishments related to former Soviet nuclear weaponry have garnered a fair amount of attention. However, CTR's achievements related to the string of chemical and biological weapons facilities scattered across some eight former Soviet states—a veritable toxic archipelago—are similarly impressive. The following discussion will first address CTR efforts devoted to the elimination of segments of Russia's chemical weapons capability before moving on to the work done to secure and dismantle the former Soviet bioweapons complex.

As was previously indicated, the USSR built an enormous weapons complex and left Russia with the world's biggest chemical arsenal. CTR funds have been instrumental in beginning to dismantle that infrastructure. Plants at Volgograd and Novocheboksarsk produced the USSR's nerve agents, while blister agents were made at Dzershinsk. With CTR monies, some 15 buildings at Volgograd have been destroyed. At Novocheboksarsk, a munitions preparation building has been demilitarized and preparations are underway to do the same with a jumbo production and filling building at that site. CTR funds have also driven the safe dismantlement and destruction of a chemical weapons production plant and testing facility located at Nukus, Uzbekistan.

Another important facet of CTR programming is directed at enhancing the security at Russia's chemical weapons storage facilities. The lack of security around these seven facilities was a problem that I aired in 1995 Stimson Center report. Given the low sums paid to the guards at the storage sites and their inferior physical security safeguards, I was concerned then, and, quite frankly, I continue to worry that bribes and crowbars could spring loose some of the man-portable munitions at these sites. With CTR funding, efforts are underway to strengthen the physical security at Shchuch'ye and Kizner. Given the delayed initiation of Russia's chemical weapons destruction program, it is reasonable to assume that more than a decade could pass before Russia's declared chemical arsenal is eliminated. Additional investments in security to lower the risks of insider theft and to harden these storage sites against outside attack would be wise.

Next, on 30 July 1992, the US government pledged to help Russia get its chemical weapons destruction program off the ground, later opting to build a destruction facility at Shchuch'ye. CTR funds were first used to build an analytical laboratory in Moscow that would permit stringent performance and environmental monitoring of chemical weapons destruction. Years slipped by as US governmental officials worked with their Russian counterparts to iron out the engineering plans and myriad logistical details for Shchuch'ye. Certainly, blame can be cast on both sides of the Atlantic for the delays that have handicapped the Shchuch'ye project. For their part, US officials noted that Russia was not doing its share to build the socio-economic infrastructure that would enable the project to move forward, but since 2000, Moscow has allotted much higher sums for that purpose. Bulldozers cleared the property, but again over \$132 million in construction funds were held up over Executive Branch certifications related to Russian treaty compliance.

At long last, Washington has put to rest its internal political squabbles related to certification and CTR. Just under \$900 million will be needed to construct the Shchuch'ye destruction facility, which, once built, will begin destroying 32,000 metric tons of nerve agent. The Russian government wants to proceed with this project, and it is in US security interests that Russia's stockpile be eliminated. The 2004 budget request for Shchuch'ye is \$200 million. Once and for all, Congress and the Executive Branch should throw their full fiscal and political support behind the Shchuch'ye project so that the destruction of Russia's stocks of nerve agent can begin as soon as possible.

Giving credit where it is due, European nations have singly and in combination provided significant funding to the Russian chemical weapons destruction program, enabling the opening of the Gorny destruction facility, the demilitarization of the Dzershinsk production plant, the initial steps to construct another lewisite destruction facility at Kambarka, and the provision of monies for socio-economic infrastructure projects at Shchuch'ye. Heading the list of major contributors is Germany, which put \$50 million into the destruction plant at Gorny. The United Kingdom has given over \$11 million, the Netherlands \$10 million, the Italians just under \$7 million, Norway \$2 million, and the European Union over \$16 million.

With regard to the former Soviet bioweapons complex, CTR funds have made headway destroying infrastructure and enhancing security at some of biological institutes. For example, significant components of the gargantuan anthrax production facility at Stepnogorsk, Kazakhstan, have been dismantled. At the biowarfare agent testing site on Vorozhdeniya Island in the Aral Sea Region of Uzbekistan, CTR funding allowed specialists to engage in additional decontamination of the pits where materials had been buried, ensuring that no residual pathogenic materials remained. In addition, projects are underway to eliminate infrastructure (e.g., air-handling capacity) and

specialized equipment at the State Research Center for Virology and Biotechnology at Koltsovo, known by its VECTOR acronym. Similar projects are on the drawing boards for the State Research Center for Applied Microbiology at Obolensk, the All-Russian Institute of Phytopathology at Golitsino, and the Pokrov Plant of Biopreparations.

A principal objective of another facet of CTR programming is to enhance biosafety practices and physical security at select biological institutes so that the pathogenic culture collections can be consolidated at fewer locations, under higher protection. Work to that effect is already underway at VECTOR, Obolensk, Golitsino, and Pokrov in Russia; the Institute of Virology at Tashkent and the Institute of Veterinary Sciences at Samarkand in Uzbekistan; and the State Research Agricultural Institute and the Kazakh Institute for Research Plague Control in Kazakhstan. Additional biological threat reduction projects are slated for facilities in Georgia and Ukraine.

Given the sheer number of facilities in the toxic archipelago, many of which have yet to see much, if anything, in the way of physical infrastructure improvements, a clear argument can be made for increasing US funds for projects that will strengthen security at chemical weapons storage sites, enhance safety and security at biological institutes, and enable dismantlement of more specialized infrastructure at both chemical and biological institutes. Should Congress decide to increase such funds, it should likewise up the number of government staffers responsible for managing the implementation of these programs. In uncertain and dangerous times, most Americans would characterize this as dollars well spent.

#### Brain Drain Prevention Efforts

Efforts to prevent the leakage of weapons expertise are another important aspect of nonproliferation programming. Brain drain prevention programs began in 1994 with the International Science and Technology Center's (ISTC's) first collaborative research grants to former weapons scientists. Fairly soon, the ISTC, which is funded through the Freedom Support Act, was joined by sister organizations, namely the Science and Technology Center in Ukraine (STCU), the Civilian Research and Development Foundation (CRDF), and the Department of Energy's Initiatives for Proliferation Prevention (IPP) program. The ISTC and other grant programs were charged with convincing thousands of skilled weapons scientists, most with barely a ruble in their pockets, that the possibility of receiving collaborative research grants was preferable to the certainty of a lucrative job in a proliferating country, several of which could be expected to seek their services. Through February 2003, the ISTC alone has funded 1,704 projects valued at \$498 million, providing grant payments to over 58,000 nuclear, missile, biological, and chemical weapons experts.

From the outset, grant assistance to biological and chemical weapons scientists was meager in comparison to the grants to nuclear and missile weapons specialists. At first, it was easier to reach into the nuclear and missile weapons communities given their previous interactions with their counterparts in the United States and elsewhere. In comparison, the US intelligence community knew less about the former Soviet biological and chemical weapons complexes. Moreover, the dual-use nature of chemical and biological facilities made it more difficult to discern where military-related activities left off and purely commercial work began. Since issuing a Stimson Center study about the status of brain drain prevention efforts in 1999, I have advocated increased funding for chemical and biological brain drain prevention grants.



US funding for collaborative research with bioweapons scientists began a gradual rise in 1997 that has become more pronounced in subsequent years. Not only are monies flowing through the Freedom Support Act for collaborative research with the former bioweaponeers, CTR funds are supporting collaborative, closely monitored, dangerous pathogens research at Obolensk, VECTOR, the Research Center for Molecular Diagnostics and Therapy in Moscow, the Research Center of Toxicology and Hygienic Reglementation of Biopreparations at Serpukhov, and the State Research Institute of Highly Pure Biopreparations in St. Petersburg. In the not too distant future, CTR funds could be devoted to similar work at several additional Russian biological institutes, as well as institutes in Uzbekistan and Kazakhstan.

Of particular concern to advocates of transparency, Russia has yet to allow access to four key military biological institutes: the Center of Military-Technical Problems of Biological Defense at Yekaterinburg; the Center for Virology at Sergiev Posad; the Scientific Research Institute of Military Medicine at St. Petersburg; and the Scientific Research Institute at Kirov. In late 1999, US officials overseeing brain drain prevention programming were hopeful that limited access would soon begin to occur. Since that has not come to pass, Washington must now consider whether some cooperative activities should be curtailed until limited or full access is granted.

For my part, I would strongly argue against cutting back on any Freedom Support Act or CTR biological brain drain prevention funds. Rather, such funds should continue to rise until US officials can confidently tell Congress that these programs have reached all of the bioweaponeers of proliferation concern. The US government needs to understand what transpired in the former Soviet bioweapons program to be able to enhance US military and civilian defenses. Continued collaborative research activities with the bioweaponeers therefore hits two birds with one stone, keeping these scientists engaged in peaceful research and slowly building the bonds of trust that will enable ever more cooperative defense efforts in the years ahead, including the opening of the closed military institutes.

Like their biological counterparts, former Soviet chemical weaponeers could accelerate the rudimentary chemical warfare programs of other countries or terrorist groups to lethal maturity. While more brain drain prevention funds have begun flowing to biological grants in the past several years, the amounts going into chemical grants have remained relatively static. From 1994 to mid-1999, the US government was averaging \$1.37 million in annual funds for chemical grants through the ISTC, the STCU, the CRDF, and the IPP. In 2001, the most recent year for which complete ISTC statistics are available, the ISTC alone was administering \$3 million in grants to chemical weapons scientists. While the IPP, STCU, and CRDF programs have some collaborative research efforts directed at chemical weapons scientists, their level of effort is generally less substantial than the ISTC's work. The ISTC grants alone would be inadequate to allow the 3,500 scientists that the US government deems to be of critical proliferation risk to support a family of four at the poverty line, which stood at \$41 per month. Consequently, a dedicated increase in grant aid to chemical weaponeers is advisable.

Several other steps could be taken to improve the administration of brain drain prevention programs. For instance, Russia should continue to clean house of the hardline Soviet holdovers who are primarily concerned with perpetuating a weapons capability and their own personal influence to the detriment of efforts to transform the weapons institutes to peaceful, commercial research and manufacturing centers. Since the launch of new research grants can take over two years, the ISTC should enact reforms to lessen the time needed to kickoff new projects, including

shorter deadlines for proposal review by the host and funding governments, the formation of expert advisory committees to pre-screen grant proposals prior to ISTC processing, and the modification of the policy regarding work plan approval. Finally, Washington still needs to improve the overall architecture for brain drain programming, at the least identifying benchmarks that will enable progress to be measured.

#### Cooperative Threat Reduction Programs Beyond the 10-Year Anniversary

While there is much to celebrate about the first ten years of CTR programs, the preceding discussion underscores that significant tasks remain. In July 2002, the leaders of the G-8 countries announced a Global Partnership Against the Spread of Weapons and Material of Mass Destruction that over the current decade would increase the \$10 billion the US government has pledged toward CTR programming by another \$10 billion from the remaining G-8 nations. The funds will apply to threat reduction across nuclear, missile, biological, and chemical weapons programs. Most of the pertinent US programming has been touched upon in the previous pages. Continuing its track record in chemical or biological threat reduction activities, Germany has promised \$33 million for the chemical weapons destruction facility at Kambarka.

The sooner that individual G-8 nations specify their intentions, the easier it will be to identify possible gaps in threat reduction programming. Less than half a year from the first anniversary of this global partnership's debut, the time has come for more concrete plans to be announced, for agreement on funding priorities, and for Russia to clarify how it will provide the support necessary to facilitate accelerated CTR programming.

In addition to this G-8 partnership, Senators Lugar and Nunn have proposed expansion of CTR-like programming beyond the borders of the former Soviet Union. As the preceding review of the proliferation threat revealed, there are several other nations that could be considered healthy candidates for assistance to help secure, convert, and dismantle chemical and biological weapons facilities and capabilities. CTR-like assistance could be particularly helpful in enhancing disease surveillance, biosecurity, biosafety, and research oversight. Such aid could be administered bilaterally for specialized projects or on a more widespread basis.

#### Enhanced Disease Surveillance

Another constructive biological threat reduction approach involves the enhancement of disease surveillance around the world. The attractiveness of this particular tool is that it can be applied on a globally or in a more targeted fashion with select countries. Providing technical and financial assistance that helps nations improve their disease surveillance capabilities is also a dual-purpose threat reduction tool. First, such aid would enable foreign countries to detect disease outbreaks as rapidly as possible, increasing the ability of the public health and medical communities to take life-saving intervention. The short time frames involved in international travel make it all the more critical that US public health authorities have as much notice as possible of disease outbreaks overseas. Depending on the disease in question, public health officials may trigger any number of measures intended to prevent the disease from migrating to US shores or to limit its spread should infected individuals already have arrived in America. The current outbreak of severe acute respiratory syndrome illustrates the importance of having well-equipped, well-trained professionals in the public health service worldwide.

The second threat reduction dimension of disease surveillance assistance relates to the links that would be established and the possible access that such US aid could enable. Many public health

laboratories in developing countries are barely equipped with basic equipment. Installing more advanced diagnostic and communications equipment would certainly improve the capabilities of such laboratories, benefiting the health and well-being of the recipient nation's citizenry. Moreover, if foreign microbiologists and epidemiologists receive advanced training at US institutions, their instruction can include inculcation of the responsibilities associated with dangerous pathogens work, as well as proper safety and security techniques. Such programs may facilitate subsequent US access to overseas facilities where US-trained personnel are working. While one does not want to overplay this second dimension of US disease surveillance aid, it could foster a better understanding of what is happening in overseas laboratories.

Last year, with these benefits in mind, the Senate passed the Global Pathogen Surveillance Act of 2002, legislation originating with Senators Joseph Biden (D-Delaware) and Jesse Helms (R-North Carolina, ret.). The House of Representatives has yet to schedule action on this bill. Also, the current request for CTR funding includes \$23 million for expanded cooperation with the ministries of health in Kazakhstan, Uzbekistan, Georgia, and Ukraine that would strengthen disease surveillance capabilities and consolidate dangerous pathogen collections in secure facilities that US personnel would be able to access.

#### More Purposeful Steps to Strengthen Biosafety, Biosecurity, and Research Oversight

In November 2002, the Bush administration debuted initiatives that were supposed to move the international community toward stiffer security surrounding dangerous pathogens, better biosafety practices, and oversight of genetic engineering research. These proposals warrant separate consideration because, if properly formulated and given sufficient political backing, they could hinder the ability of terrorists and government-level proliferators to acquire dangerous pathogens, reduce the potential for accidents at high-level biosafety facilities, and help police research activities. The current US proposals call for individual nations to take whatever steps they deem appropriate in these respective areas.

My counsel to the committee on these issues draws on a braintrust of US industry professionals who collectively have over 280 years of experience, with specialties ranging from drug research and development to process scale-up and manufacture of medicines. Their views on all eight US biological weapons nonproliferation proposals are conveyed in the Stimson Center's 2002 report, *Compliance Through Science: US Pharmaceutical Industry Experts on a Strengthened Bioweapons Nonproliferation Regime*. The US proposals related to biosafety, biosecurity, and research oversight suffer from the same handicap, namely the failure to articulate an international standard that governments would be expected to meet. Absent identification of and agreement on such standards, governments will have little to compel them to take action. Many governments will enact measures that fall short of worthwhile standards either unintentionally, because they cannot decipher the existing discrepant regulatory concepts, or intentionally, because they seek to perpetuate illicit activities. The let-each-government-do-as-it-pleases approach would further foster an uneven patchwork of domestic laws and practices that might have little near-term value and could prove difficult to harmonize in the future. All of these outcomes are unsatisfactory.

The industry experts did not consider allowing governments to set their own arbitrary standards to be a constructive step forward. Therefore, they recommended that states adopt mandatory practices in each of these areas. The industry group cited as models for uniform standards the pertinent regulations issued by the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH).

Establishing select lists of pathogens, including toxins that are dangerous to humans, animals, and plants, would facilitate the implementation of biosafety, biosecurity, and research oversight standards. For example, the CDC employs a select list to govern transfer of some human pathogens. Risk-stratified lists of human, animal, and plant pathogens need to be agreed upon to help anchor the standards. Such lists could change over time, but it would be counterproductive if too many agents were inappropriately categorized as high risk.

Sound reasons exist for establishing universal biosecurity standards. Biosecurity regulations currently vary in strength—some incorporate oversight and penalties for noncompliance, others do not. Other biosecurity regulations apply only to very limited areas of activity (e.g., shipping). The industry experts identified as an appropriate model for a minimum global standard the US access, transfer, and chain-of-custody regulations for select pathogens and toxins, or their equivalent.

Access and transfer restrictions alone are insufficient in that they do not even begin to account for the dangerous pathogens and toxins that are already present in organizations worldwide. Therefore, the industry group recommended a companion biosecurity measure: a “house cleaning” activity. Around the world, academic and research institutions, industry facilities, culture collections, and other facilities should be required to conduct a thorough inventory of the strains that they possess; declare to the appropriate authorities those delineated on the select agent lists of dangerous human, animal, and plant pathogens; and, in consultation with authorities, dispose of them, as appropriate.

The industry experts recognized that the effective implementation of any standards hinges on training, which should be conveyed first in universities and colleges and regularly reinforced in the workplace. The second foundation of implementing tougher standards begins at the level of the individual organizations that are working with dangerous pathogens or conducting research with genetically modified organisms. At universities, research institutes, industrial and government facilities, the appropriate infrastructure must be put in place to oversee these activities. For example, designated individual(s) at a facility would be responsible for proper training of personnel; review of research proposals involving genetically modified organisms; and evaluation of the sufficiency of risk assessments and containment for proposed projects. Where a governing infrastructure does not already exist, national regulations should require its creation along the lines laid out in the NIH Guidelines for Research Involving Recombinant DNA Molecules.

Next, the only way to ensure that standards are being uniformly applied nationwide is for countries to establish a national capacity to oversee facilities working with dangerous pathogens and engaged in research involving genetically modified organisms. This regulatory body would:

- Receive declarations about pertinent activities and capabilities from academic, research, industry, and government organizations;
- Certify biosafety and biosecurity practices at these facilities;
- Review, approve, and track all projects involving genetically modified organisms; and,
- Enforce research oversight, biosafety, and access, transfer, and clean house regulations.

The industry group strongly urged that noncompliance penalties (e.g., loss of job, loss of government grants, suspension of licenses) be incorporated in agreed international standards.

Absent the stipulation and enforcement of considerable penalties for noncompliance, some individuals or organizations would make only a minimal effort to abide by the regulations.

The culminating step in the implementation of global biosafety, biosecurity, and research oversight standards would be to create an international body to coordinate, promote, and administer these activities, including the updating of standards, as appropriate.

Singly, research oversight, biosafety, and biosecurity enhancement measures will not go far in thwarting nations or terrorists from engaging in wayward research, experiencing leaks at covert weapons facilities, or gaining access to dangerous pathogens. Collectively, however, global adoption of the CDC/NIH guidelines or their equivalent would raise the bar, hampering the ability of aspiring proliferators to achieve an offensive weapons capability.

Largely at the behest of the US government, the international community now plans to convene only once a year to discuss important bioweapons nonproliferation proposals. Technical talks are to last two weeks, followed by a one-week policy discussion. Biosecurity will be discussed this fall, with the topic of enhanced disease surveillance not on the agenda until 2004. The current schedule does not even include discussions of biosafety or oversight of genetic engineering research.

Senators, not only are several of the Bush administration's bioweapons nonproliferation proposals anemic, to the international community US political will to see constructive action taken in these important areas appears sadly lacking. This city abounds with rhetoric about the dangers of biological weapons proliferation. Surely, the US government can mount a more useful and concerted approach to stricter international biosafety, biosecurity, and research oversight measures. Given the Bush administration's actions thus far, the burden for instigating a more purposeful effort rests with you and your colleagues in the House of Representatives.

#### The Australia Group

Another tactic that can be used to hinder proliferation of chemical and biological weaponry is to cut proliferators off from specialized equipment and materials that would abet their proliferation goals. With that purpose in mind, the Australia Group was established in the mid-1980s. The creation of this export control cooperative was spurred by the slow recognition of Western governments that commercial trade in dual-use chemicals and expertise was fueling programs to develop and produce chemical weapons. Out of greed, ignorance, or complacency, companies and individuals from Germany, Great Britain, Japan, Austria, Belgium, the Netherlands, Italy, Switzerland, France, and the United States, among other countries, had sold Iraq and Libya products that facilitated their proliferation aims. As these nations individually began to enact export controls in the mid-1980s, Australian analysts were among the first to recognize that proliferators were selectively shopping for desired items among Western suppliers, requesting sales from one nation when turned down by another. Australia proposed that supplier nations meeting to discuss the problem in April 1985.

From an original fifteen member countries and agreement to harmonize export controls on a handful of chemical weapons precursors, the Australia Group has matured to include thirty-three member governments, plus the European Commission, that exercise coordinated export controls on 54 precursor chemicals; dual-use chemical manufacturing facilities, equipment, and related technology; plant pathogens, animal pathogens, biological agents; and dual-use biological equipment. If companies operating on the territory of an Australia Group member are approached with a purchase request for any of the items on these common control lists, the sale is not to proceed without a

licensing review by that government. That review process hinges on the proliferation implications of the individual sale in question. Should an Australia Group member deny a license, that decision is shared with other Australia Group members to reduce the possibility that the item in question could be obtained elsewhere. Australia Group members meet yearly to update each other on pertinent activities and to consider whether the control lists need adjustment or other steps need to be taken to make the export controls more effective.

Proponents of export controls argue that the cause of nonproliferation is served by severing the ability of proliferators to purchase the equipment and materials that are central to a weapons capability. Detractors, largely from developing countries, counter that export controls are discriminatory. Developing countries assert that nations that belong to the CWC and/or the BWC should be considered members in good standing of the international community, allowed full access to trade in chemical and biological goods, unless noncompliance charges are raised. They further argue that the Australia Group's controls have a negative effect on the economic well-being of developing countries. Therefore, since its inception, the Australia Group has been controversial.

In a June 1995 article, entitled "Rethinking Export Controls on Dual-Use Materials and Technologies: From Trade Restraints to Trade Enablers," US analyst Brad Roberts addressed the arguments raised by the Australia Group's critics. According to Roberts' survey of trade data, the existence of select export controls liberates trade between supplier and developing nations. In the absence of export controls, supplier companies worried that certain transactions might somehow assist proliferators tend to err on the overly cautious side, cutting trade entirely with some nations. However, with governments shouldering the burden of making the proliferation risk assessment on controlled items, those same companies are free to engage in trade in non-control list items, which by far constitute the majority of materials and equipment available or trade.

If the controversy surrounding the Australia Group and other export control endeavors is ever to be laid to rest, the relationship between export controls and trade must be further explored. Doing so could dispel objections from developing countries that may be based more on emotion than fact. Ideally, law-abiding governments around the world would then become more vigilant about trade in dual-use chemical and biological equipment and materials. The route to the more global practice of export controls lies in factual evidence about the effect of export controls on overall trade patterns.

### **Concluding Observations**

Senators, the "to-do" list for chemical and biological weapons nonproliferation programs remains quite lengthy. Unlike the list of housekeeping chores that perpetually awaits many on the weekend, the consequences of ignoring any of these to-do items or for doing them in a half-hearted manner could be grave indeed for US soldiers and citizens. For years on end, the sitting members of this committee have been stalwart supporters of common-sense nonproliferation programming. With that in mind, the following nonproliferation chores should be accomplished with all possible dispatch:

- Persist, as champions of CTR programs, with support for funds to dismantle infrastructure, upgrade security, and discourage brain drain from the former Soviet chemical and biological weapons facilities;
- Insist, in particular, on full US funding for the construction of a nerve agent destruction facility at Shchuch'ye;

- Encourage the exploration of opportunities to export CTR-like programs beyond the borders of the former Soviet empire, to other nations of proliferation concern;
- Continue to support a US campaign to enhance disease surveillance bilaterally and worldwide, reaching across the capitol to encourage the House of Representatives to consider the Global Pathogen Surveillance Act soon;
- Promote the revision of US policies related to the global strengthening of biosafety, biosecurity, and oversight of genetic engineering research, directing the Executive Branch to conduct more intense negotiations of rigorous, mandatory international standards; and,
- Request that the Executive Branch to issue a report providing statistics and analysis associated with the trade effects of export controls.

The nonproliferation battle is fought step by step, one country at a time, one facility at a time, one scientist at a time, and literally one day at a time. Given the significant challenges facing nonproliferation programs, the odds always appear stacked against success. That is, until one recognizes how many former Soviet weaponeers have chosen peaceful research over continued weapons work, how many times export controls have derailed the plans of proliferators, and how much weapons-tainted infrastructure has been destroyed within the former Soviet chemical and bioweapons complexes, at sites such as Stepnogorsk and Novocheboksarsk.

Though the costs of nonproliferation programs will mount over time, such programs constitute an ounce of prevention that could short-circuit biological and chemical weapons proliferation. Moreover, those costs are insignificant in comparison to the loss in human and animal life, as well as the devastation to crops, should governments or terrorists elect to use biological or chemical weapons.