



***STRENGTHENING DETERRENCE
AGAINST BIOWEAPONS AND
BIOTERRORISM THROUGH
CONGRESSIONAL MANDATES***

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Soldiers assigned to Thunder Squadron, 3d Cavalry Regiment, respond to a chemical attack during Exercise Rifle Forge at the Fort Hood Training Area, Fort Hood, Texas, Feb. 10, 2022. Credit: Army Staff Sgt. Christopher Stewart

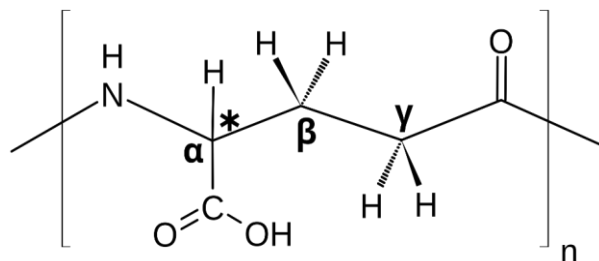
This commentary is my reflection after attending the [Biosecurity Amidst Technological and Geopolitical Dynamism](#) workshop hosted by the Center for [Global Security Research](#) in March 2024. The Center for Global Security Research at Lawrence Livermore National Laboratory brought together experts from across government, military, and technical communities where the purpose was to analyze the current biosecurity threat landscape, the hurdles to successfully alleviate future biological threats such as

acts of terrorism and biological weapons, and the impact of technology within the dilapidated security environment. The U.S. biosecurity landscapes are intertwined with the relationship within the geopolitical environment. The challenges and contributions from the biosecurity and biotechnology landscape pose an unprecedented environment including global pandemics, the rise of biological weapons and bioterrorism, and the rise in public-private partnerships to increase public health protections and boost recent advancements in biotechnology and security.

Recent [advancements](#) in biotechnology include: (1) synthetic biology with genetic editing in biofuels and novel cellular programming and antibiotic creation; (2) fabrication techniques enabling the printing of tissue fragmentation, implants, and organs; (3) cellular immunization therapies, including treating infectious diseases and cancers; (4) genetic mapping and transfers allowing for plant trait modifications; (5) regeneration of human organs through tissue engineering; personalization of pharmaceutical medications; (6) innovations in biomanufacturing such the utilization of 3D bioprinting; and more. Anthrax and COVID-19 are two of many examples of adversary uses of synthetic biology and the next generation of bioweapons. Synthetic biological weapons pose significant biological threats because they are produced to target populations. Companies such as 23andMe and other similar genealogical companies pose biological threats due to adversary countries collecting, storing, and manipulating biometric information that could be used to create future [biological weapons](#).

Resiliency against biological threats and bio-incidents are key aspects of the Department of Defense's National Defense Strategy. According to the [U.S. Environmental Protection Agency](#), biological threat agents are defined as toxic substances formed by living organisms intended to cause disease or casualty in animals, humans, or plants. For instance, a significant bioweapons attack occurred on September 18, 2001, seven days after the September 11th attack. Several letters containing the anthrax spores were sent to the Office of Senator Tom Daschle, the Office of Senator Patrick Leahy, and several news media outlets.

Several U.S. Capitol Police officers and other staffers were exposed to the anthrax spores. Anthrax is caused by the *Bacillus anthracis*, which can infect through inhalation, intestinal absorption, or skin contact. The infection can start with the skin forming small blisters with a black ulcer center and can have symptoms ranging from chest pains, shortness of breath, fever, nausea, vomiting, and diarrhea. There are two main



sources for the lethality associated with anthrax bacterium's characteristics. The poly-D-glutamic acid capsule protects and stops the bacterium from being absorbed by the host's neutrophils (white blood cells that are the key to the body's immune system), making it [anti-phagocytic](#).

Figure 1 : Polyglutamic acid ($C_5H_7NO_3$) $_n$

The second characteristic is the [anthrax toxin](#), the tripartite protein toxin which consists of three protein compounds: (i) protective antigen (PA) the cell-binding protein protective antigen, (ii) edema factor (EF), and (iii) lethal factor (LF). Once the [bacterium](#) arrives in the host, the spores grow and replicate quickly into the bloodstream to suppress the neutrophils and the immune defense system.



Figure 2: Anthrax toxin, X-ray crystal structure of the anthrax lethal factor bound to a small molecule

inhibitor, bi-mfm3,3-[5-[5-(4-chloro-phenyl)-furan-2-ylmethylene]-4-oxo-2-thioxothiazolidin-3-yl]-propionic acid.

The September 11th attack caused five casualties and left seventeen severely ill. Resulting from the 2001 Anthrax attack, Congress increased investments in biological warfare preparedness and research and passed the [S.15 - Project Bioshield Act of 2004](#), Public Law 108-276, which financed [\\$5.6 billion](#) over the next 10 years with the purchase of drugs and vaccinations. In October 2001, [H.R. 3162 Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism \(USA PATRIOT ACT\) Act of terrorist](#) became Public Law 107-56, to combat future terrorist attacks.

In 2022 the Department of Energy released its fact sheet to support the implementation of the Biden-Harris Administration's *National Biodefense Strategy and Implementation Plan for Countering Biological Threats, Enhancing Pandemic Preparedness, and Achieving Global Health Security (the Strategy)*. To address key mechanical issues against COVID-19, the Department of Energy executed the [National Virtual Biotechnology Laboratory](#) that produced several options for antiviral drugs, new testing regulations, epidemiological information, solutions to personal protective equipment shortages, and invested in research and development with the NNSA Bioassurance Program along with the bio preparedness Research Virtual Environment (BRaVE), bringing together interagency partners and key stakeholders to address bio preparedness and defense. Within the [2022 National Defense Strategy](#), the Biden-Harris Administration outlines a plan forward for the Department of Defense through the pacing challenges of adversary countries; countering novel viruses and infectious diseases; mitigating the risk and dynamics in the new appliances of quantum science, autonomy, artificial intelligence, biotechnology, and space technology; and investing in research and development. The National Defense Strategy acknowledges the advancement of biological threats as one of many threats to U.S. National Security. In 2023, the Department of Defense released the National Biodefense Strategy that outlines the DoD's strategies on early warning detection to

counter biothreats, improving military force readiness, increasing speed response time, and improving interagency coordination and collaboration with U.S. partners and allies.

Between 1990-2020, there was an estimated 565 Chemical, Biological, Radiological, and Nuclear (CBRN) terrorist attacks from Violent Non-State Actors. For [biological weapons attacks](#), the totals are up to 123 catastrophic events, with 19 deaths and 59 injuries. The Biological Weapons Conventions, formally known as the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, was a disarmament treaty that prohibits the stockpiling, development, acquisition, transfer, production, and exercise of toxic and biological weapons. The Biological Weapons Convention was established on April 10, 1972, and came into effect on March 26, 1975, in Geneva, Switzerland. BWC was the pioneer multilateral disarmament treaty to prohibit weapons of mass destruction. Currently, 187 Nations have signed the treaty. However, the effectiveness of the BWC is weakened due to the lack of any formal monitoring compliance party. Due to the rise and increase in biological weapons and threats, there has been significant Congressional activity to protect U.S. National Security, improve the supply chain and preparedness, and invest in research and development and the workforce.

Congressional Activity

After the aftermath of the September 11th terrorist attack and the September 18th mailing of anthrax spores, [H.R. 5005 – Homeland Security Act of 2002](#) was enacted to Public Law 107-296 and signed by former President George W. Bush in November 2002. This legislation established the U.S. Department of Homeland Security and a new cabinet-level position, Secretary of Homeland Security. Outside of the National Security Act of 1947, the legislation that reorganized the United State's military and intelligence agencies post-World War II, the Homeland Security Act of 2002, was the second largest re-organization legislation of an executive branch agency. Last year, U.S. Senator Tommy

Tuberville introduced [S.68- FARM Act](#). This bill would require the Secretary of Agriculture to be included on the Committee on Foreign Investments in the United States. In addition, the Committee on Foreign Investments would be required to evaluate investments that could lead to foreign oversight over any U.S. agricultural business. Recently, several bills have been introduced to establish new committees, memorandum of understanding, laboratories for research and development, and new offices to increase interagency collaboration and include a congressional reporting requirement:

- [S.1210 - NBACC Authorization Act of 2023](#) - To designate a laboratory as the National Biodefense Analysis and Countermeasures Center, and for other purposes;
- [S.2538 - Regional Biocontainment Laboratory Authorization Act of 2023](#) - To authorize the Secretary of Health and Human Services to award grants to regional biocontainment laboratories for maintaining surge capacity for purposes of responding to outbreaks of infectious diseases or acts of bioterrorism.
- [S.4413 - Synthetic Biology Advancement Act of 2024](#) - To provide for the establishment of a National Synthetic Biology Center, and for other purposes.
- [S.4428 - Biotechnology Oversight Coordination Act of 2024](#) - To establish an interagency committee to coordinate activities of the Federal Government relating to biotechnology oversight, and for other purposes;
- [S.4421 - Agricultural Biotechnology Coordination Act of 2024](#) - To establish the Office of Biotechnology Policy in the Department of Agriculture, and for other purposes;
- [H.R.9628 - ACTIVATE Act](#) - To direct the Secretary of Defense to collaborate with a federally funded research and development

center to assess the biotechnology capabilities of adversaries of the United States, and for other purposes;

- [H.R.8613 - NSF and USDA Interagency Research Act](#) - To direct the Secretary of Agriculture and the Director of the National Science Foundation to carry out cross-cutting and collaborative research and development activities focused on the joint advancement of Department of Agriculture and National Science Foundation mission requirements and priorities, and for other purposes;
- [H.R.8447 - American Agricultural Security Act of 2024](#) - To direct the Secretary of Agriculture to establish centers of excellence for agricultural security research, extension, and education, and for other purposes.

Due to the increasing threats of bioweapons and bioterrorism, congressional activity also increased with the establishment standing of new programs and reporting requirements both to the President and to Congress. U.S. Representative Jim Costa [D-CA-21] introduced [H.R. 8065 – Preventing Illegal Laboratories and Protecting Public Health](#) in April of this year. This bill would require the Secretary of Health and Human Services to (1) carry out a program that would require each seller of a highly infectious agent to comply with a logbook database, (2) consult regularly with relevant agencies such as the Center for Disease Control and Prevention, National Institute of Health, and the Department of Homeland Security, (3) Submit a report to the President and Congress: conduct periodic evaluations and assessment of high-containment laboratories in consultation with the Secretary of Agriculture, Secretary of Health and Human Services, Secretary of Defense, the National Intelligence Council, and other relevant offices. There has been an increase of congressional activity advocating for new and amended plans and roadmaps, along with congressionally mandated reporting and briefing requirements such as:

- [H.R.2153 - Securing American Leadership in Science and Technology Act of 2021](#) - The bill authorizes programs, projects, and

activities, including those regarding (1) federal research security; (2) a National Supply Chain Database; (3) basic energy sciences research and advanced scientific computing research; (4) establishment and operation of Regional Energy Innovation Centers; (5) establishment of a carbon sequestration research initiative; (6) establishment of a NIST Foundation; (7) establishment of a technology transfer office in NOAA; (8) science, technology, engineering, and mathematics, including computer science (STEM) workforce development; and (9) establishment of an Energy Foundation;

- [S.3699 - Department of Energy Science for the Future Act of 2022](#) - To provide guidance for and investment in the research and development activities of the Department of Energy Office of Science, and for other purposes.
- [H.R. 9627 – Biotech Futures Act](#) - To direct the Secretary of Defense to develop a biotechnology roadmap to guide the efforts of the Department of Defense relating to biotechnology, and for other purposes;
- [H.R.9626 - AIXBio Defense Sandbox Act](#) - To direct the Department of Defense to develop a plan for the establishment of a secure computing and data storage environment for the testing of artificial intelligence trained on biological data, and for other purposes;
- [S.4664 - Department of Energy AI Act](#) - To require the Secretary of Energy to establish a program to promote the use of artificial intelligence to support the missions of the Department of Energy, and for other purposes;
- [H.R.8564 - Elevating Biotechnology Threats Reporting Act](#) - To require certain elements of the intelligence community to submit to the congressional intelligence committees a

report with respect to biotechnology threats, and for other purposes.

- [H.R.4704 - Artificial Intelligence and Biosecurity Risk Assessment Act](#) - To require the Assistant Secretary for Preparedness and Response shall conduct risk assessments and implement strategic initiatives or activities to address threats to public health and national security due to technical advancements in artificial intelligence or other emerging technology fields.
- [H.R. 8467 - Farm, Food, and National Security Act of 2024](#) – This bill would provide competitive grant programs that would improve the United States’ capability to protect the agricultural and food systems from any biological, chemical, cybersecurity, or bioterrorism attack; expansion and upgrades to facilities to meet biosafety and biosecurity requirements.
- [H.R.9194 - Nucleic Acid Standards for Biosecurity Act](#) - The Director, in consultation with heads of Federal agencies the Director considers appropriate, shall carry out measurement research to support the development and improvement of best practices and technical standards for biosecurity measures related to nucleic acid synthesis.

Other legislation, such as the National Defense Authorization Act, the Intelligence Authorization Act, the CHIPS and Science Act, the FARMLAND Act of 2023, and the AQUAA Act, would increase investments in workforce and research development, protecting the U.S. agricultural farmlands, monitoring adversary efforts in data collection and biotechnology, and increasing cybersecurity protections. As more funding is allocated for programming, congressional activities have also included the prohibition of certain contractors connected to foreign adversaries. For instance, last December U.S. Senator Gary Peters [D-MI] introduced [S. 3558 Prohibiting Foreign Access to American Genetic Information Act of 2024](#) and U.S.

Senator Bill Hagerty [R-TN] introduced [S.3385 - A bill to prohibit contracting with certain biotechnology providers](#). Both bills would prohibit executive agencies from (1) procuring or obtaining any biotechnology equipment or service produced or provided by a biotechnology company of concern, or (2) entering into a contract or extending or renewing a contract that uses such equipment or service or that will require the direct use of such equipment or services. Those agencies may not obligate or expend loans or grant funds for such purposes. According to the MIT Technology Review, more than 26 million people globally have taken a [genetic ancestry test](#) by direct-to-consumer [DTC] companies such as 23andMe, Ancestry.com, etc. Although many Americans are submitting their genetic information to [DTC companies](#), their private health information is at risk due to the lack of coverage by the Health Insurance Portability and Accountability Act of 1996, because these companies are not healthcare providers. For example, the California-based company that retails DNA testing to consumers to learn about their ancestry and potential health risks, 23andMe recently settled a data breach lawsuit for \$30 million and has to provide customers with access to a security monitoring program for 3 years. In October of 2023, [cyberhackers](#) infiltrated the 23andMe data platforms and exposed consumers' full private information including genetic details, photos, full names, dates of birth, geographic location, etc. 23andMe failed to disclose to consumers of Jewish and Chinese ancestry that the cyberhackers were targeting them and selling their genetic information on the dark web. As biotechnology and innovation advances and gives new insights to the general public, legislation, and inter-agency cooperation need to work hand-in-hand as bioterrorism and bioweapons take on many forms.

Recommendations

Regulations Risk and Compliance

It is vital for agencies to report to congressional oversight committees, there also needs to be quarterly congressional reporting requirements for private sector companies that are storing and collecting biotechnology, genetic, and hazardous antigen data. Private sector companies need to be more transparent

with consumers regarding who have access to their data, and what are the current cyber procedures that are taking place to protect their data. There also needs to be more legislation on cyber hygiene for private sector companies and laboratories that are storing sensitive antigens and personal information. Cyber hygiene is defined as a set of practices that help keep devices, networks, data and systems secure and healthy. The goal of cyber hygiene is to protect sensitive information from cyber attacks and theft. Examples of [cyber hygiene](#) include password and device security, software updates, security software, utilization of firewalls, privacy, protection and security to online transactions, and account monitoring. Outside of cyber risk and compliance, there should also be congressional reporting requirements from private sector companies selling hazardous materials directly to the public and stricter regulations on buying hazardous materials.

International Cooperation & Research and Development

For the next generation of agricultural and biosecurity experts, there should be an allocation from the funding for scholarships to allow farmers, research scientists, and emerging legislative professionals to attend global symposiums such as the Forum for the Future of Agriculture, Global Farming Forum, and the World Bank Group's Global Forum for Food and Agriculture. This would be a great opportunity for international cooperation for the next-gen leaders to learn from partner countries on emerging biothreats and share best practices to mitigate potential hazards and build on new and existing partnerships and research. There should also be more national security workshops in rural areas in the United States on bioterrorism efforts by adversary countries on the U.S. agriculture lands. There should be more dialogue between city council, tribal leaders, military leaders, federal government, intel community, and agricultural practitioners on emerging threats to U.S. agricultural lands.

Surveillance & Reconnaissance

With a stronger dialogue and partnership between the local government, agricultural practitioners, the intel community, federal government, and military

leadership, early warning detection on biothreats should mobilize a full inter-agency effort that would efficiently provide personal protective equipment to healthcare professionals and the general public. With the investments given to research and innovation, developments of antibodies and vaccination, along with their distribution should have faster execution rates from our lessons learned from COVID-19. In regard to addressing public health communications, there needs to be stronger efforts to fight against misinformation and disinformation from adversary countries as well as an increase in efforts to inform the public to fight against public hazards properly. From the domestic and local community support, there needs to be more investment made in non-profit organizations and local support groups to ensure that government assistance programs are not disturbed in the wake of another potential worldwide pandemic.

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