

Written evidence submitted by Biosecurity Research Initiative at St Catharine's College (BioRISC), Cambridge

About BioRISC

The Biosecurity Research Initiative at St Catharine's College uses an innovative combination of research methods to generate, collate, and assess evidence across the different domains of biosecurity.

1. Executive Summary

This submission addresses the topic of the role of the private and academic sectors in supporting Government biosecurity objectives.

Key points include:

Academic and Private Sectors' Role in Supporting and Informing Policy and Action

- There is a good basis to build from in several areas where constructive relationships between Government, academic and private sectors have developed over time around shared objectives.
- These relationships serve to strengthen the UK's global links and international partnerships through connection to academic and private sector networks and their international activities.
- Attention is needed to challenges to sustaining these relationships over coming years and to actions Government can take to further support them.
- An enhanced coordination role for biosecurity across Government with a clearly identifiable focal point for engagement with academic and private sectors will be of considerable value in addressing such challenges.
- All sectors can benefit from enhanced capacities through collaboration, for example in foresight and horizon scanning activities.
- Significant value can still emerge from interactions with the academic and private sectors when they are not (fully) supportive of Government objectives; where, for example, specific objectives may be misaligned with practice, engagement with these sectors can have value in informing change in objectives. This emphasises the importance of early and sustained engagement with these sectors.
- It is important to be alert to potential tensions between objectives, and differential levels of support for them. The intersection between the Biological Security Strategy and industrial and economic strategy is a particular area to consider.

Aligning Biosecurity Practice in Academic and Private Sectors with Government Objectives

- Another important area of consideration is the extent to which practice in the academic and private sectors is aligned with Government biosecurity objectives. In this regard:
 - There is scope for further improvement of biosecurity practices.
 - It is widely acknowledged that the rapid pace of advance in the life sciences and associated technology sectors is outpacing development of policy, regulatory and other responses. This presents on-going challenges for keeping biosecurity practices aligned with Government objectives as the technologies and the context in which they are applied change.
 - The private and academic sectors provide supportive capabilities for identifying and addressing new biosecurity vulnerabilities. As technologies converge in transformative ways, additional fields of expertise need to be effectively engaged in existing networks and processes.
- There is an important coordination role that Government can play in support of initiatives that address these challenges, and each of these points are pertinent within the UK, in its work with international partners and in its global capacity building efforts.

2. Academic and Private Sectors' Role in Supporting and Informing Policy and Action

A good basis to build on in many areas

2.1 In several areas, productive relationships have been established between Government and the academic and private sectors in support of shared biosecurity objectives. There is substantial scope to learn from these experiences and disseminate good practice. The Biological Security Strategy highlights some examples including the UK Public Health Rapid Support Team and the Preventing Biological Threats educational materials.

2.2 Another good example of productive engagement has emerged from the long-standing cooperation between academia, civil society and the Government in support of the Biological and Toxin Weapons Convention (BTWC). The UK has been one of the leading proponents of an enhanced science and technology (S&T) review capacity within formal BTWC processes. In support of this work it engages with other countries and communicates regularly with academic and civil society groups

working towards the same goal. Until formal change is achieved, these groups are working together to convene expertise to identify relevant advances and provide information about these to the international community. This includes UK working papers and background documents for BTWC meetings, and complementary efforts of academic and civil society groups, including work led by science academies [1]. These efforts have added value in reaching parts of the scientific community not actively engaged with BTWC processes, informing them about areas of concern, and about their role in supporting biosecurity within their practice.

2.3 Recommendations:

- Government can support additional learning from these, and other, examples to enhance practice in engagement, coordination and partnership with the academic and private sectors. It will be worth establishing the extent to which such learning is currently shared; mechanisms used for this; and whether there has been any systematic identification and documentation of examples (including those that have not worked well). Where possible, this information should be shared beyond Government.
- It will also be worth establishing the extent to which constructive relationships are based on the efforts of a small number of individuals and how continuity may best be ensured where this is the case.

2.4 Other challenges to the establishment and continuation of such relationships include concerns about capacity.

2.5 Building and maintaining such relationships and initiatives requires time, effort and resourcing from all parties, and for each their capacity for such commitments may depend, for example, on their institutions' view of the value of such work, their ability to source specific resourcing for it, and their ability to demonstrate its value among other career requirements. Within Government this will require sustained buy-in and support from senior levels. Having forms of accountability for sustaining such efforts within overall implementation of the Biological Security Strategy will be important.

2.6 For those working in academia, institutional and sector structures and incentives are often misaligned with such efforts [2]. There is still significant siloing of academic expertise across different areas of biological security; this extends to an absence of a shared understanding of the term 'biosecurity'.

2.7 Research impact is still frequently understood in narrow ways and requires such particular types of evidence that contributions to such work are not sufficiently recognised and are easily crowded out by more highly recognised activities. While

fundors and institutions have in principle improved their support for interdisciplinary and policy-oriented research in recent years, this has been slow to change practice.

2.8 The private sector is likely to experience similar challenges around institutional buy-in, misaligned career incentives, etc.

2.9 The related matter of funding of such efforts also needs attention. Much of the work (including the examples in paragraphs 2.1 and 2.2) is not sustainably funded. Few of the groups involved have the internal capacity to support such work and rely on external funding. (This includes not only academic groups, but also recent biosecurity work by science academies.)

2.10 Reliance on external funding sources can be problematic. Funder interest in particular topics will not necessarily be sustained over time and their priorities will not always align with Government objectives, or the research topics that might otherwise be prioritised.

2.11 There are likely to be similar challenges associated with sustainability of resourcing for international biosecurity-related capacity building efforts.

2.12 Recommendations:

- Government should continue its work with UK Research and Innovation (UKRI) and academic institutions to enable change to structures and incentives that establish long-term engagement with policy-making as a legitimate and highly valued component of academic careers.
- More specifically, work that might be done in the context of the Biological Security Strategy, could include partnership between Government departments and UKRI in priority research areas, and additional support for engagement and interaction activities.
- There are some positive examples to build on including: the knowledge exchange work of the Partnership for Conflict, Crime and Security Research [3]; and the Parliamentary Office of Science and Technology / UKRI Policy Internship Scheme [4]. The new Defra Systems Research Programme may also provide a useful model [5].
- Through its increased biosecurity coordination work, Government will be able to gain further insight into different areas of biosecurity and priorities within and between them, alongside knowledge of which of these areas most needs engagement with external expertise and research capacity. Communicating these insights to research councils and other funders should highlight potential gaps and could promote a more effective balance in funding across the many areas of biosecurity relevant research. It could help

reduce duplication, identify areas for productive funding partnerships, and ensure there is a sustainable community of expertise to draw on across Government biosecurity objectives and priorities.

Enhanced Capacities through Collaboration

2.13 In support of biosecurity objectives, Government, the academic and private sectors can each benefit from enhanced capacities through collaborative work or simply by drawing on complementary efforts in the other sectors, for example in horizon scanning for future biological risks. There is cross-government work coordinating horizon scanning and foresight activities, with regular meetings of heads of horizon scanning across departments and agencies [6] and supportive activities within the Government Office for Science [7]. There are also examples of biosecurity-relevant horizon scanning and foresight in academia [8] and by science academies [9].

2.14 The results of some of these efforts are easy to access, but awareness across different sectors and fields of biosecurity about the range of activities is likely to be low. It is, for example, difficult to get an external overview of biosecurity-relevant Government foresight and horizon scanning activities. Similarly, there is no easy way to find out about the range of such activities occurring outside Government. There is substantial scope for improving the visibility of such work. Better information sharing could help reduce duplication of effort and access to a range of outputs from these activities could assist identification of more plausible scenarios.

2.15 Recommendation:

- The impact of biosecurity-relevant foresight and horizon scanning activities could be enhanced through systematic information-sharing efforts. For example, through creation of a web-portal providing summary information about such efforts and links to their outputs. Including information on the methods used in the different exercises will have value, enabling comparisons, replicability, and understanding of robustness.

Potential Non-Alignment with Government Objectives

2.16 While the overall objectives of the Biological Security Strategy – understand, prevent, detect and respond – have broad support from the academic and private sectors, these sectors will not always be supportive of more specific Government biosecurity objectives. In some cases, their role may be more valuable in examining the evidence and reasoning for, and informing change in, objectives and activities based on them – for example where they are unlikely to achieve intended goals, or

are misaligned with scientific practice (see, for example, concerns expressed by the Wellcome Trust in relation to the impact of the Nagoya Protocol on capacity to respond to global disease outbreaks [10]).

2.17 Where more specific biosecurity objectives intersect with broader Government objectives, it is worth being alert to areas of potential tension, and areas in which there may be differential levels of support. Being aware of where these could arise and being open to discussion around these tensions could help to maintain trust in relationships between Government and these sectors.

2.18 An area in which this may be particularly challenging is at the intersection of biosecurity and industrial and economic strategy. Within UK bio-industries there may be good individual and sector practice in and contributions to biosecurity, but biosecurity is not incorporated in relevant industrial and bio-economy strategy. In contrast to the extensive coverage of the needs of bio-economy and industry in the Biological Security Strategy (particularly in Section F), biosecurity considerations are absent from both the 2017 Life Sciences Industrial Strategy [11] and the 2018 National Bioeconomy Strategy [12]. This is particularly problematic because this is an area in which there is already (perceived) tension between security and innovation drivers.

2.19 Recommendations:

- Government should recognise the value of engagement and collaboration with academic and private sectors even, and perhaps particularly, when they aren't supportive of Government objectives. Early and sustained engagement can have significant value when developing more specific objectives and designing and implementing policies based on them.
- Areas of potential tension between specific biosecurity objectives and broader Government objectives should be identified so that work can be done to improve coordination, and encourage coherent approaches towards biosecurity across sectors and Government, while leaving sufficient openness to dissenting views.

3. Aligning Practice to Government Objectives

3.1 Another important area of consideration is the extent to which practice in the academic and private sectors relevant to biosecurity is aligned with Government objectives.

Need for Further Improvement in Biosecurity Practices

3.2 There is generally a good, cooperative relationship between the UK's high containment laboratories and HSE as regulator, and the recent formation of the Biosafety Strategic Leadership Group should support further learning opportunities within this sector. There will continue to be scope for improvement and a need to avoid complacency. The capacity to learn from accidents and near-misses is essential.

3.3 Recommendation:

- While some information on such incidents might need to be withheld, for example because wide knowledge of a vulnerability would itself be a biosecurity risk, this needs to be balanced with sufficient sharing of information across Government, academic and private facilities so that avoidable safety failures are not repeated. This can usefully extend to information about methods for evaluating the impacts of any changes to practices and procedures following incidents.

3.4 In addition, across UK laboratories and research institutions there remains a lack of awareness, education and training around the potential for misuse of biology and associated technologies and of responsibilities and routes to addressing this challenge [13]. Such education will support the Strategy's aim for those working in industry and academia to contribute to addressing risks of insider threats and securing hazardous materials against misuse. The latter needs to extend to hazardous information and data.

3.5 Recommendation:

- Further work is needed by Government in collaboration with partners to move to widespread implementation of biosecurity education and training, which provides understanding of responsibilities to secure research against misuse, and the ways in which such responsibilities can be fulfilled.

Keeping Practice Aligned with Government Objectives as the Context and Technologies Change

3.6 Keeping scientific practices aligned with biosecurity objectives faces further challenge in coming years and new responses need to be developed for a changing context of practice. The Biological Security Strategy does not address concerns around the movement away from traditional institutional settings that is becoming possible for increasingly advanced biology, and about the implications this has for both the safety and security aspects of biosecurity.

3.7 Over the next few years, it is likely that activities in non-traditional spaces (e.g. DIY-bio laboratories) will remain easy to monitor and closely aligned with practices in more traditional settings. This is the case, for example, because most of these laboratories in the UK are closely connected to universities, incorporate similar biosafety standards, and don't work with organisms that require measures above biosafety level 1 (see, for example, policies of the Cambridge Biomakespace [14]). This will not necessarily be the case over the longer-term.

3.8 There are some areas of scientific and technological advance for which existing biosecurity-relevant regulation isn't a good fit, for example where some characteristics of novel organisms would not be identified in risk assessment processes. In these areas, until new standards, guidelines or regulations are developed, it will be difficult for scientists to understand how best to align their practice with Government biosecurity objectives. A recent example of good practice in this area is the collaboration between government agencies in the UK, the Netherlands, Germany and Belgium to develop risk assessment methods for gene drive technology [15].

3.9 New biosecurity vulnerabilities are also arising and increasing in significance as the importance of the bio-economy grows. This can open up new targets for malicious attacks and extend the range of motivations for them (e.g. to include industrial sabotage).

3.10 There are also potential 'cyber-bio-security' vulnerabilities opening up [16]. The increasingly digitised nature of biology means that research institutions and the bio-economy are at risk of damage through cyber-attacks. Notably, the UK National Security Strategy 2015 pays substantial attention to cyber-threats, but this is not picked up in the Biological Security Strategy.

3.11 Recommendations:

- In each of these cases further work by Government in collaboration with the private and academic sectors can improve understanding of the biosecurity implications of scientific and technological advances in interaction with the changing context of research actors and settings, and the growing significance of the bio-economy.
- Responses, including regulatory change, are needed, and should be designed to be agile and adaptive to further changes in technology and/or context. In the interim, useful collaborative work can be done to develop guidance in areas that don't fit existing regulation well. It will be important to establish and maintain trust and regular communication between regulatory agencies and those conducting biological research in whatever setting.

- Biology is converging and intersecting with other areas of science and technology in transformative ways, this requires engagement of additional areas of expertise to understand novel risks and vulnerabilities at those intersections and new ways of responding to them.
- International partners are addressing the same challenges and there is scope for further collaboration and information sharing with them.

- [1] For example: <https://royalsociety.org/topics-policy/projects/biological-toxin-weapons-convention/>; <https://www.interacademies.org/43251/Assessing-the-Security-Implications-of-Genome-Editing-Technology-Report-of-an-international-workshop>.
- [2] Eighth Review Conference of the Biological Weapons Convention: Where Next? Report (version 1a) pp.5-7, <https://www.cser.ac.uk/resources/eighth-review-conference-biological-weapons-convention-where-next/>.
- [3] <https://www.paccsresearch.org.uk/about/>.
- [4] <https://www.parliament.uk/mps-lords-and-offices/offices/bicameral/post/fellowships/uk-research-and-innovation-policy-internships/>.
- [5] <https://www.gov.uk/government/news/science-research-programme-launched-to-inform-defra-policy-making>.
- [6] <https://foresightprojects.blog.gov.uk/2018/11/01/futures-foresight-and-horizon-scanning-finding-a-way-forward/>.
- [7] <https://www.gov.uk/government/groups/futures-and-foresight>.
- [8] ‘Point of View: A transatlantic perspective on 20 emerging issues in biological engineering’, Wintle, BC et al, *eLife*, 2017, <https://elifesciences.org/articles/30247>.
- [9] US National Academies, *Preparing for Future Products of Biotechnology* <https://www.nap.edu/catalog/24605/preparing-for-future-products-of-biotechnology>; Australian Council of Learned Academies, *Synthetic Biology in Australia: An Outlook to 2030* <https://acola.org/hs3-synthetic-biology-australia/>.
- [10] *Consultation on Implementing the Nagoya Protocol in the UK: Response by the Wellcome Trust*, April 2014, <https://wellcome.ac.uk/sites/default/files/wtp056334.pdf>.
- [11] <https://www.gov.uk/government/publications/life-sciences-industrial-strategy>.
- [12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/761856/181205_BEIS_Growing_the_Bioeconomy_Web_SP_.pdf.
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- [14] <https://biomake.space/home/about/space/policies>.
- [15] <https://www.rivm.nl/en/news/risk-assessment-method-for-gene-drives>.

[16] Murch, R.S. et al 'Cyberbiosecurity: An Emerging New Discipline to Help Safeguard the Bioeconomy', *Frontiers in Bioengineering and Biotechnology*, 2018, Vol.6 (39), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5895716/>.

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