Taking stock of the biosecurity landscape

Storage & Computing with DNA

June 2025





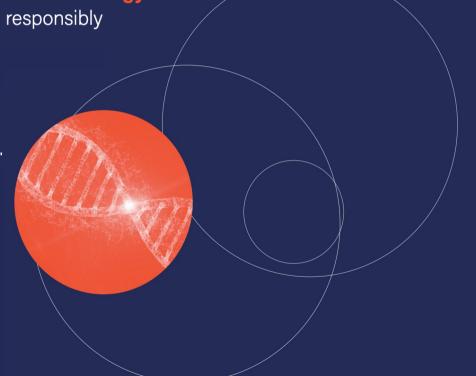
Safeguarding modern bioscience and biotechnology so it can advance and flourish safely and responsibly

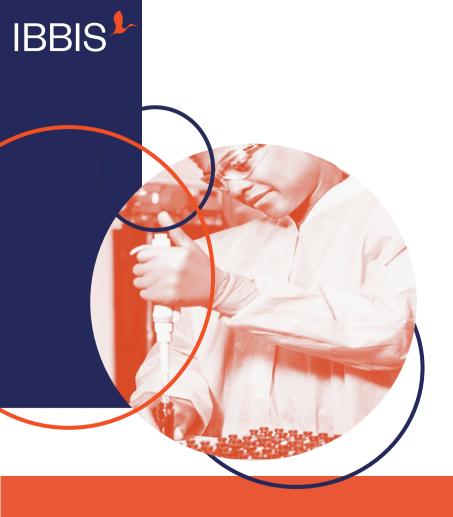
IBBIS works with global partners to strengthen biosecurity norms and

develop innovative tools to uphold them.

Our work helps reduce the risk

of catastrophic events that could result from deliberate abuse or accidental misuse of bioscience and biotechnology.





IBBIS initiatives



Common Mechanism

A free, open-source, globally-available tool for synthesis screening

The Common Mechanism helps providers of synthetic DNA and RNA to effectively screen orders to prevent synthesis technology from being exploited. We provide free, distributed, open-source, automated software for screening sequences of nucleic acids (including DNA and RNA) as well as resources to facilitate customer screening.



Onboarding

Is the customer legitimate (i.e. a member of the scientific community)?

Ordering

Any **red flags in order details** (e.g. shipping address, payment, device authorization)?

Is the **customer legitimate**? (reverify periodically)

Biorisk Screening

Is the order for DNA or RNA sequences that pose a biorisk?

Follow-Up

Does the customer have a legitimate use case and appropriate oversight?

No biorisk flags

Fulfil Order

Biorisk flags

cleared

Questions remain

Deny and Record





International standards initiative

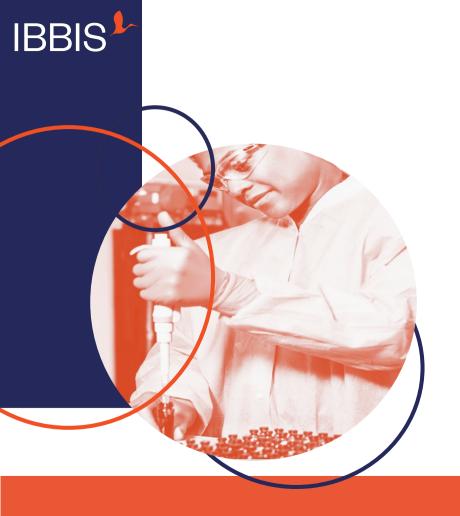
Existing guidelines provide an essential framework for DNA synthesis screening, but gaps remain in its practical implementation, especially concerning biosecurity



International Screening Standards

Supporting common international standards for DNA synthesis screening

IBBIS seeks to support standards for DNA synthesis screening that are international, inclusive and rigorous. There has been increasing interest in harmonizing and standardizing screening approaches around the world, especially in light of national and international guidance released in 2024 and concerns that advances in artificial intelligence will increase the risk that synthetic nucleic acids are misused. By promoting and enhancing emerging standards, we aim to prevent fragmentation of synthesis screening methodology while improving baseline practices.



The Growing Role of Synthetic NA in the Bioeconomy & Biosecurity



Growing Role of Synthetic NA in the Bioeconomy

- Data storage, diagnostics, biomanufacturing increasingly rely on synthetic DNA/RNA
- Access to synthesis tech is becoming cheaper, faster, and more decentralized
- Researchers and clinicians routinely order or print custom sequences
- Opportunity and risk are expanding in parallel



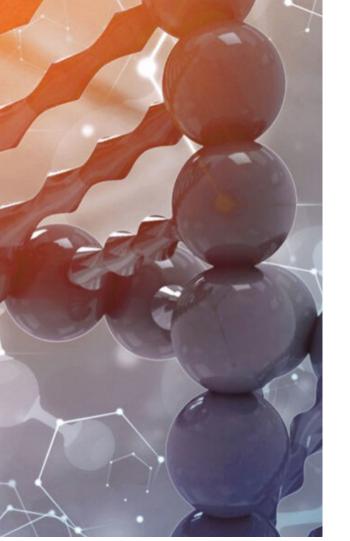
Biosecurity Risks of DNA based computing

Vast volumes of synthetic DNA are being created

Risk of unintentionally creating harmful sequences

Existing biosecurity practices are inconsistent and voluntary

Biosecurity challenge of DNA computing: the sheer scale of what we are working with necessitates a robust strategy to ensure that every combination we produce remains safe

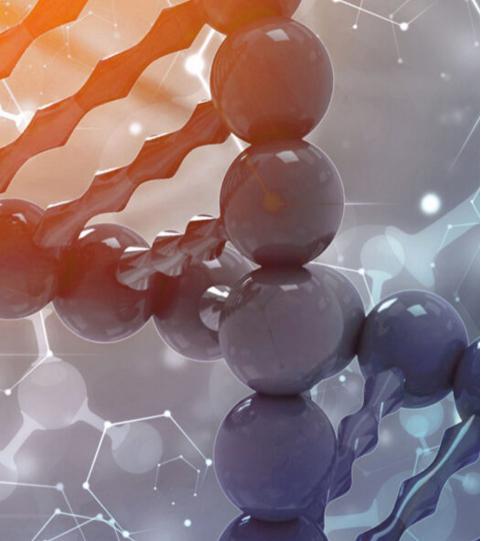


The screening gap

- No global requirement to screen synthetic NA orders
- Some companies screen voluntarily e.g. IGSC

Lack of enforcement creates:

- Security gaps
- Uneven playing field for responsible actors
- Risk of screening evasion by malicious actors



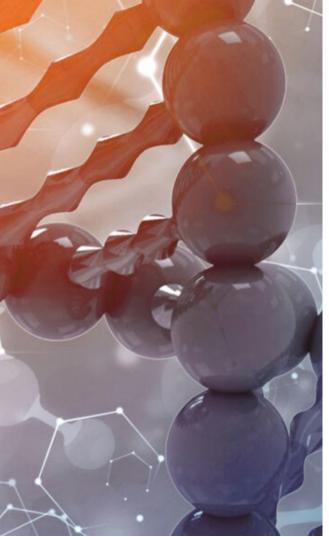
Why this matters

Inconsistent screening practices

Regulatory gaps

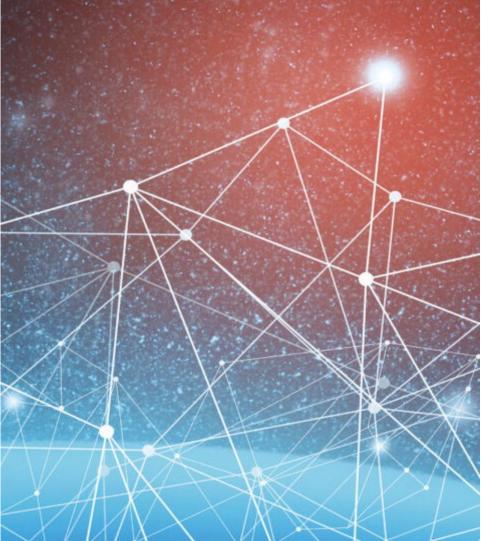
Challenges in international coordination

Limited oversight of emerging technologies



Snapshot of Regulatory Developments

Jurisdiction	Policy/Initiative	Year
USA	HHS screening guidance	2023
USA	OSTP framework	2024
USA	EO on safety & security of Bio research	2025
UK	NA screening guidance	2024
NZ	Gene Technology Bill	2025
EU	Biotech Act + EP report	2024- 2025



International standards & guidance

WHO (2022): Global guidance for responsible life sciences use

ISO 20688-2 (2024):

Technical and quality standards for gene synthesis

Dedicated section on **biosecurity** requirements

These tools support harmonization — but uptake varies





ISO 20688-2 on Nucleic Acid Synthesis:
Section 6 Biosafety & Biosecurity
Requirements







Deep Dive:

ISO 20688-2

- Uniform general guideline for the quality control of gene fragment, gene and genome synthesis
- Scope: double-stranded DNA & providers
- Sequence (50bp) & customer screening: overview of expected screening but few details
- Lab biosecurity & cybersecurity



Evaluating and strengthening biosecurity dimensions of ISO 20688-2

Developing **supplementary guidance** for double-stranded DNA producers

Facilitating **international workshops** to build consensus

Mapping **supplier practices** & promoting global adoption of screening tools



Bridging science & security

Mission: Strengthen biosecurity norms and tools globally

Independent, international initiative

Multistakeholder approach

Governments

Companies - IGSC

WHO

BWC/ISU

Standards bodies - ISO

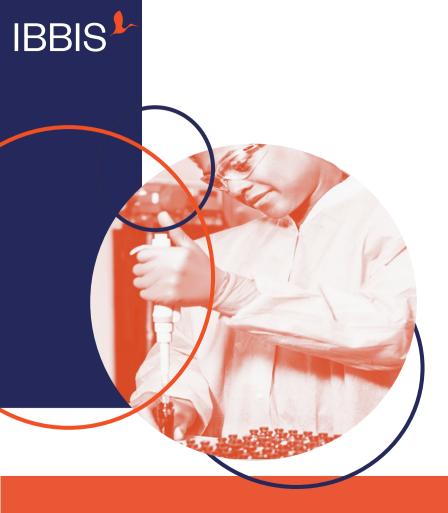
IEGBBR

WEF

OECD

Global Health Security Agenda – APP3

EU institutions



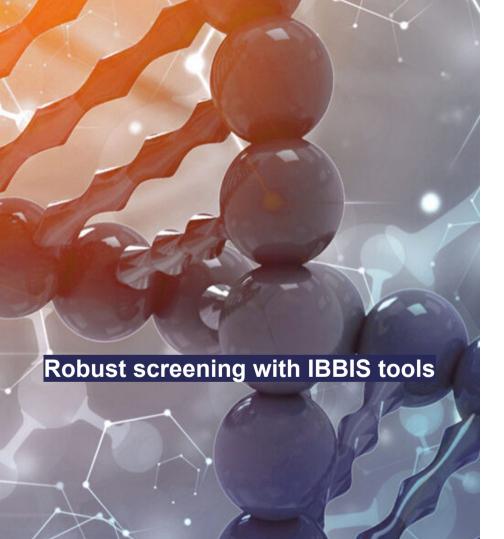
Case study



CATALOG's "Clean Library"uses rigorously pre-screened 30–50 base pair DNA components, similar to an alphabet system (26 letters → 600,000+ words).

These components are certified biologically safe, allowing unlimited combinations without repeated screening.

This safe-by-design approach aligns with US guidelines and reduces bio-risk at scale.



CATALOG uses the IBBIS-developed Common Mechanism, an open-source software suite.

Sequences are screened against four international risk databases for known pathogens and toxins.

Future encodings remain compliant with current IBBIS standards, with automatic updates as new threats emerge.





Call To Action Building a safe Bioeconomy

Engaging scientists, industry leaders, policymakers - the bioeconomy is a collaborative endeavour, transcending borders and disciplines

Establishing global standards & enforcement mechanisms

Ensuring incentives align with long-term public good

Thank You!

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