Statement of
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Before the
**Subcommittee on Oversight and Investigations**
of the
**Committee on Energy and Commerce**
**United States House of Representatives**

Hearing on
**Examining Biosecurity at the Intersection of AI and Biology**

December 17, 2025

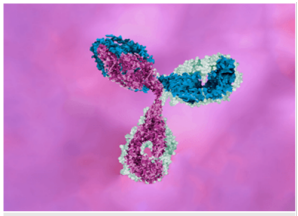
Dear Chair Joyce, Ranking Member Clarke, and the other members of the Subcommittee:

Thank you for the opportunity to testify before the Subcommittee at the hearing on Examining Biosecurity at the Intersection of AI and Biology. I lead policy, biosecurity, and trade compliance for Twist Bioscience (Twist). Founded in 2013, Twist is an American synthetic DNA manufacturer that uses a disruptive DNA synthesis platform to achieve significant scale in production capacity. The core of the platform is a proprietary technology that pioneers a new method of manufacturing synthetic DNA by “writing” DNA on a silicon chip using automated machinery and processes. We have manufacturing facilities outside of San Francisco and Portland, and in the last year, produced nearly 1 million unique gene sequences. Companies like Twist make DNA from scratch - our customers send us text files containing a sequence of As, Gs, Ts and Cs, which are the building blocks of DNA. We use that sequence to manufacture custom molecules and send the customer a tube containing the DNA that is then used for research or commercial applications.

Our customers are advancing solutions that improve health, drive economic opportunity, and promote responsible stewardship of our natural resources. To support the future of synthetic biology, we are deeply committed to promoting the beneficial and responsible application of gene synthesis technology while safeguarding biosecurity. In this testimony, we provide information about the state of the field and biosecurity efforts, as well as make the following recommendations:

- **Mandate DNA synthesis screening standards:** Enact legislation requiring all gene synthesis providers to screen orders and verify customers. It should support efforts to define “sequences of concerns” with the Department of Commerce coordinating this effort and limit the use of federal funds to compliant providers or tools manufacturers.
- **Sustain American leadership in synthetic DNA manufacturing and the development of screening resources:** Invest in domestic capacity and supply chain resilience to maintain U.S. competitiveness, reduce national security risks, and ensure the United States can shape global biosecurity norms and standards.
- **Invest in AI-enabled biosecurity tools:** Support federal investment in datasets and predictive models capable of assessing the functional risk of AI-designed biological sequences, with appropriate safeguards for dual-use concerns.
- **Promote responsible global adoption:** Share defensive biosecurity models and best practices internationally to prevent misuse from shifting to less regulated overseas providers and to strengthen global protection against AI-enabled biodesign risks.

There is tremendous benefit that comes from gene synthesis technology – synthetic DNA is widely used in biotechnology applications in many sectors including health, energy, agriculture, biomanufacturing, and more. As examples, it is used to design and test new antibody-based therapeutics or to program bacteria that sit at the roots of plants and provide nitrogen allowing a farmer to reduce the fertilizer they use. Additional examples are highlighted below:



Synthetic DNA, which encodes potentially therapeutic proteins (i.e., biologics), is being used to accelerate drug discovery. The global biologics market size was valued at USD 461.74 billion in 2022 according to one report.

Scientists are using synthetic DNA to produce spider silk, which is stronger than steel and Kevlar and can be used to produce ultra-strong parachutes or enhanced body armor.

Synthetic DNA is used to create better crops that are more resistant to certain pests and environmental conditions. The result is reduced fertilizer use which reduces costs and improves water quality.

Rare-earth elements are notoriously hard to extract from the Earth's crust and to separate from one another. However, microorganisms are being programmed to aid in for rare-earth element recovery and separation.

Synthetic DNA is considered a dual-use technology, meaning it may be utilized for both beneficial and harmful purposes. In 2006, a journalist from *The Guardian* demonstrated the potential risks associated with unverified gene synthesis by ordering a small piece of DNA from the virus that causes smallpox, which was delivered to his home, and later published an article[1] describing the security risks associated with this kind of acquisition. The synthesis industry worked together with the U.S. and other governments to identify ways to ensure our customers use our products responsibly. The Department of Health and Human Services (HHS) published a guidance document in 2010 and later revised in 2023, which formed the backbone of robust industry practices that remain in place today.[2] Additionally, industry formed the International Gene Synthesis Consortium[3], an organization I now chair, to coordinate and improve upon these screening practices.

[1] https://www.theguardian.com/science/2006/jun/23/weaponstechnology.guardianweekly
[2] https://aspr.hhs.gov/S3/Pages/Synthetic-Nucleic-Acids.aspx
[3] https://genesynthesisconsortium.org/

Upon receiving an order, responsible synthesis companies like Twist evaluate the ordering customer to ensure they are a legitimate scientific actor. We also use computational methods to screen the sequences ordered, essentially reverse engineering the origin and function of those sequences to determine if they could be misused. If a sequence does pose a risk, we conduct follow up screening to ensure the customer will use that sequence in responsible research or commercial activity. If concerns persist, Twist may deny the order, and in some very rare cases, we notify law enforcement.

The growth in artificial intelligence (AI) model capabilities has created a new set of challenges for these screening practices. We think of AI models in biotech as falling into two major categories. First, the large language models many of us are familiar with do pose challenges around misuse by potentially providing knowledge around the construction of biological weapons. The frontier AI labs have taken these risks seriously and most models have very capable guardrails in place to limit this specific form of misuse. There is a second class of models that we generally describe as biological design models. These are not ‘chat bot’ models but instead are complex, highly capable models able to design DNA or protein sequences to accomplish specific scientific or commercial goals.

As an example, the Institute for Protein Design at the University of Washington recently released, as open source and freely available, their RFDiffusion3 model[4] - a model capable of taking as input any molecule of interest and designing a totally new protein capable of binding tightly to this molecule. Tools like this offer incredible opportunities to advance science, but they can also be used to design harmful novel proteins that may not share any similarity with already

[4] https://www.ipd.uw.edu/2025/12/rfdiffusion3-now-available/

known dangerous proteins. This lack of similarity would make it difficult for our biosecurity screening systems to detect the risk of misuse in these orders.

The synthesis industry is excited to see our customers begin to use these tools to push their science forward and solve some of the nation's and world's most pressing challenges. We proudly serve as the transition point to bring these digital designs into the physical world with DNA encoding these novel proteins. We have, in parallel, begun a series of efforts to ensure we understand any risk posed by these models and how to mitigate those risks. Twist recently published work[5] with Microsoft and others evaluating whether applying these models to controlled toxin and viral sequences would result in sequences that could evade our screening systems. The study found that, as of a year ago when this work was conducted, the design tools were not yet capable of reproducing harmful function without including a significant amount of the original pathogen sequence, allowing our screening systems to maintain accuracy in threat detection. The design tools, however, continue to increase in capability, and we believe this will not remain the case for long.

The DNA synthesis industry is investing in efforts to address this future potential risk including working with the National Institute of Standards and Technology (NIST) to develop standardized methods for measuring the accuracy of biosecurity screening systems. This work is empowering an industry-driven effort to move toward third-party verification of our screening systems against regulated threat agents and has been an extremely productive example of the strength of public-private partnership. We look forward to continuing to work with NIST, given the overlap between this screening work and their work on AI standards at the Center for AI Standards and Innovation (CAISI).

[5] https://www.science.org/doi/10.1126/science.adu8578

Additionally, the DNA synthesis industry has worked with the International Biosecurity and Biosafety Initiative in Science, IBBIS, a Geneva-based non-profit, to stand up the Sequence Biosecurity Risk Consortium or SBRC[6]. The SBRC is a consortium of industry, non-government organizations, and academic partners working to develop a shared understanding of the risk posed by specific individual biological components.

We are also working on improving the information sharing interface between the AI design tools and synthesis companies. Our customers use these tools to design the sequences they order from us – but we don't generally witness this biological design tool use directly. Mechanisms like transfer of metadata from an AI design tool to a synthesis provider can help customers to clearly communicate their legitimate intent and can help speed order review and reduce screening and follow up costs for synthesis providers.

While the synthesis industry continues its active push to build new mitigations to the risks posed by biological design models, we do believe the federal government can play an important role in supporting these efforts to prepare for future AI capabilities.

First, we strongly urge Congress to advance legislation that requires gene synthesis providers to screen their orders and verify the legitimacy of their customers to mitigate the risk of the misuse of synthetic nucleic acid sequences. While screening is the standard practice for large synthesis providers around the world, it is important for the United States Government to take a leadership position and establish screening as necessary and non-negotiable. Legislation should apply screening requirements to both gene synthesis providers as well as to

[6] https://sbrc.bio/

manufacturers of benchtop gene synthesis tools. These benchtop tools increasingly enable users to generate synthetic DNA outside of traditional commercial ordering channels. As benchtop capabilities become more accessible and automated, the absence of consistent screening creates a potential gap in biosecurity oversight, even when the vast majority of users are engaged in legitimate research or commercial activity.

Legislation should also task the federal government with an ongoing role in defining 'sequences of concern', those sequences, whether from regulated organisms or not, with a demonstrated connection to functions of concern. This work is well underway in partnership with NIST as a result of administrations making screening a priority for nearly two decades. Given the success of this public-private partnership to date, we believe that the Department of Commerce is best positioned to continue its leadership role and coordinate with other departments and agencies on such efforts. Importantly, we also believe it is imperative that legislation support broad adoption by requiring that federal funds are only used to purchase synthetic DNA from providers that meet federally adopted standards.

Moreover, it is essential that the United States Government act decisively to secure and sustain American leadership in synthetic DNA manufacturing and the development of biosecurity risk assessment tools. Given its use as a foundational product enabling the entire bioeconomy, the National Security Commission on Emerging Biotechnology has highlighted synthetically produced DNA as a key supply chain vulnerability, warning that the first country to scale this technology will secure a significant strategic edge.[7] This assessment is echoed by a recent analysis from the Hoover Institution, which notes that "security starts with competitiveness. If U.S. companies are not the world leaders in building DNA, then users will order DNA

[7] https://www.biotech.senate.gov/wp-content/uploads/2024/01/Biotech-Commission-Dec2023-Report.pdf

elsewhere."[8] Maintaining United States leadership not only strengthens domestic resilience, but also positions the country to shape global standards and drive the adoption of high-quality, trusted biosecurity tools informed by American intelligence and technical expertise. Absent sustained leadership, the United States risks ceding both economic and security advantages to countries that are investing aggressively in this critical domain.

We believe the best defense against model-driven design will also be model-driven to enable the community to answer essential questions about the functionality of AI-designed sequences. To support the country's leadership in this effort, we strongly urge the United States Government to invest in data sets and predictive models to detect when an arbitrary protein sequence or structure is capable of performing a specific biological function known to be harmful. These models themselves pose dual-use risks, and as such the Federal Government is well-placed to safely generate the underlying data sets necessary to build these models and to ensure they are shared broadly but responsibly.

It is important to note that the DNA synthesis industry is a highly global industry, and providing such defensive models only to American companies risks pushing bad actors to use overseas providers that may not have the resources or willingness to screen their orders appropriately. It removes our ability to detect a threat that nonetheless may still be used to harm Americans. Defense against AI-enabled biodesign risk will be strongest when those defenses are shared globally, protecting against misuse no matter the country of manufacture. This again highlights the powerful role NIST can play here, in representing the United States to international standards bodies and setting standards for responsible use of emerging biotechnologies around the world.

[8] https://www.hoover.org/research/biosecurity-really-strategy-victory

In closing, we thank the Subcommittee for its leadership in advancing this critical and timely conversation at the intersection of AI, biology, and national security. We believe this conversation helps to ensure that the United States can both harness the extraordinary benefits of synthetic biology and AI while responsibly mitigating their risks.