Special Report

Preventing the Proliferation of Chemical and Biological Weapon Materials and Know-How

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CHEMICAL AND BIOLOGICAL PROLIFERATION THREATS

The former Soviet Union (FSU) had the largest and most sophisticated chemical and biological warfare (CBW) programs in the world. At their peak, these programs involved more than a hundred military and civilian facilities and employed tens of thousands of scientists and technicians in research, development, production, and testing of CBW agents and delivery systems. Most of the detailed information on Soviet CBW programs has emerged over the past decade, primarily from the defections of senior weapons scientists. Although several CBW facilities were located in non-Russian republics of the Soviet Union, Russia retains the largest concentration of technical personnel and infrastructure.

Under the 1993 Chemical Weapons Convention (CWC), Russia has declared 40,000 metric tons of chemical weapons (CW) agents stored at seven depots on Russian territory, and 24 former CW production facilities.[2] In addition, former CW scientist Vil Mirzayanov has alleged that the Soviet Union covertly developed, tested, and produced tens of tons of novel "binary" nerve agents under the codename *novichok*, or "newcomer." (A binary chemical weapon consists of two relatively nontoxic ingredients that mix to form a lethal agent while the munition is in flight to the target.) According to Mirzayanov, some *novichok* agents are five to 10 times more toxic than standard nerve agents such as sarin and soman, are resistant to medical treatment, and can be prepared from common agricultural chemicals not covered by the routine verification system of the CWC, thus impeding their detection and control.[3] To date, Moscow has denied producing *novichok* agents.

The former Soviet biological weapons (BW) program was even larger than the CW program, employing roughly 65,000 people.[4] In addition to four military microbiological facilities under the auspices of the Ministry of Defense, a complex of some 50 pharmaceutical facilities known as Biopreparat engaged secretly in the development and production of BW agents. Leading Biopreparat institutes were the Center for Applied Mi-

crobiology in Obolensk near Moscow, the Center for Virology and Biotechnology "Vector" in Koltsovo near Novosibirsk, and the Institute for Ultra-Pure Biological Preparations in St. Petersburg. Other components of the BW program were hidden within the KGB, the Soviet Academy of Sciences, and the Ministries of Agriculture, Health, and Chemical Industry.

According to former Soviet bioweapons scientist Ken Alibek, Soviet BW scientists successfully weaponized the causative agents of plague, anthrax, smallpox, tularemia, Marburg hemorrhagic fever, and other fatal or incapacitating diseases. They also reportedly developed genetically modified strains of pathogens that were resistant to standard antibiotics, and conducted research on anti-crop and anti-livestock agents that could cause famine and economic hardship. Alibek claims that Soviet research efforts advanced to the threshold of creating a new class of genetically engineered BW agents.[5] The Soviet BW complex also included several mobilization plants for large-scale production and weaponization of BW agents in wartime. For example, a major production facility at Stepnogorsk, Kazakhstan, had sufficient capacity to cultivate, process, and load into munitions a total of 300 tons of dry anthrax during a 220-day wartime mobilization period.[6]

Although former Biopreparat institutes such as Obolensk and Vector are now fairly open, suspicions remain that offensively oriented research may be continuing at facilities under the control of the Russian Ministry of Defense. In particular, the military microbiology facilities at Kirov, Yekaterinburg, Sergiev Posad, and Strizhi remain shrouded in secrecy and off-limits to Western visitors. The US government also believes that some biological production facilities in Russia, "in addition to being engaged in legitimate activity, may be maintaining the capability to produce BW agents."[7]

Concerns Over "Brain Drain"

The legacy of the Soviet CBW programs poses serious proliferation threats.[8] All the ingredients for a black market are present: under- or unemployed CBW scientists, and sensitive weapons and materials stored at far-flung locations with inadequate physical security. At former CW research and development institutes such as the State Institute of Organic Chemistry and Technology (GosNIIOKhT) in Moscow, approximately 50 percent of the scientific personnel had been laid off by the fall of 1995.[9] Similarly, after Russian President Boris Yeltsin halted the offensive BW program in 1992, the Biopreparat institutes experienced funding and personnel cuts of 30 and 50 percent, respectively.[10] Today, many institutes cannot afford to pay the remaining scientists their $100 per month average wage. Under these bleak economic conditions, it is conceivable that former Soviet CBW scientists and technicians might be tempted to sell their expertise to would-be proliferators, a phenomenon known as "brain drain."

Some links between proliferant states and the former Soviet CBW establishment have already been reported. In 1992, for example, the governments of Russia and Syria signed an agreement to create a Syrian Center of Ecological Protection that would not only address ecological problems but conduct research on CW defense.[11] Reportedly, three Russian scientists participating in the Syrian center had worked on the *novichok* program. In 1999, the London-based Arabic newspaper *Al-Quds al-Arabi* reported that Syrian missile warheads had been loaded with the nerve agent VX and a novel agent called *novichok*.[12]

It is difficult to know how many former Soviet scientists are involved in the brain drain phenomenon. In December 1998, the *New York Times* reported that at least five Russian germ warfare experts had gone to work in Iran, which was paying them $5,000 per month in lieu of their regular $100 monthly salary.[13] Assessing Iran's recruitment efforts, the London *Times* reported that Iran had hired "the best people in the Russian biological weapons program. They have saved years of experiments and have been able to go straight from basic research to production, and the development of an effective delivery system."[14]

Another reason for concern stems from the fact that a number of facilities formerly involved in Soviet CBW programs are located in the newly independent states (NIS) of the FSU. After the dissolution of the Soviet Union, the governments of the new republics—some of which were unaware of the secret weapons plants on their territories—were neither financially nor organizationally prepared to assume responsibility for these facilities and their sensitive personnel. The government of Kazakhstan, for example, learned only recently of an abandoned Soviet CW production facility at the Pavlodar Chemical Plant.[15]

Illicit Exports of Sensitive Materials

Former Soviet CW production facilities are typically embedded in large chemical industry complexes, some of which still produce dual-use chemicals for commercial sale. The Pavlodar Chemical Plant in Kazakhstan, for example, manufactures phosphorus trichloride (PCl_3) and phosphorus pentasulfide (P_2S_5) for domestic and international markets.[16] Both of these chemicals are precursors—key ingredients—for the production of nerve agents. In addition, some former CW production facilities still contain specialized equipment for manufacturing highly toxic chemicals, such as corrosion-resistant chemical reactors.

The export of CW precursor chemicals and specialized production equipment is restricted by both the CWC and the Australia Group, an informal forum of industrialized countries that harmonize their national CBW export controls. Nevertheless, the high profits obtainable from black-market sales of restricted items may tempt corrupt or desperate plant administrators in the FSU to engage in illicit exports. Although the Russian export control system is consistent with the CWC and most requirements of the Australia Group, its enforcement record is poor.

Some former Soviet CW production facilities, such as the Khimprom plant in Volgograd, are known to retain business links to countries of CW proliferation concern.[17] Representatives of the Volgograd city administration have stated that because of the economic difficulties facing local defense enterprises, they cannot rule out cooperation with foreign countries, including Iran and Iraq. Exacerbating the problem of weak export-control enforcement, the Russian federal arms export agency, Rosvooruzhenie, recently opened a branch in Volgograd.[18] Historically, officials of this agency have been sympathetic to defense enterprises and have turned a blind eye to questionable exports.

Although some proliferation of CW-related materials has been documented, the magnitude of the problem is hard to assess. In 1995, the Russian Federal Security Service charged Anatoliy Kuntsevich, a former general in the Chemical Troops, with having shipped 800 kilograms of CW precursors to Syrian buyers and attempting to smuggle an additional 5.5 tons. Although Kuntsevich was fired, the charges against him were later dropped. More recently, the ex-director of the former CW production plant in Pavlodar sold corrosion-resistant chemical process equipment and other sensitive goods to unknown buyers.[19]

Physical Security of CBW Materials

Despite a major effort to safeguard fissile materials in the FSU, the US government has paid relatively little attention to the security of Russia's 40,000-metric-ton chemical arsenal. Russian CW stocks include thousands of air- and artillery-delivered munitions, 80 percent of which are filled with high-quality nerve agents. These weapons are in excellent condition, and some chemical artillery shells weigh as little as 20 to 40 pounds.[20] Such munitions are easily man-portable and would be particularly dangerous in a terrorism context.[21] Although Russian chemical munitions are typically stored without their explosive components, terrorists who managed to steal several chemical artillery shells could use plastic explosives to rupture the shells and disseminate the lethal agent. Physical security measures at CW storage depots concentrate on fencing and are far from ideal, with poorly paid guards and few if any tamper-resistant seals, electronic alarms, or video monitors to provide multiple layers of defense.[22]

With respect to biological weapons, Moscow reportedly destroyed the multi-ton stocks of BW agents that were produced during the Soviet era, but Russia still retains culture collections of lethal microbes for therapeutic and biodefense purposes. For example, the research center at Obolensk has an extensive collection of bacterial pathogens, while the Vector center in Koltsovo houses more than 15,000 viral strains including the deadly smallpox, Marburg, and Ebola viruses.[23] Existing physical security measures—gates, guards, and guns—are mostly directed against outsider threats, with little emphasis on discouraging the more likely insider threat. Unlike nuclear or conventional explosives, chemical and biological agents stored in impermeable containers give off no detectable signatures. As a result, even strengthened border and airport security controls would be unlikely to prevent the smuggling of these materials.

A few reports of diversion of CBW weapons and military-grade agents have begun to emerge. In 1996, in an undercover sting operation, the Istanbul Security Directorate seized vials of Russian-made mustard gas and sarin, which detectives had agreed to buy for $1 million. The seller disclosed that he had acquired the agents from a former KGB officer in Russia.[24] With respect to bio-

logical agents, sources in the US intelligence community assert that samples of the smallpox virus were smuggled from Russia to Iraq and North Korea in the late 1980s and early 1990s.[25] In 1992, during the Georgian civil war, armed personnel reportedly gained access to the Institute of Experimental Pathology and Therapy in Sukhumi and seized samples of plague and cholera microbes from the culture collection there.[26] In 1995, plague, cholera, and anthrax cultures were reportedly stolen from a Kazakh anti-plague institute with the intent to use them in a terrorist attack on the city of Khabarovsk.[27] During the 1999 trial in Egypt of members of al-Jihad, a group associated with Osama bin Laden, defendant Ahmed Salama Mabrouk stated that the group had purchased ingredients for CBW agents from former Soviet bloc countries with the intent to produce and employ such agents for terrorist attacks against US and Israeli targets.[28]

EXISTING NUNN-LUGAR PROGRAMS IN THE CBW AREA

Stemming Brain Drain

In 1994, the International Science and Technology Center (ISTC) in Moscow was established with funds from several governments to give former Soviet weapons scientists the opportunity to redirect their expertise to peaceful activities, integrate themselves into the international scientific community, and assist in the transition to a market economy. (A similar center was founded in Kiev, and the ISTC has branch offices in Minsk, Yerevan, and Almaty.) From 1994 through 1998, about three percent of ISTC grants went to chemistry projects, and just over 13 percent to biology projects.[29] In 1999, the US government increased ISTC funding for biological scientists by $10 million, including expanded support for civilian research at Vector, Obolensk, and other Biopreparat institutes.[30] Funding for former CW scientists, however, has remained static at around four percent of the ISTC budget.[31] In the past few years, the Departments of Defense, Agriculture, Health and Human Services, and the Environmental Protection Agency have begun funding scientific grant programs for former CBW specialists through the ISTC.[32]

The US Department of Energy's (DOE's) Initiatives for Proliferation Prevention (IPP) program began engaging former Soviet CBW personnel in 1997.[33] IPP-funded science and engineering projects must have a good potential for commercialization and typically involve a fixed-price contract from a US national laboratory to an FSU research institute for specific deliverables agreed in advance. At present, nearly 30 percent of the IPP annual budget is devoted to chemical and biological projects.[34] In the CW area, IPP funding has supported civilian research at GosNIIOKhT and the development of business, marketing, and commercial production plans for the Khimprom plant in Volgograd and other former CW production facilities. In the BW area, the IPP program has commissioned research projects at 18 former BW institutes, including Vector and Obolensk.[35] A report by the US General Accounting Office, released in February 1999, criticized IPP programs in the CBW area on the grounds that they had not been adequately reviewed by US officials prior to approval and could have dual-use characteristics.[36] To address these concerns, DOE officials have intensified their review and oversight of IPP project proposals.[37]

The Civilian Research and Development Foundation (CRDF), established by the National Science Foundation and supported with private and US government funds, facilitates cooperative research projects between US and FSU weapons scientists, although its overall funding level is much lower than that of the ISTC. In the 1996 grant cycle, CRDF provided $250,000 for projects involving former BW scientists and $550,000 for those involving CW scientists.[38]

Enhancing Physical Security

Efforts are under way to enhance the security of collections of dangerous microbial pathogens in the FSU. In 1997, the Department of Defense (DOD) developed plans with the Vector and Obolensk centers for biological materials protection, control, and accounting (BMPC&A) of their pathogen culture collections. From 1997 to 1999, DOD set aside $3 million for security improvements at these and other former BW institutes in Russia and Kazakhstan, and the Pentagon expects to spend at least $10 million on physical security and accounting measures in fiscal year (FY) 2000.[39] Approximately $20 million in security upgrades at CW storage depots in Russia are also planned under a program that Congress included in the FY 2000 defense budget.[40]

Dismantling Former CBW Production Facilities

In 1997 and 1998, a total of $20.2 million in Cooperative Threat Reduction (CTR) funds were authorized to destroy militarily relevant production equipment and ventilation systems at the former Soviet CW production facilities in Volgograd and the former VX nerve-agent filling plant in Novocheboksarsk, Russia. To date, however, only $2.2 million has been obligated because of the need to secure approval for such efforts from the Organization for the Prohibition of Chemical Weapons (OPCW) in The Hague.[41] In 1999, the governments of the United States and Uzbekistan signed a bilateral agreement to provide $6 million in CTR funds to dismantle the Chemical Research Institute at Nukus, which contains CW-relevant equipment. In the BW area, the governments of the United States and Kazakhstan signed a contract in September 1998 worth $1.5 million to dismantle fermentors and other equipment in the former Soviet BW production facility at Stepnogorsk.[42]

Chemical Weapons Destruction

In an effort to "jump-start" the destruction of the Russian chemical arsenal, the CTR program has spent over $140 million on the development and design of a pilot nerve-agent destruction plant for the Shchuchye CW depot, which houses over 5,450 metric tons of nerve agent weaponized in nearly two million artillery projectiles, 718 bulk-filled FROG and Scud missile warheads, and 42 bomblet-filled SS-21 missile warheads. The Russian government has designated GosNIIOKhT as the analytical laboratory for its national chemical demilitarization program, and US assistance has helped provide non-military jobs for its staff. In FY 2000, however, Congress cancelled $130 million that had been budgeted for construction of the Shchuchye plant. Part of this money was reallocated for security upgrades at the CW depots in Russia, and the rest was transferred to "higher priority" CTR projects.

EVALUATION OF NUNN-LUGAR PROGRAMS IN THE CBW AREA

The US-funded programs to combat brain drain, including ISTC, IPP, and CRDF, have enabled former CBW scientists to remain at home, support their families, and live in dignity without having to sell their weapons-related knowledge to proliferant states or terrorists. During the economic crisis plaguing the FSU, external funding has helped to prevent a major exodus of CBW specialists. Collaborative research programs at former CBW facilities have also increased the level of transparency at these inherently dual-use sites. Although some critics have expressed concern about supporting research on dangerous pathogens with potential military applications, such work would probably continue in any case. Collaborative programs ensure greater US oversight while helping to redirect former Soviet weapons scientists into peaceful or defense-oriented areas of research.[43]

The security enhancements being implemented for the culture collections of dangerous microbial pathogens stored at Vector, Obolensk, and other biological institutes in the FSU will help to reduce the risk of theft from these facilities. Improving the security of CW storage facilities is also warranted as an interim step while work continues on the ultimate destruction of the Russian chemical stockpile. Because the chemical munitions are poorly inventoried, the risk of insider diversion justifies establishing accountancy and control measures at each depot.

Congress's decision to cancel CTR funding for the Shchuchye pilot destruction plant was motivated by several understandable concerns, including uncertainty over the cost of the facility, doubts about Russia's ability or willingness to meet its financial obligations to the CW destruction program, limited financial assistance from other countries, and organizational upheavals within the Russian government that have hampered the development of a coordinated federal destruction plan. Moreover, in October 1997, an investigation of the Russian CW destruction program by the Auditing Board of the Russian State Duma found a number of financial improprieties, including large sums of foreign monies that could not be accounted for.[44]

Given the lack of leadership, initiative, financing, and organization on the Russian side, influential members of Congress have argued that the political and financial difficulties are simply too great, the costs too high, and the benefits too limited—Shchuchye holds less than 14 percent of the Russian CW stockpile—to warrant continued US support. Nevertheless, the decision to eliminate all funding for the Shchuchye pilot destruction plant seems short-sighted. Regardless of how many sensors and alarms are installed at the CW storage depots, only elimination of the entire stockpile will remove the threat

that these weapons could fall into the wrong hands. Moreover, if Russia cannot destroy its chemical stockpile according to the timetable specified in the CWC, it could be tempted to withdraw from the treaty, a development that would have serious consequences for the global CW nonproliferation regime.

POLICY RECOMMENDATIONS

Increase funding for CBW brain-drain programs. American support for the ISTC has averaged $15 million annually, an insignificant sum in the overall US national security budget. Given the magnitude of the brain-drain threat, a sound argument can be made for doubling, if not tripling, the US contribution. Furthermore, a comparatively small percentage of overall US funding to combat brain drain has been directed at former CBW scientists. Increasing the level of BW support to 30 percent of the ISTC budget, and CW support to 20 percent, would more accurately reflect the proliferation concerns associated with these former weapons scientists. In addition, US companies that have invested in the Russian and NIS economies, or are planning to do so, should be encouraged to hire former CBW scientists as a matter of priority. The US government may wish to consider a set of incentives to promote such recruitment.

Expand brain-drain programs at the former CW institutes. Although the US government launched a new initiative in 1998 to reach out to former Soviet BW scientists, no comparable program has targeted scientists and weaponization experts at former CW institutes in Russia such as Shikhany, Novocheboksarsk, and Pishti. As a result, hundreds of former CW scientists and engineers remain at risk of foreign recruitment. The discovery of a former CW production plant in Pavlodar, Kazakhstan, also suggests that current brain-drain programs have lagged in engaging former CW facilities outside Russia. The US government should therefore design a special program, modeled after the 1998 BW initiative, to fund civilian research by former CW scientists and engineers. To recruit more former CW researchers, the ISTC and other brain-drain programs should actively solicit proposals. Moscow could facilitate this effort by providing the US government with a list of senior scientists who were involved in CW programs in Russia and Kazakhstan.

Improve oversight of CW-related projects. Because of lingering concerns that former BW personnel in Russia may be involved in offensive or dual-use activities, ISTC and DOD projects require an active Western partner to provide "aggressive, invasive oversight."[45] In practice, such partnerships have benefited both sides by promoting close scientific interactions while increasing transparency at former Soviet BW institutes. No similar oversight requirement exists for CW-related projects, however. Although a few hands-on projects have begun at GosNIIOKhT headquarters in Moscow, none exist at its branch offices in Shikhany, Volgograd, and Novocheboksarsk. Stronger oversight at these sites could build confidence that ongoing activities are strictly peaceful or defensive in nature.

Increase the level of attention given to former CBW production facilities in the FSU. It has been more difficult to stem brain drain from former CBW production facilities than from research institutes, for two reasons. First, current CTR legislation specifically prohibits the use of US funds to support defense conversion in the FSU. Second, current brain-drain programs are better suited to small, research-oriented institutes than to large production complexes. To bridge this gap, the CTR program should seek limited authority for defense conversion activities at targeted former CBW production facilities. Until such funding becomes available, the European Union countries and Japan may wish to focus their assistance on CBW conversion projects. The ISTC and other grant programs should also consider sponsoring joint projects with Western companies to manufacture consumer products at former CBW production plants.[46]

Move more aggressively to improve the security of pathogen collections scattered throughout the FSU. In addition to the culture collections at Obolensk and Vector, several collections of anti-personnel and anti-agricultural agents exist at other biological institutes, including those at Vladimir, Saratov, and Golitsino in Russia, and Almaty and Otar in Kazakhstan. Although some money has been appropriated for security enhancements, higher priority should be given to protecting these culture collections and consolidating them at fewer locations.

Provide additional CTR funding to dismantle proliferation-relevant production equipment and infrastructure at former CW facilities. In addition to Volgograd and Novocheboksarsk, dismantlement programs are warranted at Shikhany in Russia and Pavlodar in Kazakhstan. Beyond reducing proliferation concerns, dismantlement activities would

increase transparency at these sites and facilitate their conversion to commercial production.

Expand current US export-control assistance programs to former CBW production facilities. Because of the economic and conversion difficulties faced by many former CBW production facilities, illegal trade in proliferation-sensitive materials has increased. US and FSU officials should cooperate to stem the flow. At present, the US Department of Commerce's Nonproliferation and Export Control Program exclusively targets Ministry of Atomic Energy, Russian Space Agency, and Ministry of Economy facilities.[47] This program should be expanded with CTR funding to cover the former CBW facilities in Russia and Kazakhstan. In addition to stemming illicit trade and fostering an export-control culture, internal-compliance programs would increase transparency with respect to CBW-related technologies.

Condition restoration of CTR funding for the Shchuchye pilot nerve-agent destruction facility on a rethinking of Russia's chemical demilitarization plan. US financial support for Russian chemical demilitarization should be conditioned on a thorough review of the current plan to build costly destruction facilities at each of the seven CW storage depots. In the wake of the economic crisis in Russia, this plan is no longer affordable. The Russian government should implement the initial phase of its destruction program by proceeding with facilities at Gornyi and Kambarka to destroy blister agents stored in bulk tanks, which are in danger of leaking and cannot be moved. Instead of building costly destruction facilities at all five nerve-agent depots, however, it would be far more cost-effective to move the filled munitions stored at the other depots to full-scale destruction plants built at Shchuchye and another central location.[48] The benefits of moving the nerve-agent stocks currently stored at Kizner to Shchuchye for destruction seem particularly obvious. Since the transport of chemical weapons is currently banned under Russian law, the State Duma would have to pass new legislation authorizing it. Admittedly, advocating an approach in Russia that is prohibited in the United States would be a significant political challenge, but it is worth a try.

Internationalize financial assistance for Russian chemical demilitarization by setting up a coordinating body of Western donors. The London and Paris groups of creditor nations should consider a program of targeted debt relief and rescheduling aimed at assisting the Russian government to implement its CW destruction program according to the timetable set out in the CWC. At the same time, the Russian government should commit in advance to allocating its own share of funding for any chemical demilitarization project before inviting foreign donors to provide additional support. Indeed, foreign donors may wish to avoid supporting major CW destruction efforts to which the Russian government does not contribute in a significant way.

Expand education and outreach efforts to increase the confidence of the Russian public in the CW destruction program. The US government should work with other Western donors and non-governmental organizations (such as Green Cross Russia) to facilitate citizen involvement in CW disposal decisions at all Russian stockpile sites. Establishment of Russian citizen advisory boards could be helpful in this regard. In addition, the US and Russian governments should establish a panel of respected scientific and public figures from both countries to evaluate controversial aspects of the Russian CW destruction program and recommend solutions. The US National Academy of Sciences and the Russian Academy of Sciences could co-sponsor this panel, and the US National Research Council could provide experienced staff to help organize the panel and facilitate its work.

Promote and strengthen Russian participation in the CWC as an important multilateral tool to influence Russia's behavior regarding CBW proliferation. By the same token, the door should be kept open for Russia to join the Australia Group. If Moscow is to attract foreign government and private investment for its CBW demilitarization and conversion efforts, however, it must be more forthcoming about past activities, including the *novichok* CW program and the full extent of the offensive BW program. The Russian Ministry of Defense should also allay suspicions in the West about possible offensive work at military biodefense institutes by arranging for scientific exchanges and reciprocal visits to these facilities.

CONCLUSION

Although the Cold War ended a decade ago, the toxic legacy of the vast Soviet chemical and biological weapons programs will continue to threaten international peace and security well into the new century. Initially, the array of US government nonproliferation initiatives under the umbrella of the Nunn-Lugar program focused

narrowly on the dismantlement and control of surplus nuclear weapons, launchers, and fissile materials. In recent years, however, US policymakers have begun to address the security threats posed by the proliferation of CBW-related materials, equipment, and know-how from Russia and other former Soviet republics.

Numerous reports describing the recruitment of former Soviet CBW specialists by Iran, Syria, and other countries of proliferation concern, and the purchase or theft of CBW-related materials and equipment by proliferant states and terrorists, indicate that these potential threats have begun to materialize. The Nunn-Lugar program has taken some belated but useful steps to stem the hemorrhage of CBW technology and know-how from the FSU. Even so, much remains to be done, particularly with respect to halting the brain drain of former CW scientists and weaponeers, upgrading the security of pathogen culture collections, converting former CBW production facilities, and destroying the vast CW stockpile that Russia inherited from the Soviet Union.

To meet these challenges, the US Congress should increase significantly its funding for CBW disarmament and nonproliferation efforts under the Nunn-Lugar program. Regrettably, congressional leaders have tended to define the Russian CW stockpile as an "environmental problem" and the conversion of former CBW production facilities as "foreign aid." These views are dangerously short-sighted and have led to the neglect of real threats to US security. In order to support a long-term strategy for containing proliferation from the former Soviet chemical and biological weapons complexes, Congress should restore funding for Russian CW destruction and drop its ban on assistance for the conversion of former CBW production facilities to peaceful commercial activities. The Nunn-Lugar program can make a real difference in helping to contain the spread of chemical and biological weapons, but only if it is given the necessary tools and financial resources to do the job.

[1] This paper summarizes the findings and conclusions of the CBW Working Group of the CTR assessment. Members of the working group were (in alphabetical order) Gulbarshyn Bozheyeva, Igor Khripunov, Sonia ben Ouagrham, George Parshall, Amy E. Smithson, Jonathan B. Tucker, and Kathleen M. Vogel.

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