Dual use research of concern

Some manuscripts provide information that could be directly misapplied to pose a significant threat to public health, safety or security, agricultural crops and other plants, animals, or the environment. For such information to be published, the benefit to the research community, society, or to public health, must outweigh any risks.

Editors should be aware of potential dual use research of concern (DURC) issues relevant to their field and are expected to seek assistance from the publisher if they believe a submitted manuscript presents information that can be directly misapplied to pose a significant threat with broad potential consequences to public health and safety, agriculture crops and other plants, animals, the environment, material or public security.

This document provides a framework for assessing the risks and benefits of publishing dual use information, and guidance about types of research that may raise biosecurity or nuclear proliferation concerns. The assessment form can be used to assess a broad range of threats including, but not limited to: biosecurity, chemical and nuclear threats; and emerging areas of research (e.g. information that may pose a threat to public safety or security related to: data security; infrastructure security; the application of artificial intelligence in weapons).

Biosecurity concerns

Types of research that should raise biosecurity concerns[1]

1. Enhancement of the harmful consequences of an agent or toxin
2. Demonstration of how to render human or animal vaccines ineffective
3. How to confer resistance to therapeutically useful antibiotics or antiviral agents for humans, animals, or crops
4. Enhancement of the virulence of human, animal, or plant pathogens, or make non-pathogens virulent
5. Increase of the transmissibility of pathogens
6. Alteration of the host range of pathogens
7. How to enable the evasion of diagnostic or detection methods
8. How to enable the weaponization of biological agents or toxins, such as increasing the stability and ability to disseminate the agent or toxin
9. Enhancement of the susceptibility of a host population to the agent or toxin
10. Generation or reconstitution of an eradicated or extinct agent or toxin

Agents that should raise biosecurity concerns
The bioterrorism agents/diseases listed by Center for Disease Control and Prevention (CDC) https://emergency.cdc.gov/agent/agentlist-category.asp. But this list is not comprehensive and the Fink Report[1] also includes:

- Avian influenza virus (highly pathogenic)
- Reconstructed 1918 influenza virus
- Foot-and-mouth disease virus
- Rinderpest virus
- Variola minor virus

Nuclear proliferation concerns

Some of the science of nuclear weapons is not well understood or is approximated. 'Horizontal' proliferation refers to nation-states or non-state entities acquiring nuclear weapons or developing the capability and materials for producing them. 'Vertical' proliferation refers to nation-states that already possess nuclear weapons increasing their stockpiles, improving the technical sophistication or reliability of their weapons, or developing new weapons.[2]

Some research may have clear relevance to nuclear proliferation; for example, some research related to explosives, detonation or miniaturization. Nuclear proliferation risks can also arise in disciplines such as physics, astronomy, chemistry, and materials research that deal with states of matter and of materials under conditions relevant to nuclear weapons. The Military Applications Division of the French Alternative Energies and Atomic Energy Commission (CEA-DAM) LMJ-PETAL user guide lists specific areas of research that may be sensitive[3]: equation of State (EOS), atomic spectra and opacities, constitutive relations and damage laws of materials, radiative hydrodynamics, turbulent hydrodynamics, x-ray radiation transfer, mixing physics in convergent flows, and actinide studies. Studies related to EOS and opacities warrant particular consideration.

For EOS, constitutive relations and damage laws: studies involving simple elements or mixtures are not considered sensitive if their atomic number is lower or equal to 71. For atomic numbers from 72 to 91, studies at pressures above 1000 GPa are considered sensitive. For atomic numbers greater than 91 studies are considered sensitive at any pressure.

For atomic spectra and opacities: studies of elements with atomic number 37 or higher at temperatures over 50 eV are considered sensitive.

1. Biotechnology Research in an Age of Terrorism (National Academies Press (US), **2004**). https://www.ncbi.nlm.nih.gov/books/NBK222048/
2. Sidel, V.W. and Levy, B.S. Proliferation of Nuclear Weapons: Opportunities for Control and Abolition, *American Journal of Public Health*, 97, 1589-1594 (**2007**). https://ajph.aphapublications.org/doi/10.2105/AJPH.2006.100602
3. Section III.4 in The Military Applications Division of the French Alternative Energies and Atomic Energy Commission (CEA-DAM) Laser MegaJoule PETawatt Aquitaine Laser (LMJ-PETAL) User Guide http://www.asso-alp.fr/wp-content/uploads/2020/10/LMJ-PETAL-Users-guide-v2.0.pdf

Dual use research of concern: risk and benefit assessment

This framework is used to assess the risks and benefits of publishing dual use information.

General overview of information

What information is provided and to what extent is it novel?	

Risk analysis

Could the application or utilization of this information threaten: public health or safety, agriculture crops or other plants, animals, the environment, material, data or public security? If so, please describe. For example: • Is novel information provided that could be intentionally used to threaten public health or safety? • Does the information expose vulnerabilities in national or public security?	
If a risk has been identified, in what time frame (e.g. immediate or years from now) might the information be used to pose a threat?	
If the information were to be published 'as is', what is the potential for: • Public misunderstanding? What are the potential implications of such misunderstandings, e.g. psychological, social, health decisions, economic or commercial? • Sensationalism? In what way might it result in widespread concern or even panic about public health, safety or security?	

Benefit analysis

Are there potential benefits from the application or utilization of this information to: public health or safety, agriculture crops or other plants, animals, the environment, material or public security? If so, please describe. For example: • What potential solution does it offer to an identified problem or vulnerability?	
Will this information be useful to the research community? If so, how?	
If a benefit has been identified, in what time frame (e.g. immediate or years from now) might the information be used to realise the benefit?	

Risk vs. benefit assessment

Based on the risks and benefits identified, and considering the time frame in which these might be realized: • Do the benefits of publishing the information outweigh the risks? • Do the risks outweigh the benefits?	

Communication recommendations

Are changes to the content recommended before publication? For example: • Should contextual information be added? Such as: emphasising the benefits of the research, stating regulatory approvals, or explaining the safety measures in place when the research was conducted? • Should a modified version be published? For example, is it possible to remove the material that poses concerns without compromising scientific integrity or standards of methods reporting or data availability?	
Is delaying publication recommended? For example, until a clearly defined condition is met such that publication no longer poses the same level of risk.	

Adapted from appendix 5 of *National Science Advisory Board for Biosecurity (NSABB); Proposed Framework for the Oversight of Dual Use Life Sciences Research: Strategies for Minimizing the Potential Misuse of Research Information*
https://biosecurity.fas.org/resource/documents/NSABB%20draft%20guidelines%20on%20dual%20use%20research.pdf