Addressing Biosecurity Risks in Private Laboratories and Biological Supply Chains

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In November 2025, a doctor from Hyderabad with access to laboratory materials was investigated for his alleged attempt to manufacture ricin out of his personal residence.[1] Ricin, a biological toxin derived from castor beans, is defined as a category B bioterrorism agent by the US Centers for Disease Control and Prevention (CDC).[2] The investigations found castor materials and laboratory equipment from the premises. The incident highlighted the broader problem of how access to laboratory materials and knowledge can be weaponised when controls are not in place. This case clearly revealed issues of existing biosafety, where biological agents and toxins may impact populations through unintended externalities, such as leaks or mishandling, and biosecurity, where such agents are actively deployed to harm targets by malicious actors.

Such cases are not limited to India, nor are they rare. In 2018, German authorities found Sief Allah H in Cologne, Germany, who had reportedly acquired castor beans and researched methods for producing ricin within a residential setting.[3] In 2020, Pascale Ferrier, a Canadian national, produced ricin in her home and mailed ricin-laced letters to the then United States President Donald Trump and law enforcement officials in Texas.[4] Both these cases demonstrated how relatively accessible biological toxins and publicly available technical information can be weaponised by individuals operating outside formal scientific institutions.

These examples should not be interpreted as evidence that private laboratories, instruments, and biological agents are inherently dangerous, or that scientific openness itself is a threat. The issue is governance, or rather, a lack of governance in critical areas.

Governance of Labs and Materials in India

India's biotechnology and diagnostics sectors have expanded rapidly over the past 5 years.[5] Private pathology laboratories now perform functions that were once concentrated within government institutions and large research centres. These labs handle infectious samples and biological materials, conduct molecular diagnostics, and increasingly operate with sophisticated testing capabilities.[6] This expansion has improved healthcare access and research capacity, but has also created a regulatory gap being discussed. Unlike the countries mentioned above, oversight mechanisms for private laboratories in India remain fragmented and heavily dependent on voluntary compliance.[7]

Currently, laboratory biosafety in India is dispersed across multiple ministries, agencies, and guidelines, including the Department of Biotechnology (DBT)[8], which acts as the de facto agency overseeing biosafety, biosecurity and biotechnology innovation; the Indian Council of Agricultural Research and Biosafety[9], which goes beyond human biosafety and biotechnology and adds risks that may include animal exposure; and

environmental regulations under the Environment Protection Act.[10] Private-sector labs must be authorised by the National Accreditation Board for Testing and Calibration Laboratories (NABL), which is limited to accreditation. This dispersed governance results in uneven safety enforcement.

This problem becomes more significant when viewed in the context of global biosecurity concerns. The Biological Weapons Convention (BWC) imposes obligations on states to prevent the misuse of biological materials. Compliance with these conventions, especially considering private pathology labs and private access to biological materials and knowledge, is not limited to military controls and border monitoring. It also requires domestic governance of laboratories, research institutions, supply chains, and scientific exchange networks. With India lacking a single oversight authority and excluding private-sector labs from the process that government labs and biosafety labs are required to undergo, enforcement of the BWC becomes superficial.

Governance Gaps and Recommendations

India has relevant regulatory guidelines on certain issues, but their implementation is patchy, especially in the private sector. Systems of laboratory accreditation, including NABL certification, emphasise technical proficiency and diagnostic expertise. A broader strategy for biosafety regulation is necessary to tackle the biosecurity cases as identified above. Laboratory facilities working with infectious or hazardous biological substances must be integrated into systems characterised by standardised inventories, chain-of-custody documentation, compulsory biosafety training, and periodic audits.

One gap in Indian governance is the lack of a standardised incident-reporting system for laboratory incidents. Such a framework was originally introduced in 2013 through the establishment of the Biotechnology Regulation Authority of India Bill (BRAI Bill)[11]; however, the bill lapsed and was not reintroduced. India has since lacked a central authority to oversee biosafety and biosecurity. Zavaleta-Monestel *et al.* noted that lab-associated infections and containment breaches are also often underreported.[12] A lack of mandatory and standardised reporting protocols makes it difficult for regulators to pinpoint vulnerabilities and institutional weaknesses.[13]

Another aspect involves the increased availability of biotech and scientific tools. In most cases, it is good to share scientific knowledge.[14] But this discussion is further complicated by the emergence of AI-driven chatbots, which make this type of knowledge easily accessible to untrained professionals or malicious actors.[15] Discussions about international biosecurity have shifted their focus towards dual-use research, which means conducting scientifically justified experiments that may have harmful applications. Globally, the focus on governance has begun to evolve, given the risks posed by dual-use research involving pathogens, toxin enhancement, and transmissibility.[16] In India, risk assessment mechanisms remain underdeveloped, particularly among private entities.

There should also be a greater focus on supply chain control. Biological agents and laboratory equipment can be legally purchased for various uses. Controlling these purchases does not mean placing limits on legitimate scientific trade, but implementing better controls when such purchases are made. While the Directorate General of Foreign Trade (DGFT)'s Export of Special Chemicals, Organisms, Materials, Equipment and Technologies (SCOMET) list under the Ministry of Commerce and Industry already covers the trade and transfer of such materials, there is a gap in overseeing domestic purchases, which can be out of the norm or outside of a regulated amount. The Hyderabad, Canada and Cologne ricin cases demonstrated how materials with legitimate industrial or agricultural uses can become part of improvised toxin production efforts.

While the BRAI did lapse, and these gaps exist because of the fragmented nature of the biosecurity and biosafety governance, there are a few ways that can address the oversight gap that can be implemented under existing government agencies, such as the DBT, as discussed:

1. Implement the National Biosecurity Procurement Monitoring Program

India must develop a centralised system to monitor biosecurity-related procurements of biological agents, chemical precursors, and specialised lab equipment. Instead of placing unnecessary bans on commercial transactions involving scientific products, the system must target atypical purchases, bulk buying, and dangerous combinations of materials. Supplier firms, dealers, and laboratory companies can be asked to retain purchase documentation and report suspicious procurement activities to competent regulatory agencies. Integration of information technology monitoring programs with established regulatory bodies, such as the DBT, and state-level health departments, will ensure preventive surveillance without stifling legitimate science and industry.

2. Develop Risk-Based Laboratory Licensing

The NABL must expand its licensing program to accommodate different levels of security and monitoring based on the types of hazardous biological materials, toxins, or dual-use capabilities possessed by each laboratory. Compliance procedures and requirements must differ. For example, labs handling hazardous biological materials or toxins must meet stringent safety standards, including regular biosafety audits, personnel reliability screening, and a mandatory incident reporting system.

3. Ensure Mandatory Inspections and Compliance Reviews of Private Pathology Labs

The regulatory agency that monitors private pathology labs must conduct periodic inspections that focus specifically on biosafety and biosecurity compliance. Inspections must review practices for the storage and transport of infectious materials, stock records of dangerous biologicals, waste disposal, staff biosafety training, and electronic records management to prevent leaks that could be exploited by malicious actors. In addition, any lab that works with high-risk pathogens or other biological agents must undergo periodic surprise inspections and third-party biosafety reviews. This would eliminate regulatory discrepancies across the country's burgeoning private diagnostics industry.

India's biosecurity strategy thus needs to move beyond being reactive. An arrest after the crime has been committed is not an alternative to effective systems of governance that focus on prevention. This requires institutional robustness, which entails a clear licensing structure for facilities handling potentially dangerous biological material, personnel screening when required, biosafety audits, and secure databases.

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