

To enable the convergence of artificial intelligence (AI) and biotechnology (AIxBio), policymakers could consider mechanisms that promote innovation while encouraging responsible development and continually assessing future risk. AI models are already transforming the way we use biology to produce pharmaceuticals, food, energy, and chemicals. The rapid advancement of AI used for biotechnology indicates that a breakthrough moment is likely in the near future. Companies in the United States, China, and elsewhere are actively pursuing such a “ChatGPT moment” for biological design tools. The United States must lead in the invention and application of such technologies so that we may realize the enormous benefit of AIxBio and lead in developing international norms for responsible innovation.

This white paper lays out policy options to promote U.S. innovation, provide oversight of AI models for biotechnology, and assess future risk.

Promoting U.S. innovation

Establish infrastructure

Collect and standardize common biological data types:

Congress or the President could establish a central office that would require agencies¹ to coordinate, collect, manage, and store high-quality biological data and encourage wider data availability while protecting privacy and ensuring data security. Such an office would spur innovation by providing researchers and developers access to often-costly datasets. Access to often-costly diverse and high-quality biological data is also a key factor in the race to create a breakthrough moment in AI and biotechnology since all AI models are trained with data.

Dedicate high performance computing capabilities to AIxBio:

Congress could direct an agency such as the Department of Energy (DOE) to build a new, or repurpose an existing, high performance computing cluster specifically dedicated to biotechnology and built with the intention of advancing AIxBio discovery.

Launch a National AI Research Resource for Biotechnology pilot program:

A pilot program could be established through the National Science Foundation (NSF) that provides a safe computational environment for advancing AI research specific for biotechnology. This would be similar to a pilot program that was launched through the White House Executive Order on AI² but would provide infrastructure, models, and data that are specific to biology. This program could expand the current AI pilot program or be established as a separate and parallel pilot.

Establish a national network of cloud labs: Research agencies including NSF and DOE could establish a network of cloud labs across the country where experimental instrumentation for chemistry and biology could be accessed by external researchers. Current cloud labs^{3,4} show that these facilities could provide access to expensive laboratory infrastructure, accelerate the development of AI-enabled autonomous experimentation, standardize data collection, and provide a safe and secure laboratory venue.⁵

Create partnerships

Develop an AIxBio consortium: An agency such as NIST could establish a consortium of stakeholders from government, industry, and academia to share best practices, provide a comprehensive understanding of which groups are funding AIxBio research and development, and increase access to critical data resources related to AIxBio. Similar consortia were established in past defense bills (e.g., the Consortium on Additive Manufacturing for Defense Capability Development)⁵ and the National Quantum Initiative Act (e.g., the Quantum Economic Development Consortium).⁶

Establish an international working group focused on AIxBio:

Congress could pass legislation to create an AIxBio working group within a multilateral body such as Five Eyes. Members have proposed the “Five AIs Act,” which develops an AI working group under the Five Eyes Framework, focused on collaboration to advance AI systems within member countries, implementing intelligence gathering related to AI, and providing ethical frameworks for development.⁷ A specific AIxBio effort

could be included in this legislation or passed as a separate act.

Support innovation

Establish an AI and biotechnology sandbox: Based on the idea of a Quantum Sandbox,⁸ the Department of Defense (DOD) could establish a public-private partnership focused on the development of near-term use cases and pilot demonstrations of AI toward biotechnology for national security applications.

Oversight of AI models for biotechnology

Publish standards for potentially harmful algorithms: Agencies such as DOD, NSF, DOE, and the National Institutes of Health (NIH) and other stakeholders could convene AI developers and scientific journals to create guidance on publishing the computer code from models that have the potential to be used for harm. This group could also establish guidance on guardrails for publicly available AI models that interact with biotechnology. Scientific publishers need to carefully consider what information is made available to the public.

Establish an independent group to conduct flexible risk assessments: Congress could authorize NIST, in consultation with the Intelligence Community (IC), to establish and oversee an independent group tasked with running risk assessments that would be both robust and flexible based on the type of AI model and the specific bio-related risks. Flexibility in oversight is critical because AI models are constantly advancing, which changes the risk profile as it relates to biotechnology. Importantly, such a group would need to be appropriately staffed with experts from academia and industry who understand both biotechnology and computer science. Additionally, such a group should be able to quickly and consistently assess models so as not to create a time-consuming process that might stifle innovation.

Assessing future risk

Initiate a regular intelligence assessment of future AlxBio risks and possible countermeasures: To assess complex future risks related to AlxBio, the IC could conduct annual assessments of emerging possible threats and countermeasures. These assessments would be unclassified, with the possibility of a classified annex,

and performed in collaboration with academia and industry experts. These assessments will provide justification for the establishment of different oversight considerations and could also centralize information from different intelligence agencies related to AlxBio. These assessments would also require that the IC bring in more individuals who are trained in both AI and biotechnology.

Initiate a global competitive analysis focused on AlxBio: The Executive Branch could establish an office to conduct a competitive analysis to assess the state of biotechnology infrastructure and technological advancement in the United States, compared to our strategic adversaries, with a focus on AlxBio. It is critical to understand where the United States stands so that we can appropriately calibrate AlxBio oversight policies to prevent ceding any competitive advantage. Members have proposed S. 1873, which would establish an Office of Global Competitive Analysis to accomplish a similar purpose.⁹

Sources

1. Agencies could include the Department of Defense, the Department of Health and Human Services, DOE, NSF, the Department of Agriculture, and the National Institute of Standards and Technology (NIST)
2. Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence, Sec. 5.2.(a)(i)
3. <https://cloudlab.cmu.edu/>
4. <https://newscenter.lbl.gov/2023/04/17/meet-the-autonomous-lab-of-the-future/>
5. Pub.L. 118-31, Sec. 223
6. Pub. L. 115-368, Sec. 201
7. H.R. 6425. 118th Congress
8. H.R. 2739. 118th Congress
9. S. 1873. 118th Congress

For any questions about this series of white papers, or the AlxBio work at the National Security Commission on Emerging Biotechnology, please contact us at ideas@biotech.senate.gov

Staff at the National Security Commission on Emerging Biotechnology authored this paper with input from the expert Commissioners. The content and policy options in this white paper represent ideas that the Commission is considering as we move toward official policy recommendations.

