

The Impact of Emerging and Converging Technologies on Biosecurity and its Education: Workshop Report

In October 2025, the London Metropolitan University Biological Security Research Centre (LMU BRSC) held a hybrid workshop under Chatham House Rules to explore the current and future real-world implications of emerging technologies on the field of biosecurity with a view as to how best to create biosecurity educational materials that are timely and future-proof.

The workshop aimed to explore the impact of emerging and converging technologies—including synthetic biology, artificial intelligence, neurobiology, mirror biology, and related scientific innovations—to identify how these technologies reshape the risk landscape and affect the future of biosecurity education. This workshop forms part of a two-part initiative. A subsequent workshop will focus specifically on teaching methodologies, curriculum design, and evaluation frameworks, culminating in the development of a comprehensive textbook on biosecurity education.

Professor Lijun Shang, founding director of the BSRC, chaired the event. The workshop emphasised that new thinking and approaches are required to address the continuing problems on achieving biosecurity education and implementing the Tianjin Biosecurity Guidelines, particularly in relation to an evolving risks landscape. Speakers were given three fundamental questions to consider in their presentations and as the underlying basis for discussions:

1. What are the key advances, how impact biosecurity and how best can biosecurity education be shaped to engage life sciences?
2. What other fields of research are there besides those we are considering already that should be covered?
3. Is it sufficient for individual chapters or do we need an overall framework for the book?

Following introductory and welcome sessions, the workshop featured two substantive sessions: first on Current Concerns of advanced sciences and technologies on Biosecurity and its education and the second on Future Concerns (Governance and education). The workshop concluded with a robust discussion session.

Presentations explored measured assessments of evolving risks and governance challenges posed by advances in synthetic biology, genome editing, gene synthesis, neurosciences, bioinformatics, digital sequence information (DSI) and the role of artificial intelligence in protein, virus and microbial design, vaccine development, pathogen detection, data analysis and threat assessment. Participants also discussed the uncertainty surrounding potential risks

and timelines associated with mirror biology. Barriers to AI-enabled biological design were explored as well as a realistic assessment of the current state-of-play and necessary indicators to the lowering of barriers discussed. Advances in AI and the potential such tools hold for lowering technical barriers such as large language models (LLMs) and the risks associated with a lack of robust safeguards were discussed, and much focus was given to overall emphasis on the need for sober risk evaluations that pay attention not just to new risks, but also to the impact of the evolution of current technology. With this in mind, speakers emphasized the need for flexible and adaptive educational frameworks that can evolve alongside technological change.

The workshop also broadened its scope beyond scientific and technological developments to consider underlying risks at the foundation of the risks posed by chemical and biological weapons. Speakers discussed the value neutrality of scientific and technological tools such as AI within themselves and drew attention to the key aspect of human motivations and intentions that could fuel misuse and create fears. Challenges for efforts to prevent the misuse of biology should take into account perceptions of utility (and how advances might affect these), potential avenues of overcoming barriers and circumventing controls, creeping legitimization where gradual unchecked activities blur the line between what is prohibited and what is permissible, and who the potential actors are that could diverge from the norms preventing the misuse of the chemical and life sciences and technologies. In this sense, it is crucial to take a behavioural approach to biosecurity education that emphasises a culture of responsibility and responsible science.

Workshop Highlights

The workshop examined the technological and conceptual implications of converging technologies for biosecurity education, both now and in the future. Speakers encouraged participants to consider not only whether a tool is used, but how its availability and design influence choices, open opportunities, or justify actions. This behavioural perspective reframes responsible science as an understanding of context—how research fits into and impacts the broader world.

Throughout the workshop, several key themes emerged:

- Intent over technology – the core concern lies in motivation and purpose, not merely in the tools themselves.
- Rethinking risk – challenging assumptions that technological utility equates to mass lethality.
- Amara’s Law – a reminder that “we tend to overestimate the effect of a technology in the short run and underestimate it in the long run,” underscoring the need for balanced governance approaches.
- Bridging gaps – particularly between laboratory practice and education, and between policy and implementation.
- Multi-dimensional approaches – recognizing that civil society, education, and local initiatives can advance responsible behaviour and risk awareness without waiting for formal arms control agreements.

- Dual-use understanding – the need for clear criteria and shared understanding of what constitutes dual-use research.
- Human element – sustained focus on the actors, activities, motivations, and intentions that ultimately determine outcomes.

Conclusion

The workshop underscored that effective governance of emerging technologies depends on integrating technical vigilance with human-centred responsibility. While technological progress will continue to reshape the risk landscape, the participants emphasised that cultivating ethical awareness, adaptive education, and behavioural understanding will be critical for maintaining biosecurity and the norm against the use of CBW. Biosecurity education should evolve in tandem with scientific and technological change, ensuring that researchers, educators, and policymakers remain attuned to new forms of risk and responsibility.

More information

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