Biosecurity Risks and Vulnerabilities in the Post-2020 World

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The global spread of the novel coronavirus (COVID-19) since early 2020 has demonstrated how modern societies remain vulnerable to biological threats. By mid-December 2020, the world suffered 172 million cumulative cases and accounted for 3.83 million deaths.[1] As a globalized phenomenon, the Americas and Europe felt the pandemic's impact at greater magnitudes, accounting for 85 percent of new cases and 86 percent of deaths globally.[2] Although uncertainty remains surrounding the origins of COVID-19, the novel virus clearly shows the detrimental effects and impacts pathogens can forge on our globalized society.

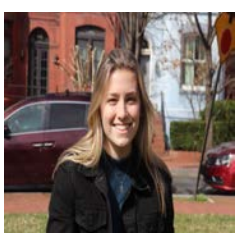
This article examines biosecurity risks and vulnerabilities in the post-2020 world. As the world seeks to recover, the attractiveness of biological weapons, highlights sectors with biological vulnerabilities, and identifies new threats. It is imperative to understand the biosecurity and bioterrorism vulnerabilities revealed by the COVID-19 pandemic. Fortifying institutional mechanisms and existing industries will prove necessary to combat the weaponization of biological components to maintain the international order and peace worldwide.

Attractiveness of Biological Weapons

New biological threats must be discerned from the COVID-19 pandemic. While biological weapons are considered weapons of mass destruction (WMDs), they differ in the decentralized nature of the attacked environment and can spread over an uncontrolled period. Harmful pathogens travel quickly in an interconnected twenty-first century world. Great power competition promotes scientific and biological advances that may "permanently alter the national security landscape and their uses for offensive and defensive purposes."[3] As this interstate rivalry motivates and accelerates biotechnology research and scientific innovation, barriers to the development of biological weapons decrease.

The extensive research and progress made for understanding the human genome provides vulnerabilities for nefarious actors to take advantage. Due to an understanding of the way the human genome differs, in which genetic variation can express physical differences among individuals, synthetic biological agents may be developed to target specific populations. Weaponized biological agents provide lethal means of dispersion, surmounting national boundaries and fortified security measures that can leave broad populations vulnerable, including important elements of national security apparatuses, such as high-level government and military officials.

1 "WHO Coronavirus (COVID-19) Dashboard," *The World Health Organization*, June 15, 2021, https://covid19.who.int/
2 "Weekly Epidemiological Update – 15 December 2020," *The World Health Organization*.
3 Joanna Rozpedowski, "Bio-Security in the Age of Global Pandemics," *Global Security Review*, April 20, 2021, https://globalsecuritytyreview.com/bio-security-in-the-age-of-global-pandemics/



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In October 2020, the Chairman of the Joint Chiefs of Staff Mark Milley and senior Pentagon officials were required to quarantine after a colleague tested positive for COVID-19.[4] National leaders themselves may be vulnerable to illness; US President Donald Trump, Canadian Prime Minister Justin Trudeau, and Brazilian President Jair Bolsonaro, among many others, contracted the novel coronavirus in 2020. The ability of biological weapons to reach powerful individuals poses possibilities for hindering the regular functioning of government institutions as well as weakening a state's ability to respond in times of war or emergency.

Several advances in the field of biology, biotechnology, and synthetic technology have increased the access and likelihood of weaponizing a biological agent due to the diffusion of knowledge among individuals and accessibility via the Internet. In addition to scientific progress, the costs of artificially creating biological agents have decreased significantly, and thus will decrease the expertise and equipment costs necessary to create such agents. According to Ernst & Young, "the first sequencing of the human genome required 13 years and US$3 billion; today, it takes a week and US$600."[5] Coinciding with the decreased barriers to entry, the interest of synthetic biology by layman is increasingly growing and has become known as "biohackers," who seek to biologically alter their own bodies. Untrained scientists and non-state actors can seek to weaponize biological agents without truly understanding the underlying scientific implications.

Biological weapons can confound traditional deterrence strategies, impeding a state's ability to harden defenses. The traditional two-pronged approach to successful deterrence rests not only on a state's ability to credibly threaten a powerful, punishing response, but also relies on the ability to identify the perpetrator to punish wrongdoing. Biological weapons can be attractive due to their ability to deliver a nonattributable payload, blurring the certainty needed to designate a retaliatory response.[6] While global leaders have politicized and attributed Chinese responsibility to the origins of the COVID-19 pandemic, the difficulty to prove intent or malice reduce the ability to provide a clear response. This explicit difficulty of attribution may create an appeal for the use of biological weapons by future actors.

Institutional Vulnerabilities

Recognizing the need for international oversight and cooperation on the dangers of biological weapons, the Biological Weapons Convention (BWC) went into effect in 1975.[7] Supplementing the 1925 Geneva Protocol, which prohibited the use of biological and chemical weapons following the deployment of poisonous gases and chemical agents in World War I by multiple nations,[8] the BWC prohibits the "development, production, acquisition, transfer, stockpiling and use of biological and toxin weapons."[9] While the Convention serves to uphold an institutional norm against the use and proliferation of biological weapons among its member states (currently comprising of 183 states), it is far from perfect.

4 Barbara Starr and Zachary Cohen, "Senior Pentagon leadership quarantining after exposure to coronavirus, *CNN,* October 6, 2020, https://www.cnn.com/2020/10/06/politics/pentagon-leadership-self-isolating-coronavirus/index.html

5 John de Yonge, "How the COVID-19 Outbreak could provide Synbio's Breakout Moment," *EYQ*, May 6, 2020, https://www.ey.com/en_us/covid-19/how-the-covid-19-outbreak-could-provide-synbios-breakout-moment

6 "Elizabeth L. Stone Bahr, "Biological weapons attribution a primer," *Naval Postgraduate School,* https://calhoun.nps.edu/handle/10945/3483

7 "Biological Weapons Convention," *United Nations Office for Disarmament*, https://www.un.org/disarmament/biological-weapons/

8 "Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare (Geneva Protocol)," *U.S. Department of State*, https://2009-2017.state.gov/t/isn/4784.htm

9 "Convention on the Prohibition of the Development Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction," *Audiovisual Library of International Law*, https://front.un-arm.org/wp-content/uploads/2020/12/BWC-text-English-1.pdf

The BWC serves as the first international treaty to ban an entire class of weapons, although it fails to provide a verification or investigation mechanism, like those of the Nuclear Non-proliferation Treaty and Chemical Weapons Convention, for state compliance. Without any formal mechanism to investigate compliance violations, the BWC loses much of its ability and remains something more akin to a "gentleman's agreement."[10] As posited by defense neorealists, including Kenneth Waltz, states may seek their survival by ensuring a balance of power by countering another state from becoming too strong.[11] Observing state noncompliance or violations may incentivize other states to proliferate or further develop a biological weapons program in order to ensure its national security and wellbeing. Without a formal mechanism to ensure BWC compliance, member states lack the incentives to uphold the treaty and may only further perpetuate violations to the BWC.

Following the global COVID-19 outbreak, many questioned the origins and the possible release of the harmful biological pathogen by China. While China's participation in the BWC began in 1984, various US defense and intelligence reports held the understanding that China maintained its biological weapons program from the onset of its BWC commitment, in violation of their treaty responsibilities. Chinese noncompliance remained an issue of concern for the past four decades and even consumed great time in a 2019 US Senate hearing on Biological Threats to U.S. National Security.[12]

In addition to China, Russia has historically defied BWC member obligations and secretly continued its biological and chemical weapons programs. In August 2020, Russian opposition leader Alexei Navalny was poisoned with Novichok, a Soviet-era nerve agent, presumably employed by senior Kremlin officials.[13] As great power competition continues to disrupt the current international order, the development of biotechnology and biological weaponry is expected to increase. In early April 2021, allegations emerged over the possibility that the US is developing biological weapons along borders of China and Russia.[14] As biological weapons programs continue to go unchecked by the BWC, further development, uses, and hostilities over biological weapons will continue to grow and present challenges to the global security environment.

While ensuring BWC compliance has been challenging for decades, the long-term and global implications observed throughout the COVID-19 pandemic may call greater attention to, incentivize actors, and enhance biological weapons activities.

Economic Vulnerabilities

Observing the international community's pandemic response over the last year provides insight into how the world might react in the event of a biological weapons incident, and shows how much national insecurity and economic havoc can be wrought by biothreats.

Addressing the macroeconomic implications of a biological attack, nations may seek to take advantage of vaccine diplomacy and global assistance. The cost of developing, producing, and distributing vaccines places a tremendous burden on a nation, which many developing nations cannot afford. In response to the COVID-19 pandemic, the United States spent more

10 Lukas Trakimavicius, "Is Russia Violating the Biological Weapons Convention?" *Atlantic Council,* May 23, 2018, https://www.atlanticcouncil.org/blogs/new-atlanticist/is-russia-violating-the-biological-weapons-convention/

11 Kenneth Waltz, *Theory of International Politics*, (New York: McGraw-Hill, 1979), pg. 4

12 Claudia Adrien, "Chinese biotechnology Dominates U.S. Senate Hearing on Biological Threats," *Homeland Preparedness News,* November 21, 2019, https://homelandprepnews.com/countermeasures/40093-chinese-biotechnology-dominates-u-s-senate-hearing-on-biological-threats/

13 "Russia Responsible for Navalny Poisoning, Rights Experts Say," *UN News*, March 1, 2021, https://news.un.org/en/story/2021/03/1086012

14 Brendan Cole, "Vladimir Putin's Adviser Says U.S. is Developing Biological Weapons Near Russia," *Newsweek*, April 8, 2021, https://www.newsweek.com/russia-china-nikolai-patrushev-vladimir-putin-biological-weapons-1581896

than $9 billion on purchasing vaccines,[15] more than double Haiti's federal budget.[16] Especially if the United States does not, other nations may seek to increase their global influence, dependence, and power by providing equipment and vaccine support to financially weak nations. In early 2021, India, encouraged by it's "Neighborhood First' policy, seeking to bolster relations within its immediate region, began providing COVID-19 vaccines to its neighbors – selling or securing over 19 million doses.[17] While India continues to suffer from the pandemic, it seeks to reinforce its regional influence and control within Southeast Asia.

Healthcare Response Challenges

At the onset of the coronavirus pandemic, hospitals and the medical community experienced drastic shortages in the personal protective equipment (PPE) necessary for providing essential healthcare while combatting the risk of exposure and spread of the virus. In March 2020, the World Health Organization (WHO) estimated that 89 million medical-grade masks, 76 million examination gloves, and 1.6 million goggles were required for the pandemic response monthly.[18] In the United States, stockpiles of PPE fell to dangerously low levels due to the medical community's lack of foresight for crisis planning and management. Over the last three decades, health systems in the United States shifted to just-in-time (JIT) inventory management to increase efficiency and decrease inventory costs.[19] While this management system provides great benefits financially in normal times, it exacerbated the unavailability of inventory in times of emergency. US hospitals lacked essential stockpiles and necessary, long-term supply chains that connect local manufactures to produce inventory quickly when needed.[20] Working under equipment constraints, healthcare workers began reusing single-use PPE or did not wear the appropriate PPE when tending to patients to conserve the dwindling stockpile, decreasing the effectiveness to protect oneself the spread of the virus.

The COVID-19 pandemic highlighted the United States' and international community's vulnerability of the PPE supply chain to a biological attack. A potential aggressor's decision processes rests upon a cost-benefit analysis, in which the expected benefits of an attack must exceed its expected costs. Deterrence by denial seeks to deter an action by making it "infeasible or unlikely to succeed, thus denying a potential aggressor confidence in attaining its objectives."[21] PPE acts as a primary bio-defense asset, as it seeks to minimize the spread of contagious pathogens, thus reducing, or denying, the harm an actor's actions can achieve and its subsequent benefits. The inadequate stockpile of needed defense to contagious biological agents can have grave implications for deterrence and defense strategies. The PPE supply chain breakdown highlights the international community's biodefense mechanisms and inability to defend oneself through deterrence by denial.

15 Karen Weintraub and Elizabeth Weise, "Federal Spending on COVID-19 vaccine candidates tops $9 billion, spread among 7 companies," *USA Today*, August 10, 2020, https://www.usatoday.com/story/news/health/2020/08/08/feds-spending-more-than-9-billion-covid-19-vaccine-candidates/5575206002/

16 Onz Chery, "Haitian government sets $3.7 billion budget for 2021 fiscal year," *The Haitian Times*, October 1, 2020, https://haitiantimes.com/2020/10/01/haitian-government-sets-3-7-billion-budget-for-2021-fiscal-year/

17 Sohini Bose, "The Dynamics of Vaccine Diplomacy in India's Neighbourhood," *Observer Research Foundation*, June 15, 2021, https://www.orfonline.org/research/the-dynamics-of-vaccine-diplomacy-in-indias-neighbourhood/.

18 "Shortage of personal protective equipment endangering health workers worldwide," *The World Health Organization*, March 3, 2020, https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide

19 Bill C. Kinney and Stephen B. Symonds, *Just-in-Time Inventory Management; Application and Recommendations for Naval Hospital, Oakland*, (California: Naval Postgraduate School, 1992), https://apps.dtic.mil/dtic/tr/fulltext/u2/a261824.pdf

20 Bruce Y. Lee, "Why Mask, Gown, PPE Shortages Persist, Even Though Manufacturers Want to Help, *Forbes*, January 18, 2021, https://www.forbes.com/sites/brucelee/2021/01/18/why-mask-gown-ppe-shortages-persist-even-though-manufacturers-want-to-help/?sh=395c45a66de2

21 "Michael Mazarr J., *Understanding Deterrence*, (Santa Monica, CA: RAND Corporation, 2018), https://www.rand.org/content/dam/rand/pubs/perspectives/PE200/PE295/RAND_PE295.pdf p 2

Social Vulnerabilities

The social implications of the COVID-19 pandemic exposed the vulnerabilities of a digitally connected society to a biological weapons incident. As the world becomes more technologically dependent and reliant on the dissemination of information online, the US and the globalized community is becoming increasingly susceptible to truth decay, "the erosion of trust in and reliance on objective facts in political debate and civil discourse about public policy."[22] The information overload online, 24-hour news cycle, and ability for any individual to spread their own thoughts as truth can perpetuate the spread of misinformation and disinformation. Throughout the COVID-19 pandemic, the spread of falsified information created a rift between the scientific community and vast parts of the public sphere.

The spread of disinformation and misinformation and its ability to take hold has posed vulnerabilities to a biological weapons attack because it further erodes public trust for the government, as national leaders appear to be lacking control of the situation. The spread of multiple and inconsistent narratives eroded officials' ability to create a consensus among its citizens and has further prolonged the pandemic and propagated the spread of the virus. This affects future deterrence efforts because it reveals an overall lack of trust and clarity needed to combat a harmful biological agent. Emerging in 2021 world, the anti-vaxxer movement gained traction throughout the creation and rollout of the COVID-19 vaccine. Non-compliance to recommended health measures can further impede a nation's biodefense. Nefarious actors may view the public's vaccine hesitancy and inability to comply with official's recommendations as a potential weakness in a defense plan to curb the effects of a biological attack quickly and effectively.[23]

The COVID-19 pandemic has demonstrated how biological incidents can perpetuate political and institutional distrust within the preexisting status quo of a nation, facilitating the push of marginalized individuals to seek refuge elsewhere. The increased use of social media throughout 2020 has added 316 million users, totaling to 5.22 billion unique mobile users,[24] increases the threat of spreading falsified information.

While the post-2020 world brings optimism surrounding the end of the COVID-19 pandemic, a dialogue about remaining biosecurity risks is vital. While the advancement and use of biological weapons is prohibited among most states, its lack of enforcement, coupled with the potential to inflict harm in numerous industries around the world, provides accessibility and appeal. To fortify the global security environment, the vulnerabilities and biosecurity risks must be assessed, intuitional design of the BWC must be reconsidered, and defense organizations must work tangentially with the public sector to minimize industry weaknesses.

22 Jennifer Kavanagh and Michael Rich, *Truth Decay: An Initial Exploration of the Diminishing Role of the Facts and Analysis in American Public Life*, (Santa Monica, CA: RAND Corporation, 2018), pg. 2

23 Regan Lyon F., *The COVID-19 Response has Uncovered and Increased Our Vulnerability to Biological Warfare*, (Military Medicine, 2021), pg. 2

24 Dave Chaffey, "Global Social Media Research Summary 2021," *Smart Insights,* March 11, 2021, https://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research/