NATIONAL ACADEMIES Sciences Engineering Medicine

Health and Medicine Division
Board on Global Health
Forum on Microbial Threats

Charting a Responsible Future in AI & Biosecurity: Understanding Technology Capabilities

Webinar (session 1 of 2)

Pre-webinar questions to consider:

- What do you mean when you use the term "AI"? How do you define the term "biosecurity"?
- What is different about the new AI tools based on foundation models? What are some examples of capabilities that are now achievable and weren't before? How does this change your work?
- What are the increased risks for misuse with these tools? How are you thinking about mitigation or safeguards for these risks?

NOVEMBER 6 | 12:00 – 1:30 PM ET

Purpose

This two-part webinar will bring together technology developers, researchers, and policymakers working at the intersection of foundation model-based artificial intelligence (AI) and biological research for nuanced discussions that explore the impact of these technologies on innovation, potential biosecurity risks, and promising solutions. The first session will examine the technological capabilities and bridge the needs for risk management between developers and policymakers. The second session will focus on governance of these emerging technologies, including challenges in defining regulatory policies as well as approaches in safeguarding against these risks.

12:00 PM ET **Welcome and stage-setting** *(10 min)*

Forum member: Syra Madad (NYC Health+Hospitals)

Moderator: Michael Imperiale (University of Michigan)

- Overall framing: how close are we to achieving a full understanding of the genotype-to-phenotype relationship?

12:10 PM **Panel opening remarks** *(10 min each; c.45 min with buffer)*

Nita Madhav (Ginkgo/Concentric)
Beneficial application of machine learning to develop tools that mitigate biosecurity risks and potential dual-use applications

TBD
Application of foundation models to protein design and implications for biosecurity

Carter Price (RAND Corporation)
Draft framework on control points and addressing risks through each mechanism

Aparupa Sengupta (NTI)
Considering the real vs projected risks landscape in life sciences research, and practical approaches to address each

12:55 PM **Panel discussion** *(30 min)*

Questions to consider

- On innovations/benefits
    - What is the most exciting and realistic potential capability to come in the future? Where are we now and what key steps/developments (particularly around data availability) would still be necessary to get there? What uncertainties/pitfalls exist?
- On risk for misuse
    - What are the true risks for misuse right now or possibly to come? What are the risks for intentional misuse? For accidental misuse? How can we start to dissect the types of risks and how they can be addressed?
    - How do these new technologies lower the threshold for expertise in carrying out potential attacks? (and for whom?)
- What are the necessary data points to inform the development of policy frameworks that balance the innovation and risk considerations?

1:25 PM **Wrap-up: summary of key issues raised** *(5 min)*

Moderator: Michael Imperiale (University of Michigan)

1:30 PM **ADJOURN SESSION 1**

NATIONAL ACADEMIES Sciences Engineering Medicine

Health and Medicine Division
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Charting a Responsible Future in AI & Biosecurity: Enabling Safe Innovation and Governance

Webinar (session 2 of 2)

NOVEMBER 15 | 12:00 – 1:30 PM EASTERN TIME

Purpose

This is the second session of a two-part webinar that brings together technology developers, researchers, and policymakers working at the intersection of foundation model-based artificial intelligence (AI) and biological research for nuanced discussions that explore the impact of these technologies on innovation, potential biosecurity risks, and promising solutions. The first session examined the technological capabilities and bridge the needs for risk management between developers and policymakers. This session will focus on governance of these emerging technologies, including challenges in defining regulatory policies as well as approaches in safeguarding against these risks.

12:00 PM ET **Introduction from moderator** *(5-10 min)*

Moderator: Michael Imperiale

12:10 PM **Panel opening remarks/reflections** *(10 min each; c.45 min with buffer)*

Daniel E. Ho (Stanford University)
What are the risk concerns and challenges from the legal perspective?

Jonas Sandbrink (University of Oxford)
Layered approach to considering policy options, connecting to benchmarks (e.g., functional characterizations of biological applications and tools for their capabilities), and building in evaluations to define the characteristics of the tools

Lynda Stuart (Institute for Protein Design, University of Washington)
Leveraging foundation models for pandemic preparedness, rapid development of countermeasures against emerging threats

12:55 PM **Panel discussion** *(30 min)*

Questions to consider

- What can be regulated?
  - What still needs to be defined to enable further discussions on regulation?
  - How to identify or think about what should or need to be controlled?
- What are approaches that can be taken to think about regulation and safety?
  - Hear from policy, legal, tech, and bio/research perspectives
  - What are pain points in advancing the development of regulatory framework(s)?

1:25 PM **Wrap-up: summary of key issues raised** *(5-10 min)*

Moderator: Michael Imperiale (University of Michigan)

1:30 PM **ADJOURN SESSION 2**

Speaker Biographies

Daniel E. Ho, J.D., Ph.D., is the William Benjamin Scott and Luna M. Scott Professor of Law, Professor of Political Science, Professor of Computer Science (by courtesy), Senior Fellow at the Stanford Institute for Human-Centered Artificial Intelligence, Senior Fellow at the Stanford Institute for Economic Policy Research, and Director of the Regulation, Evaluation, and Governance Lab (RegLab). His scholarship focuses on administrative law, regulatory policy, and antidiscrimination law. Ho serves on the National Artificial Intelligence Advisory Commission, advising the White House on AI policy, as Senior Advisor on Responsible AI at the U.S. Department of Labor, on the Committee on National Statistics of the National Academies of Science, Engineering, and Medicine, as a Public Member of the Administrative Conference of the United States, and as Special Advisor to the ABA Task Force on Law and Artificial Intelligence.

Ho received his J.D. from Yale Law School and Ph.D. from Harvard University and clerked for Judge Stephen F. Williams on the U.S. Court of Appeals, District of Columbia Circuit. He is the recipient of numerous awards, including the John Bingham Hurlbut Award for Excellence in Teaching at Stanford Law School, the Carole Hafner Award for the best paper at the International Conference on Artificial Intelligence and Law, the Best Empirical Paper Prize from the *American Law and Economics Review,* a Best Paper Award at the ACM Conference on Fairness, Accountability, and Transparency (FAccT), the Best Paper Award at the AAAI/ACM Conference on AI, Ethics, and Society (AIES), and the Warren Miller prize for the best paper published in *Political Analysis.*

Michael J. Imperiale, Ph.D., is the Arthur F. Thurnau Professor of Microbiology and Immunology at the University of Michigan. His research focuses on interactions between BK Polyomavirus and human host cells that determine viral persistence and replication. In addition to his research, Imperiale has been engaged in science policy discussions centering around biosafety, biosecurity and biodefense. He is the founding Editor-in-Chief of *mSphere*, and also recently served as Associate Vice President for Research Policy and Compliance at the University of Michigan.

Imperiale received his B.A., M.A., and Ph.D. from Columbia University, and completed postdoctoral training at Rockefeller University before joining the University of Michigan faculty. He has been recognized with numerous honors, including being a fellow of the American Academy of Microbiology and the American Association for the Advancement of Science, and a recipient of the Distinguished Faculty Award and Rackham Distinguished Graduate Mentor Award from the University of Michigan.

Syra Madad, D.H.Sc., M.Sc., M.C.P., serves as the Senior Director of the System-wide Special Pathogens Program at NYC Health + Hospitals and Health and Co-Principal Investigator at the Institute for Diseases and Disaster Management. Her work focuses on emergency management: prevention, preparedness, mitigation, response, and recovery related to infectious disease outbreaks with an emphasis on healthcare and public health biopreparedness. She was the inaugural director of the NYC Health + Hospitals system special pathogens program, maintaining readiness at the nation's largest municipal healthcare delivery system for all communicable infectious disease threats through ongoing training, education, drills, developing protocols, and processes and more. She has responded to multiple infectious disease outbreaks as an infectious disease epidemiologist including Ebola, measles, MPox and Zika.

Madad earned her doctoral degree in health science with a concentration in global health studies from Nova Southeastern University in 2014 , Master of Science in Biotechnology with a concentration in Biodefense and Biosecurity and holds numerous professional certifications, including Advanced Emergency Planning Certification, All Hazard Response (CBRNE) Training for Laboratory Personnel, Infection Control and Prevention Certification, Biosafety Level III Training, and Identification of the Primary Select Agents of Bioterrorism Training.

In addition, Madad is a fellow at the Harvard Kennedy School Belfer Center for Science and International Affairs where she regularly publishes on the latest public health guidance, epidemiological concepts and scientific literature to help the public understand complex topics using infographics and simplified science communication. She's also Core Faculty in the National Emerging Special Pathogens Training and Education Center (NETEC) and affiliate faculty at the Center for Emerging Infectious Diseases Policy & Research at Boston University. She serves as a member of the National Science Advisory Board for Biosecurity (NSABB). Dr. Madad is prominently featured in the Netflix docuseries, Pandemic: How to Prevent an Outbreak, and the Discovery Channel documentary, The Vaccine: Conquering COVID.

Nita Madhav, M.S.P.H., is the Head of Epidemiology & Global Risk Analytics at Concentric by Ginkgo, the biosecurity and public health unit of Ginkgo Bioworks. Previously, Madhav served as Chief Executive Officer at Metabiota, a company that specialized in measuring, mitigating, and managing epidemic risk. Nita has over 15 years of experience in probabilistic modeling and risk assessment. The majority of her experience has focused on monitoring and modeling infectious disease spread and economic impacts to provide actionable insights to commercial entities, governments, and multilateral organizations. Before becoming CEO, Madhav was the Vice President of Data Science at Metabiota, where she established and led the data science and modeling group. Before joining Metabiota, Madhav worked as a Principal Scientist at AIR Worldwide, where she led the life and health research and modeling team. Prior to that, she conducted hantavirus research at the Special Pathogens Branch of the US Centers for Disease Control and Prevention. Madhav holds a BS in Ecology & Evolutionary Biology, with distinction, from Yale University and an MSPH in Epidemiology from the Rollins School of Public Health at Emory University.

Carter Price, Ph.D., is the research quality assurance manager for the Homeland Security Research Division, a Professor at the Pardee RAND Graduate School, and a senior mathematician at the RAND Corporation. He has previously been the codirector of the Center for Scalable Computing and Analysis at Pardee RAND. Some of his major projects include work on the COMPARE microsimulation model to study health care reform, assessments of terrorism risk models, analyses of defense budgets, and studies of acquisition policies. He has also studied predictive policing and assessments of forest fire fighting capabilities. His project leadership experience includes applications of artificial intelligence methods to policy analysis, issues related to immigration data management, studies of the macroeconomic impact of the Affordable Care Act on states, trends in economic inequality, and analytic support for the Commonwealth of Virginia on COVID-19. He has also taught courses on data science and artificial intelligence. Price has submitted testimony to the U.S. Congress and testified in front of state legislatures. His work has appeared in the *Washington Post*, *CNN*, *USA Today*, and the *New Republic*. He has a Ph.D. in applied mathematics from the University of Maryland, College Park, and a B.A. in mathematics and physics from Hendrix College.

Jonas Sandbrink is a biosecurity researcher at the University of Oxford. His current research focuses on the implications of synthetic biology and artificial intelligence for biological security risks. Sandbrink has served as a Biosecurity Advisor to the UK Cabinet Office and Google DeepMind.

Previously, Sandbrink worked with the Future of Humanity Institute, University of Oxford on mitigating risks of emerging technologies and preventing catastrophic biological risks. He was an Emerging Leaders in Biosecurity Fellow at the Johns Hopkins Center for Health Security, an Ending Bioweapons Fellow at the Council on Strategic Risks. He has interned at the German Parliament and has worked as a consultant for the Nuclear Threat Initiative's Global Biological Policy and Programs team. Before focusing on security aspects of emerging technologies, he researched platform vaccine technologies and infectious disease epidemiology. Sandbrink was part of the winning team of the 2020 Next Generation for Biosecurity Competition. He holds a bachelor's degree in medical sciences from the University of Oxford and is pursuing a DPhil (PhD) at Nuffield Department of Medicine, University of Oxford.

Aparupa Sengupta, Ph.D., M.S., M.Sc., serves as a Senior Program Officer for NTI's Global Biological Policy and Programs team (NTI | bio). In this role, she supports the Biosecurity Innovation and Risk Reduction Initiative (BIRRI) to reduce risks of biotechnology catastrophe. This includes efforts to advance the International Biosecurity and Biosafety Initiative for Science (IBBIS), a new international entity NTI is launching to safeguard science and reduce the risk of catastrophic events that could result from deliberate abuse or accidental misuse of bioscience and biotechnology.

Sengupta is an accomplished scientist and global health security practitioner with more than 15 years of research, regulatory, and training experience across the fields of infectious disease containment, biosafety and biosecurity, and global biological risk reduction. Prior to joining NTI in 2022, she served at the University of California (Merced campus), where she initiated and led their biosafety and biosecurity programs, first, as the campus biosafety-biosecurity officer since May 2018 and then as the Assistant Director for Environmental Health and Safety and Director of High Containment Research Laboratories. From the start of the COVID-19 pandemic, she served as the COVID-19 response subject matter expert at the institution's Emergency Operation Center. Prior to 2018, Sengupta was a Biosafety Officer at Rutgers University, where she managed an Institutional Biosafety Committee that reviews biological risks related to infectious disease and recombinant DNA research, and she led multiple projects related to CRISPR/Cas9 and other emerging technologies and their potential implications in the biosafety-biosecurity realm.

Sengupta is an active member of American Biological Safety International (ABSA Int.), where she plays key leadership roles in multiple committees; to highlight- Chair, Publications Committee and Co-Chair, International Engagement Committee. She also teaches pre-conference courses in the field of gene editing and related to other emerging technologies, and she has been invited to give many talks in the U.S. and internationally, advocating for the safe and secure use of emerging recombinant technologies in the evolving field of biosciences.

Sengupta holds a Ph.D. in Microbiology & Applied Biochemistry and M.S. in Molecular Genetics and Biotechnology from Michigan Technological University and a M.Sc. in Biotechnology from Bangalore University, India. Sengupta is also a Registered Biosafety Professional (RBP) with ABSA International.

Lynda Stuart, M.D., Ph.D., is Executive Director of the Institute for Protein Design (IPD) at the University of Washington School of Medicine. Stuart is a physician, scientist, and advocate for healthcare as a human right. She brings to the IPD over 20 years of experience in immunology, global health, and product development. As Deputy Director of the Gates Foundation from 2016 to 2022, she oversaw the development and distribution of vaccines, biologics, and antibody therapies to address urgent global health challenges. Notably, Stuart led the Foundation's COVID-19 discovery and translational vaccine response efforts, managing a large portfolio of COVID-19 and pan-coronavirus vaccine candidates. During this time, she collaborated closely with the IPD to guide the development and approval of SKYCovione, the IPD's royalty-free vaccine for COVID-19.

Stuart holds a PhD from the University of Edinburgh and an MD from the University of Cambridge and the University of London. She has served on the Massachusetts General Hospital Executive Committee for Research and as an affiliate of the Broad Institute of Harvard and MIT. Since leaving the Gates Foundation, Stuart was the Vice President of Infectious Disease at the mRNA company BioNTech. Stuart now holds a faculty appointment with the Department of Biochemistry at the University of Washington School of Medicine.