

Testimony before the Bipartisan Commission on Biodefense

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I would like to thank Co-Chairman Lieberman and Co-Chairman Ridge for extending an invitation to testify today on the issue of biodefense, and also express thanks to the commission members and staff for your dedication on this important topic.

Today I will first provide an overview of what we consider to be key aspects of this threat. I will then address challenges to the bioeconomy, and then will finish with an outline of how CSET is putting in place the tools to tackle this difficult problem. We believe our approach will provide decision space for both the United States and its allies to understand the depth and breadth of potentially risky research around the world, assess foundational and enabling technologies—including AI—that will have an impact on this field in the future, and help design better policies to both harness its potential and protect against misuse.

As new developments in biotechnology create opportunities for human health, manufacturing, and discovery, there is the possibility that this research may push societal norms regarding the use of research that enhances virulence or transmissibility (“gain of function”), as well as introduce risks through the exploration of exotic toxins, misuse of animal models and human embryos.

Differences in approach and regulations could potentially lead to ethical asymmetries where proscribed research in one country or region could be explored in another in ways that could impact the speed and adoption of technology, cause an undesirable “off-shoring” of the bioindustry from the United States to those countries, and increase the possibility of misuse. It will be increasingly important to maintain transparency, reciprocity, and robust discussions of global norms related to the different aspects of biotechnology, including gain of function research, genomic security and privacy, the use of non-human primates, editing of human embryos, and population surveillance.

Additionally, too often policies and programs focus only on technical capabilities to the detriment of the application, development, impact, and security of that research. Even if some have the purest of intentions for the work, others will not always be as scrupulous. Given the complexities of these issues, political leaders will need to base their decisions on *the best*

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available data and information related to global trends in biotechnology investments, human capital development, and supply chains, as well as capabilities.

CSET, the Center for Security and Emerging Technology where I work, is uniquely positioned to begin to explore this data and information.

You have already heard from many experts today about the specific aspects of the threat and catastrophic biological risks, accidental releases of pathogens into the environment, and dangerous biological information getting in the hands of bad actors. So I will only highlight a handful that we are particularly concerned with, and where we are focusing our efforts.

1. Gain-of-function research and dual-use research of concern have the potential—through either deliberate misuse or accident—to create catastrophic biological risk and pose biological threats. While it is important to study human, animal and plant pathogens, and understand host-pathogen interactions, more needs to be done to understand the depth and breadth of research globally, and to reach a better understanding of how to regulate it. Major viral outbreaks like MERS, SARS, and COVID-19 are zoonotic in origin and jumped to humans. Animal and plant-specific pathogens that destroy animal herds and crops can cause major disruption to food supplies.
2. Disruption to the bioeconomy supply chain has devastating effects on U.S. research and medical care. At the beginning of the pandemic, there was a backlog of medical gear including personal protective equipment. Additionally, necessary laboratory equipment did not make it to the United States. Low-tech needs such as gloves, pipette tips, and bleach for decontamination are vital to lab operations. Experimental materials including DNA extraction kits and research animals were also interrupted. Labs could not conduct any kind of research during this time, halting and/or slowing groundbreaking and innovative research.
3. Comprehensive oversight and understanding of risky research is necessary for cross-national cooperation and transparency in biosafety. High-containment research requires proper equipment, training, and safety measures to lessen risk of lab accidents involving dangerous pathogens. It's also important to distinguish why high-containment labs exist. While some research pathogens, others are reference laboratories and medical facilities to diagnose and treat patients.

The Bioeconomy

I will now turn to threats to the bioeconomy. Emerging technologies, such as biotechnology, are increasingly at the center of global competition, providing the foundational research and developments that drive economic growth and simultaneously shaping international military and economic competition, and the direct health, employment, and safety of our citizens.

Our strategic competitors—such as China—have made developing a strong bioeconomy a key pillar of their economic development. China seeks to dominate in these technologies—stating that its latest policies and programs will transform China from a “biotech power (生物技术大国)” to a “biotech superpower (生物技术强国)”.

China is laying the groundwork to do this—much like its approach to develop 5G—by having a long-term strategy, building an innovation base that includes interdisciplinary research labs, and creating industrial and research clusters that co-locate universities, government research entities such as the Chinese Academy of Sciences, and commercial entities; using its talent programs to attract overseas experts—which in the bio field have been quite successful—and leveraging its collaborations with foreign entities. Its efforts include:

- A multi-decade effort to support its biotechnology sector and foster its bioeconomy, through funding of Big Science facilities, support to national “champions” (i.e. favored companies), programs for talent recruitment, and increased funding for basic research.
- China has also amassed the largest sequencing capacity in the world which it leverages to acquire genomic data. It is important to note that China does not allow the export of its own genomic data. Its national security law compels companies in China to share any data they have with the Chinese government. Our co-panelist Ed You will discuss this in more detail—but this raises a host of both privacy and security issues.

China has also shown that it is willing to push ethical boundaries in biology especially, with its less-regulated use of human embryos, mass production of non-human primates, and genomic surveillance.² The implications of China exporting these technologies sets the tone for discovery,

²Liang Piping, et al., “CRISPR/Cas9-mediated Gene Editing in Human Triprounuclear Zygotes.” *Protein Cell* 6.5, pp. 363–372, 2015; David Cyranoski, “The Crispr-Baby Scandal: What’s Next for Human Gene Editing” *Nature* 566, pp. 440–442, 2019; There are marmoset colonies in the United States, however, U.S. regulatory hurdles and expense give China an edge; James Leibold and Emile Dirks, “Genomic Surveillance: inside China’s DNA Dragnet,” Australian Strategic Policy Institute: *The Strategist*, June 17, 2020.

challenges global norms on many levels, attracts companies to do this kind of research, and has a direct impact on human and animal rights worldwide.

No discussion would be complete without consideration of the potential military applications and the role of the PLA in this work. China takes a holistic approach to its science and technology development. China's 13th Five Year Plan for Military and Civil Fusion specifically calls for a cross-pollination of military and civilian technology in areas not traditionally viewed as "national security issues," such as neuroscience and brain-inspired research, as well as biotechnology.

- China's People's Liberation Army researchers have a long history of involvement in these areas, and the PLA historically has been in charge of public health in China. This was most recently on display during the COVID-19 response and information coming to light about the PLA's involvement with Beijing Genomics Institute's commercial efforts in Europe collecting the genomic data from pregnant women and their unborn children.

What can the United States and its allies do?

Bearing all this in mind, the United States and its allies will be better positioned to both harness the capabilities of biotechnology and protect against its misuse by being aware of public indicators of risky research at scale. We will accomplish this by understanding which categories of gain of function research are being explored by whom, where it is happening, and how it is changing over time (the haystack). This will lay the foundation for then understanding potential anomalies in research and development (the needle), thus providing an open source avenue for identifying risky research/researchers by experts.

CSET's Work

CSET offers a perspective on these questions that no other organization can provide. Our mission to work at the nexus of national security, emerging technology, and in this case, issues related to both biosecurity and bioeconomy, are uniquely positioned to bridge historically siloed parts of the policymaking community that must work together to both harness the capabilities of this technology area and protect against its misuse.

CSET's data collection and data team also provide a unique capability that will enable research that is not done elsewhere. We are using CSET-acquired data resources in combination with other data to create rich evidence-based discussion for better decision-making. This includes the following: developing a gain of function classifier to identify gain of function research through academic publications, developing additional signals of dual use research of concern, and identifying biosafety level-3 labs worldwide using publicly available data.

In taking a holistic approach to this issue we believe that risks to national security and the bioeconomy can be mitigated.

Thank you for your time, and I am happy to take any questions.