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Review Article

A retrospective on the intellectual adventures of think tanks in biosecurity before and after the COVID-19 pandemic outbreak

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Abstract

Think tanks play a fundamental role in shaping policy agendas in Western countries, especially in the US. As international biosecurity is turning from a moderate to a serious concern, the convergence of biosecurity subjects and think tanks is evidently increasing. Examining the involvement and implication of think tanks in biosecurity policy formulation domestically and internationally is, therefore, of great value. This article takes a brief look at the intellectual output of over 30 think tanks during the last five years, before and after the outbreak of COVID-19, and tries to build an understanding of the extent to which these think tanks informed strategic, operational, and tactical decisions, with the aim of providing a better basis for dealing with sophisticated biological threats.

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Biosecurity subjects have become the new foci of worldwide think tanks, in part because of their great strategic value in researching the evolving biosecurity landscape and its potential implications for national security. A conservative estimate puts the number of registered think tanks with a high reputation in Western countries that are concerned with biosecurity subjects at more than 30. The academic products of these think tanks, which have a role in national security decision-making and shaping biosecurity governance mechanisms, are worth examining. At present, there are relatively few comprehensive studies of biosecurity think tanks and their outputs. The articles that are available include calls for strengthening biosecurity strategic research and building specialized think tanks, brief comments on biosecurity issues and types of think tanks in recent years, and a deep analysis of one biosecurity think tank in the United States. As the COVID-19 crisis continues, it is worth analyzing the intellectual outputs of these think tanks from new perspectives and over a longer time span, especially before and after the pandemic outbreak.

This paper reviews the work of think tanks on biosecurity, mainly from developed countries, over the past five years, with the aim of identifying the frontiers of biosecurity and governance challenges. First, the biosecurity research reports of think tanks during the 2016–2021 period were collected and arranged in order in Table 1. Then, the think tank reports were sorted and subjectively classified under four themes according to their research topics. On this basis, the viewpoints of the think tanks can be understood from a broader perspective. It should be noted that this article does not include reports from some government agencies that issued numerous research reports that pertain to biosecurity, such as the Government Accountability Office in the United States, and some scientific organizations or alliances that issued exciting research reports in past years, such as the Engineering Biology Research Consortium. For convenience, this paper includes only a small proportion of the selected think tanks’ reports, testimonies, and research papers.

1. Biorisk scenarios and prediction

1.1. Public situation awareness

Biosecurity is a shared global responsibility. The Nuclear Threat Initiative (NTI) and the Johns Hopkins Center for Health Security, with research by the Economist Intelligence Unit (EIU), developed a Global Health Security (GHS) Index that put forward a public benchmarking of health security and related capabilities across 195 countries for the first time. The GHS Index assesses countries’ health security and capabilities across 6 categories, 34 indicators, and 85 sub-indicators. The inaugural GHS Index, released prior to the outbreak of the COVID-19 pandemic in 2019, found that some countries were not prepared for a globally catastrophic biological event. The average overall GHS Index score was 40.2 out of a possible 100. It has been suggested that the 2021 GHS Index will incorporate important lessons learned from the COVID-19 pandemic and continue to serve as an international benchmark for capacity and capability in times of global disaster.

1.2. The future biosecurity landscape

High-level think tanks have devoted great attention to analyzing the nature of the future biosecurity landscape. In its report “A World at Risk,” the Global Preparedness Monitoring Board (GPMB), an independent monitoring and advocacy body, jointly convened by the World Bank Group and the World Health Organization, showed that a combination of global trends, including insecurity and extreme weather, had exacerbated the risk of public health emergencies. The report articulated the possibility that a rapidly moving, highly lethal pandemic of a respiratory pathogen could be very real and that the world was not prepared for it.

The Johns Hopkins Center for Health Security put forward the new concept of “global catastrophic biological risks” and pointed out that incidents caused by biological agents—whether naturally emerging or reemerging, deliberately manufactured and released, or laboratory engineered and escaped—could lead to far-reaching impacts beyond the capabilities of national and international governments or the private sector to manage. As NTI suggested, global catastrophic biological risks have been increasing for several reasons, including the ease of manipulating biological organisms and creating and engineering pathogens; potential state and non-state interest in biological weapons; the legitimate global biotechnology research enterprise interest in the creation and enhancement of pathogens with pandemic potential; laboratory accidents and errors; and globalization.

In its stark report, entitled “Future Proof,” the Centre for Long-Term Resilience warned that the threat of an engineered pandemic on a scale many times worse than naturally occurring pandemics like COVID-19 need to be treated with the same level of urgency as the threat of nuclear war. Toby Ord, one of the report’s authors and a senior research fellow at the Future of Humanity Institute at Oxford University, calculated that there was a one-in-six chance that a catastrophic event might occur in the next 100 years.

1.3. Pandemic tabletop exercise and scenarios

Think tanks tend to favor pandemic tabletop exercises. For example, the Johns Hopkins Center for Health Security designed the Clade X scenario by mixing aspects of actual past events with well-researched fictional elements. The scenario began with an outbreak of a novel parainfluenza virus called “parainfluenza clade X” that was moderately contagious and moderately lethal and for which there were no medical countermeasures. As the narrative continued, the disease spread within countries and internationally at an accelerating rate, overloading medical facilities. As the pandemic became increasingly severe, the political leadership needed to deal with a variety of tough political issues. In the exercise scenario of a tabletop exercise in February 2020 at the Munich Security Conference held by NTI, the spread of the deadly virus, an engineered version of the H2N2 influenza virus, resulted from an accidental release. The exercise highlighted the growing biological risks in an increasingly interconnected world and the possibility of future pandemics caused by engineered or synthesized biological agents. Exercises similar to Clade X are a particularly effective way of gaining a fuller understanding of the urgent challenges in a dynamic real-world crisis.

Conceptual scenarios can be effective in illustrating the gaps in technological governance and can be helpful in determining recommended mitigating measures. Using a series of six conceptual scenarios—CRISPR charlatans, dual-use discovery, bioweapons for
covert action, bioterrorism 2.0, gene drive biosafety breach, and weaponized bio-narratives—researchers from George Mason University and Stanford University discussed the various risks in each scenario and proposed a process for assessing genome editing risks with a lasting meaning.\(^7\) For example, in the first scenario, “CRISPR Charlatans,” a reckless actor developed loosely regulated products with adverse effects, and the policy options included industrial engagements and better regulatory capacities.

### 1.4. Bioeconomy security

Biosecurity has typically been interpreted as the physical security of individuals, facilities, and the food supply in the context of threats such as toxins and pathogens. However, according to “Safe-guarding the Bioeconomy,” a report from the National Academies of Sciences, Engineering, and Medicine, the focus of biosecurity policy must shift from protecting specific targets from specific threats to securing the bioeconomy as a system.\(^9\) The report argued that the bioeconomy accounts for more than 5 percent of the gross domestic product, or more than $950 billion, in the US, and that global supply chains and reliance on single-sourced materials or components could disrupt bioeconomy value chains.

| Think tank | Report title | Year |
|------------|--------------|------|
| 1 | National Academies of Sciences, Engineering, and Medicine (US) | Gene Drives on the Horizon: Advancing Science, Navigating Uncertainty, and Aligning Research with Public Values | 2016 |
| 2 | Federation of American Scientists | Use of Attribution and Forensic Science in Addressing Biological Weapon Threats | 2016 |
| 3 | European Academies' Science Advisory Council | Genome Editing: Scientific opportunities, public interests, and policy options in the EU | 2017 |
| 4 | Woodrow Wilson International Center for Scholars | The Intelligent and Connected Bio-Labs of the Future: Promise and Peril in the Fourth Industrial Revolution | 2017 |
| 5 | MIT Washington Office | The Future Postponed 2.0 | 2017 |
| 6 | The Federal Experts Security Advisory Panel | Guiding Principles for Biosafety Governance: Ensuring Institutional Compliance with Biosafety, Biocountermeasures, and Laboratory Biosafety Regulations and Guidelines | 2017 |
| 7 | National Academies of Sciences, Engineering, and Medicine (US) | Dual Use Research of Concern in the Life Sciences: Current Issues and Controversies | 2018 |
| 8 | Johns Hopkins Center for Health Security | Clade X exercise: Improving policy to prepare for severe pandemics | 2018 |
| 9 | George Mason University and Stanford University | Biodefense in the Age of Synthetic Biology | 2018 |
| 10 | National Academies of Sciences, Engineering, and Medicine (US), Parsons Co | Roadmap for Implementing Biosecurity and Biodefense Policy in the United States | 2018 |
| 11 | Gryphon Scientific, National Defense University (US), Parsons Co | A World at Risk | 2019 |
| 12 | Global Preparedness Monitoring Board | New Tech, New Threats, and New Governance Challenges: An Opportunity to Craft Smarter Responses? | 2019 |
| 13 | Carnegie Endowment for International Peace | Global Health Security (GHS) Index | 2019 |
| 14 | Nuclear Threat Initiative and Johns Hopkins Center for Health Security | ReOpen America campaign | 2020 |
| 15 | Center for Strategic and International Studies | The U.S. Department of Defense’s Role in Health Security: Current Capabilities and Recommendations for the Future | 2020 |
| 16 | Stockholm International Peace Research Institute | Bio Plus X: Arms Control and the Convergence of Biology and Emerging Technologies | 2020 |
| 17 | Nuclear Threat Initiative | Preventing Global Catastrophic Biological Risks: Lessons and Recommendations from a Tabletop Exercise Held at the 2020 Munich Security Conference | 2020 |
| 18 | James Martin Center for Nonproliferation Studies | A Guide to Investigating Outbreak Origins: Nature versus the Laboratory | 2020 |
| 19 | Nuclear Threat Initiative | Preventing the Next Global Biological Catastrophe | 2020 |
| 20 | Japan Science and Technology Agency Research and Development Strategy Center | Recommendations for building an infectious disease research platform for building a country that is resistant to infectious diseases | 2020 |
| 21 | World Economic Forum, Nuclear Threat Initiative | Biosecurity Innovation and Risk Reduction: A global Framework for Accessible, Safe and Secure DNA Synthesis | 2020 |
| 22 | American BioDefense Institute | Two Worlds, Two Bioeconomies-The Impacts of Decoupling US–China Trade and Technology Transfer | 2020 |
| 23 | Johns Hopkins Applied Physics Laboratory | Safeguarding the Bioeconomy | 2020 |
| 24 | National Academies of Sciences, Engineering, and Medicine (US) | A Strategic Vision for Biological Threat Reduction | 2020 |
| 25 | National Academies of Sciences, Engineering, and Medicine (US) | Future Proof | 2021 |
| 26 | Centre for Long-Term Resilience | A Global Deal for Our Pandemic Age | 2021 |
| 27 | G20 High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response | The Apollo Program for Biodefense – Winning the Race Against Biological Threats | 2021 |
| 28 | The Bipartisan Commission on Biodefense | Accelerating National Genomic Surveillance | 2021 |
| 29 | Office of Science and Technology Policy (US) | Key U.S. Initiatives for Addressing Biological Threats series | 2021 |
| 30 | Rockefeller Foundation | Tijnian Biosecurity Guidelines for Codes of Conduct for Scientists | 2021 |
| 31 | Council on Strategic Risks | Exploring Science and Technology Review Mechanisms under the Biological Weapons Convention | 2021 |
| 32 | Tianjin University and Johns Hopkins Center for Health Security | Filling Critical Gaps: Comprehensive Recommendations for Public Health Preparedness, Response, and Recovery | 2021 |
| 33 | The United Nations Institute for Disarmament Research | One for All: An Updated Action Plan for Global COVID-19 Vaccination | 2021 |
| 34 | National Biodefense Science Board (US) | America Ranked First?! The Truth about America’s Fight against COVID-19 | 2021 |
| 35 | Rockefeller Foundation | Is virus tracing for COVID-19 politicized? | 2021 |
| 36 | Chatham House | Solidarity in response to the COVID-19 pandemic | 2021 |
| 37 | Peterson Institute for International Economics | How COVID-19 vaccine supply chains emerged in the midst of a pandemic | 2021 |
| 38 | RAND Corporation | A Comparison of National and International Approaches to COVID-19-Related Measures | 2021 |
must revolve around the cost and time they would require to implement. In this case, biosecurity is clearly synonymous with economic security.

2. The impact of scientific advances on biosecurity

2.1. Synthetic biology and engineering biology

Because of synthetic biology’s rapid growth and its potential for harmful applications, the National Academies of Sciences, Engineering, and Medicine, at the request of the US Department of Defense (DoD), conducted a study that resulted in a report, “Biodefense in the Age of Synthetic Biology,” which detailed a scientific framework for dealing with the anticipated security concerns arising out of synthetic biology in the near future. The report ranked synthetic biology capabilities from the highest relative level of concern (such as re-creating known pathogenic viruses, making biochemicals via in situ synthesis) to the lowest (modifying the human genome using human gene drives), based on the availability and ease of use of the technologies, the challenges of producing an effective weapon, the expertise and resources required to carry out an attack, and both the proactive and reactive countermeasures that might be taken. Because synthetic biology-enabled weapons might be unpredictable and hard to monitor or detect, it was recommended that the DoD should consider evaluating how the public health infrastructure needs to be strengthened to adequately recognize a potential attack. A report endorsed by the World Economic Forum and NTI recommended a global system to expand synthetic DNA screening practices by developing an international, cost-effective, and sustainable mechanism to prevent illicit DNA synthesis and misuse.

2.2. Gene drives

Gene drives have the potential to address environmental and public health challenges but modifying organisms using gene drives may have unintended consequences, such as the unintentional disruption of a non-target species. Following global calls in December 2016 for a UN moratorium on the use of gene-drive technology from Southern countries and over 170 organizations, the Convention on Biological Diversity’s Subsidiary Body on Scientific, Technical and Environmental Advice, a key United Nations (UN) body for Gene Drive governance, sought input from scientists and experts. However, according to the Gene Drive Files, a trove of emails and other records uncovered by civil society investigators, a previously undisclosed gene drive “advocacy coalition” appears to have recruited experts in an attempt to influence UN discussion. The European Academies’ Science Advisory Council recommended that policy-makers must ensure that the regulation of applications is evidence-based, takes into account likely benefits as well as hypothetical risks, and is proportionate and sufficiently flexible to cope with future advances in science.

To navigate the uncertainty posed by this field, a report also based on the National Academies of Sciences, Engineering, and Medicine study found that the current regulatory practices for assessing the risks or potential environmental effects of field experiments or planned releases involved in the Coordinated Framework for the Regulation of Biotechnology were inadequate, and recommended a collaborative, multidisciplinary, and cautionary approach to research on and governance of gene-drive technologies. The JASONs, a group of elite scientists that advises the US government on national security, had also undertaken classified studies on gene drives at the request of the US government, focusing on what might be realizable within the next 5–10 years, especially with regard to agricultural applications.

2.3. Risks posed by the convergence of technologies

The risks posed by the convergence of biotechnology and emerging technologies are varied. A study by the Woodrow Wilson International Center for Scholars analyzed the promises and perils that were likely to arise with the development of civil and military AI technologies and future networks of intelligent and connected bio-labs. The boundary between biology and cyberspace is becoming increasingly blurry. The DNA sequences available in public resources can be used to create biological threats that do not exist in nature, and cybersecurity vulnerabilities in DNA synthesizers could disrupt laboratory biosecurity or allow intruders access to sensitive information. The Stockholm International Peace Research Institute provided a picture of how the risks and challenges posed by the convergence of developments in biotechnology with additive manufacturing, artificial intelligence, and robotics have increased the possibilities for the development and use of biological weapons. The study explored the extent to which concerns arising from the convergence of biology and emerging technologies can be dealt with through existing governance mechanisms and found that existing governance frameworks are ill-equipped to review and address the risks posed by the convergence of biotechnology with emerging technologies comprehensively and effectively.

2.4. Ethical and normative questions and risks

Advances in the biotechnology field have raised new ethical and normative questions and risks that require new solutions. The Carnegie Endowment for International Peace indicated that gene alterations can generate unpredictable and undesirable consequences in the species that is modified, as well as in other species (ecological risk). Research aimed at rendering deadly viruses more contagious or pathogenic poses dangers, and the publication of such techniques and research outcomes could educate and empower malevolent actors (health and safety risks). Law enforcement agencies’ growing use of data-sensitive biotechnologies—such as finger-printing, systematic collection of human DNA samples, and the introduction of biometric identifiers and intelligent implants—all pose important societal risks, including to the core principles of the rule of law and human rights (rule of law risks). The diversity of possible applications of genome engineering and gene drive technology (including the production of bioweapons) and their potential impacts are unpredictable (international security risks).

3. Fighting against COVID-19

3.1. The COVID-19 response and resilience

To track how well different countries and US states are responding to the pandemic and to make valid cross-country and cross-state comparisons, the authors of a RAND Corporation report examined measures used in the early stages of the pandemic (December 2019–May 2020) and found tremendous variability in how different countries and US states measured and reported on COVID-19 indicators. The American BioDefence Institute, which produced several whitepapers on COVID-19 related to biodefense and biosecurity strategy that were made available to the United States Congress, announced the launch of its ReOpen America campaign with the goal of developing practical options for mitigating the pandemic’s adverse effect on American society and the economy as a whole in 2020. A research report jointly released by the Chongyang Institute for Financial Studies of the Renmin University of China, the Taihe Institute, and the Intellisia Institute concluded on the basis of objective facts that the United States was...
a “failed country in fighting the pandemic.” This report was the first in the world released by think tanks that revealed the truth about the COVID 19 resilience performance of the US in response to Bloomberg’s questionable COVID Resilience Ranking.31

3.2. Vaccine supply chains and distribution

Major disparities in vaccine distribution have left much of the global population unvaccinated, posing a threat to ending the COVID-19 pandemic. Researchers from the Peterson Institute for International Economics tried to answer two questions: Could more vaccine doses have been manufactured faster some other way? Would alternative policy choices have made a difference? The report went over general supply chain needs, the development and supply chain of the top COVID-19 vaccine candidates by Pfizer/BioNTech, Moderna, AstraZeneca/Oxford, Johnson & Johnson, Novavax, and CureVac, major policy interventions, and further points of reflection, such as the effects of international interdependence. The researcher concluded, “That explicit stance, as well as the implicit fear that other countries would do the same thing, almost certainly contributed to many company decisions to establish parallel supply chains in different markets rather than building out additional capacity in the United States or any other single location.”32 The Rockefeller Foundation called for the “G7 and other donors to step up so that COVAX closes its US$9.3 billion funding gap by June 2nd, allowing it to unlock an additional 1.8 billion doses of vaccine, enabling 92 low- and middle-income countries to vaccinate half their adult population.” Its report provided a five-point action plan for scaling equitable vaccination around the world: share more sooner; make more quicker; build in the global South; support delivery systems; and close the financing gap.33

3.3. Origin-tracing investigations

The COVID-19 pandemic has exposed key gaps in the global community’s ability to assess infectious disease outbreaks of international concern. The goal of the “A Guide to Investigating Outbreak Origins: Nature versus the Laboratory” report from the James Martin Center for Nonproliferation Studies (CNS) at the Middlebury Institute of International Studies at Monterey (MIIS) was to outline a readily adoptable, stepwise methodology to guide the investigation of corresponding outbreak origins.34 The CGTN Think Tank released a global online opinion poll, in which as many as 95 percent of survey respondents reported that they believed that “the issue of the origin of COVID-19 has been politicized.” The results of the survey showed that, on average, 83 percent of English-, Spanish-, French-, Arabic-, and Russian-speaking netizens agreed the origin of COVID-19 had been politicized, and 83 percent of English-, Spanish-, French-, Arabic-, and Russian-speaking respondents on Twitter supported origin-tracing investigations in multiple countries.

3.4. Solidarity in response to the COVID-19 pandemic

The Director-General of the World Health Organization, Dr. Tedros Adhanom Ghebreyesus, emphasized that the only way to defeat the pandemic was for all countries to work together in a spirit of solidarity. A research paper from Chatham House, The Royal Institute of International Affairs, examined the state of solidarity at different levels of governance—global, regional, and national—and offered case studies on the COVAX mechanism.35

4. Governance mechanisms of biosecurity

4.1. Public health preparedness and financing

A report written by the G20 High-Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response found that “COVID-19 will likely be a forerunner of future catastrophic pandemics unless significant new investments and reforms are urgently made to bolster global and national capacities for pandemic preparedness and rapid response.”36 It identified four major global gaps in pandemic prevention, preparedness, and response related to (1) globally networked surveillance and research, (2) resilient national systems, (3) the supply of medical countermeasures and tools, and (4) global governance. The Panel recommended an international funding increase of US$75 billion over the next five years to address these gaps. In parallel, NTI recommended that the United States should “support and fund new global platforms and capabilities to improve pandemic preparedness” by establishing a GHS Challenge Fund. The National Biodefense Science Board is the federal committee that advises the office of the Assistant Secretary for Preparedness and Response (ASPR) in the US Department of Health and Human Services (HHS). The National Biodefense Science Board’s All-Hazards Science Response Working Group draft report made five recommendations for enhancing the country’s disaster preparedness and response: a One Health threat assessment for biosurveillance and situational awareness; enhancement of medical countermeasures; reinforcing health workforce readiness; increasing health facility resilience; and improving communication with the public during health crises.37

4.2. Laboratory biosafety and biosecurity

The Federal Experts Security Advisory Panel (FESAP) in the US was established to provide recommendations to the Secretaries of Health and Human Services and Agriculture and the Attorney General related to the security of biological select agents and toxins (BSAT). In response to incidents involving biological select agents and toxins that raised safety and security issues, following recommendations in the Report of the Federal Experts Security Advisory Panel,38 the document “Guiding Principles for Biosafety Governance: Ensuring Institutional Compliance with Biosafety, Bioccontainment, and Laboratory Biosecurity Regulations and Guidelines” provided an overview of the federal regulations, requirements, and guidelines on biosafety and biosecurity in the US and a description of some of the voluntary laboratory accreditation systems.39

4.3. Microbial forensics and bioweapon attribution

Deterrence through attribution (“determining who is responsible and culpable for a biological attack”) was the primary policy tool for dealing with threats from the manufacture, proliferation, and use of regulated biological select agents and toxins. In two reports from the Federation of American Scientists,40,41 researchers explored the use of microbial forensics as a tool for creating a common baseline for understanding biologically triggered phenomena and examined how the legal, policy, law enforcement, medical response, business, and media communities interact in a bioweapon attribution environment and how scientifically based conclusions require credibility in these communities in order to have relevance in the decision-making process about how to handle threats. The Bipartisan Commission on Biodefense hosted a meeting entitled “Attribution of Biological Crime, Terrorism, and Warfare: Challenges and Solutions” in 2017, which addressed the
current states of science, investigations, and intelligence for biological attribution and the extent to which they inform strategic, operational, and tactical decisions.42

4.4. Reducing biotechnology risks

No global governance approaches exist to identify and reduce the biotechnology risks arising from the quickly expanding international biotechnology capabilities. NTI recommended that the United States “support and fund new global platforms and capabilities to improve pandemic preparedness, reduce biotechnology risks, and decrease the likelihood of a globally catastrophic biological event.”43 Specifically, it recommended the launch of a dedicated global entity focused on reducing the risk of biotechnology catastrophe and the establishment of a permanent UN facilitator and unit within the Office of the UN Secretary-General dedicated to responding to high-consequence biological events and international capabilities to rapidly investigate biological events of unknown origin.

4.5. Science and technology innovation

The Bipartisan Commission on Biodefense in the US, with its mission to conduct a comprehensive assessment of the state of US biodefense efforts, urged Congress to allocate funding for efforts to develop and deploy the technologies needed to defend against all biological threats, empower public health, and prevent pandemics. Its study report, “The Apollo Program for Biodefense,” encompassed four main goals: implementing the National Blueprint for Biodefense; producing a National Biodefense Science and Technology Strategy; producing a cross-cutting budget; and appropriating multi-year funding.44 As detailed in the Commission’s report, examples of such investments included vaccine candidates for prototype pathogens (e.g., one prototype pathogen in each of the 26 viral families known to infect humans); the production of multipathogen therapeutic drugs in advance of outbreaks; flexible and scalable manufacturing of pharmaceuticals; needle-free methods of drug and vaccine administration; ubiquitous sequencing; minimally- and non-invasive infection detection; massively multiplexed detection capabilities; point-of-person diagnostics; digital pathogen surveillance; a national public health data system; an integrated national pathogen surveillance and forecasting center; next-generation personal protective equipment; pathogen transmission suppression in the built environment; comprehensive laboratory biosafety; and technologies to deter and prevent bad actors. In its plan to address future pandemic threats, the Biden administration’s science adviser and the 11th Director of the Office of Science and Technology Policy (OSTP), Dr. Eric Lander, proposed an investment of $41 billion to develop safe, accurate, and effective vaccines, therapeutics, and diagnostics faster than ever.45

Funding for basic research is also essential. The MIT Washington Office provided concrete examples of breakthrough opportunities for basic research and their potential long-term impacts. Included in “The Future Postponed 2.0” report were opportunities in the field of mapping the human exposome and unveiling the viral ecology of the earth.46 Mapping the exposome is ultimately about understanding the divergence between human genetic predispositions and biological reality, while an in-depth knowledge of viral ecology would lead to scientific knowledge of the structure and function of living systems on a variety of scales, ranging from genes to ecosystems to the global carbon cycle. In its think tank report, the Japan Science and Technology Agency (JST) Research and Development Strategy Center (CRDS) looked back on the measures taken since the outbreak of COVID-19 and identified issues and bottlenecks in the future. The report proposed the following three recommendations to drive these priority items: promotion of infectious disease research from both host and pathogen; construction of microbial genome information platform and establishment; advancement of collaboration between social science and natural science research.47

4.6. Biosecurity infrastructure

Gaps exist globally in tracking and alerting for SARS-CoV-2 variants and in existing global genomic surveillance efforts, which are ad hoc, siloed, and inadequate to meet the demands of a rapidly changing virus. The Rockefeller Foundation released an action plan, “Accelerating National Genomic Surveillance,” and a companion document, “Implementation Framework: Toward a National Genomic Surveillance Network,” advocating creating a national genomic surveillance system in the United States as part of a $1 billion commitment to incubate a global, data-driven, pandemic prevention system. The plan identified six elements: building a viral defense system; broadening diversity; connecting national public health systems; securing additional resources; creating new analytic tools; and rapidly assessing threats posed by new virus variants.48 A product of the CSIS Commission on Strengthening America’s Health Security proposed the following recommendations: expanding the authority of the Biological Threat Reduction Program to increase flexibility in detecting and countering the proliferation of novel highly communicable emerging diseases; sustaining funding of military overseas infectious research laboratories, the Armed Forces Health Surveillance Branch, Global Emerging Infections Surveillance System, and the National Center for Medical Intelligence in support of host nation disease surveillance capabilities; and expanding the use of exercises and developing new scenarios.49 A report from the National Academies of Sciences, Engineering, and Medicine, illustrated a 5-year strategic vision for international health security programs and provided findings and recommendations on how to optimize the impact of the DoD Biological Threat Reduction Program in fulfilling its biosafety and biosecurity mission.50

4.7. Biosecurity and biodefense policy road mapping

Understanding the current policy landscape and the potential to achieve biodefense objectives is crucial. A report by Gryphon Scientific, the National Defense University, and Parsons revealed a bifurcation of the US policy landscape for countering biological threats and presented a roadmap for implementing biosecurity and biodefense policy to leverage the capabilities of science and technology advances and minimize security risks. This project, funded by a generous grant from the US Air Force Academy and Defense Threat Reduction Agency under their Program on Advanced Systems and Concepts for Countering Weapons of Mass Destruction, involved the first-ever systems-based analysis of the entire US biosecurity and biodefense policy landscape.51 The Nolan Center, an institute of the Council on Strategic Risks, released five briefers in its series “Key US Initiatives for Addressing Biological Threats,” examining specific departments and programs in the US federal government whose missions include countering biological threats. In the first briefer, “Key US Initiatives for Addressing Biological Threats, Part 1: Bolstering the Chemical and Biological Defense Program,” they proposed that the US government should invest $10 billion each year in the DoD Chemical and Biological Defense Program, as well as $10 billion annually in the Department of Health and Human Services, over a decade.52 In the second briefer, CSR experts proposed several ideas for maximizing the capabilities of the DOE Labs for addressing biological threats, including positioning the Labs to be world leaders in engineering biology and more.53 The third briefer provided several recommendations to help ensure that the Biological Threat Reduction Program, a key yet little-known US DoD program for addressing
biological threats, is sufficiently robust and effective in the coming years. In the fourth brief, they proposed recommendations for maximizing the capabilities of the Department of State for addressing biological threats, including enhancing multilateralism via tailored bio-cooperation mechanisms, as well as appointing a special envoy and increasing biorisk expertise across the US diplomatic corps. In the fifth brief, they proposed several recommendations for improving the development, production, and delivery of rapid medical countermeasures as a cornerstone for addressing the full range of biological threats.

4.8. Dual-use research of concern

Dual-use research of concern (DURC), which focuses on 15 select agents and toxins and 7 types of experiments in the United States, describes research that can be reasonably anticipated to provide knowledge, information, products, or technologies that have the potential to create negative consequences for health and safety, agriculture, the environment, or national security. The National Academies of Sciences, Engineering, and Medicine examined the policies and practices governing dual-use research in the life sciences and warned that a lack of awareness of dual-use issues among many life scientists is hampering efforts to address biorisk risks. The report identified multiple elements in dealing with dual-use research of concern: education and training of individuals in the broader life sciences community; engagement with advisory bodies with monitoring and/or enforcement capabilities; international harmonization of policies and approaches; engagement with existing (e.g., World Health Organization, Biological Weapons Convention [BWC]) or newly convened international entities; legislative, regulatory, or policy mechanisms positioned at critical stages of the dissemination process; uniform roles and responsibilities for publishers; and increased engagement with the public.

4.9. Issues on the BWC

In anticipation of the Ninth Review Conference of the BWC, Tianjin University has partnered with the Johns Hopkins Center for Health Security to finalize a set of guiding principles and code of conduct for individual scientists and institutes engaging in biological research. The principles and standards established in the code of conduct are designed “to be fundamental and inherently adaptable to diverse contexts and thus may be used to develop new—or enhance, supplement, and update existing—codes of conduct to fill the gaps in biosecurity governance at national and institutional levels.” The United Nations Institute for Disarmament Research published a study that “seeks to inform discussions on establishing a dedicated and systematic S&T review process under the BWC through an examination of existing S&T review-type mechanisms employed in different regimes beyond the BWC, a survey of States Parties views on a possible review mechanism, and a study of past and present discourse on this issue in the BWC.” The study found that two types of potential models became evident: a limited-participation model and an open-ended model.

5. Conclusion

This article found that both the number of Western think tanks concerned with biosecurity and their intellectual outputs in this area have been increasing, and that these think tanks have been making efforts to influence the decision-making and policy development process in different ways, most often by directly presenting their work to funding bodies, testifying before authorities, communicating their insights by hosting events domestically or at international conferences, building networks and communities through which they nurture and spread ideas and spur action, or indirectly disseminating their views in the public media, such as scientific journals and newspapers.

Think tanks’ intellectual adventures in biosecurity have promoted the development of the biosecurity discipline to a certain extent. These think tanks have strong senses of national interests and risks, adhere to strategic foresight with respect to scientific and technological changes and international relations, and strengthen methodological innovations such as policy road mapping and scenario deduction, and try to answer the following questions: how transformative technologies such as artificial intelligence and genome editing raise new opportunities and challenges for health, security, and governance in different geopolitical contexts; how to better deal with the increasing biorisks in the era of biosecurity; and how to more efficiently influence national or international decision-making mechanisms to promote biosecurity governance.

The endeavors of these think tanks in the biosecurity field are relevant to understanding the overall development trend and future evolution of international security, and exploring the effective mechanisms of think tanks in policy decision-making is a worthwhile task. However, the policy recommendations of some think tanks to create offensive-oriented biological deterrence run contrary to the current trend of global peace and development and are expected to be a waste of thought.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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