Dual-Use of Emerging Technologies & WHO Dual-Use Guidance

Filippa Lentzos

Associate Professor, King's College London

Chair, WHO TAG on Responsible Use of Life Sciences & Dual-Use Research

Hope and caution

- Biology and the life sciences play a crucial part in the portfolio of global biomedical research
- But the very tools and techniques that enable the discoveries of biologists and life scientists studying important human pathogens also create potential risk.

The dawn of genetic technologies

- With tools of genetic engineering came ability to rewrite the genetic code and to possibly create—in test tubes—organisms that had never before existed
- ‘Berg letter’: “the creation of novel types of infectious DNA elements whose biological properties cannot be completely predicted in advance”; called for an immediate suspension of certain classes of experiments because of “serious concern that some of these artificial recombinant DNA molecules could prove biologically hazardous.”
- 1975 Asilomar Conference on Recombinant DNA—sought to “set standards allowing geneticists to push research to its limits without endangering public health.”

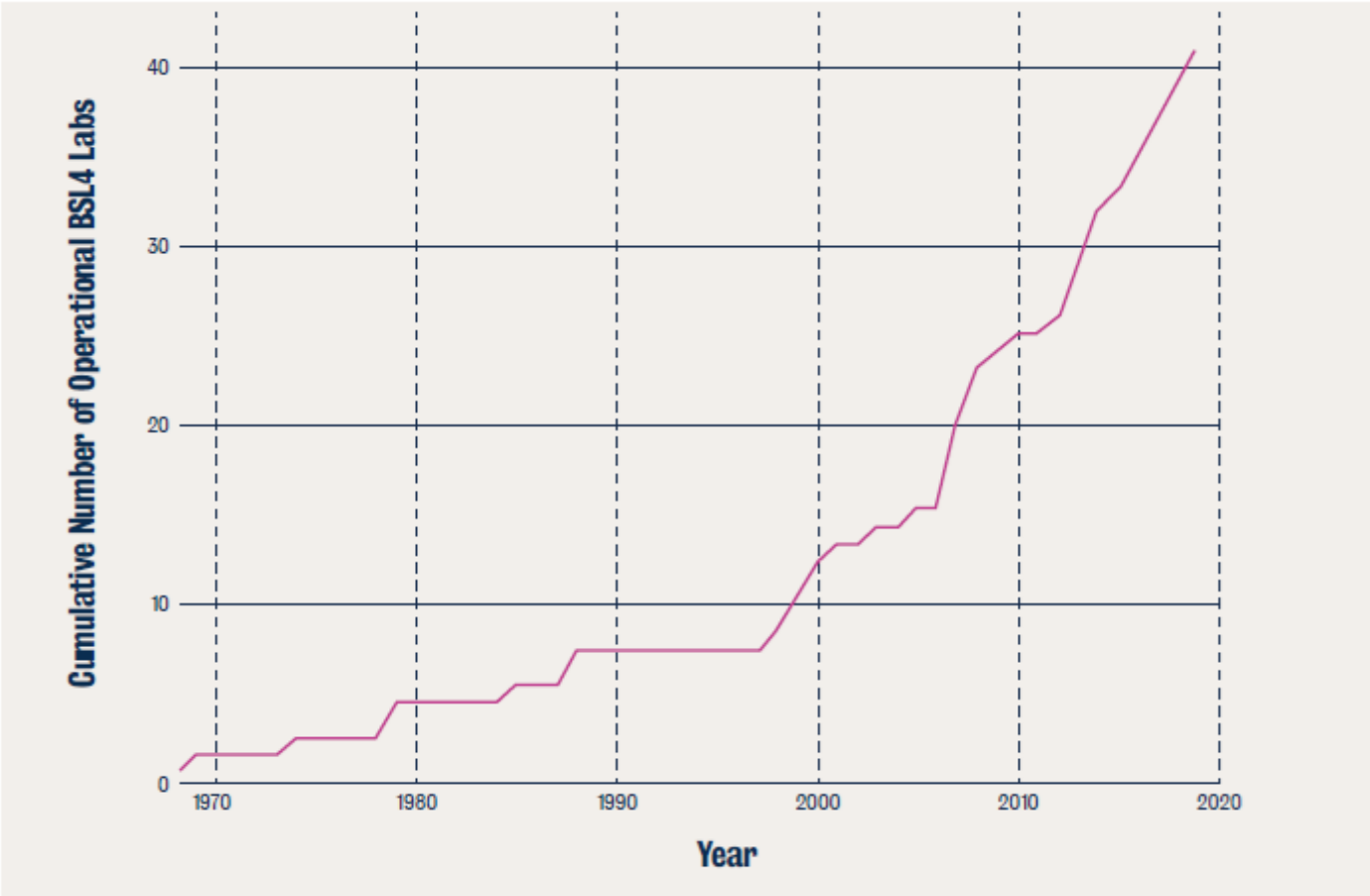
Genetic technologies today

- It has become ever-simpler to identify the genes underlying desirable (and undesirable) traits and functions; and there is unprecedented capacity to engineer organisms, including pathogens.
- Proliferation of the labs and other infrastructure necessary to perform high-risk life science research

Global proliferation of BSL4 labs.

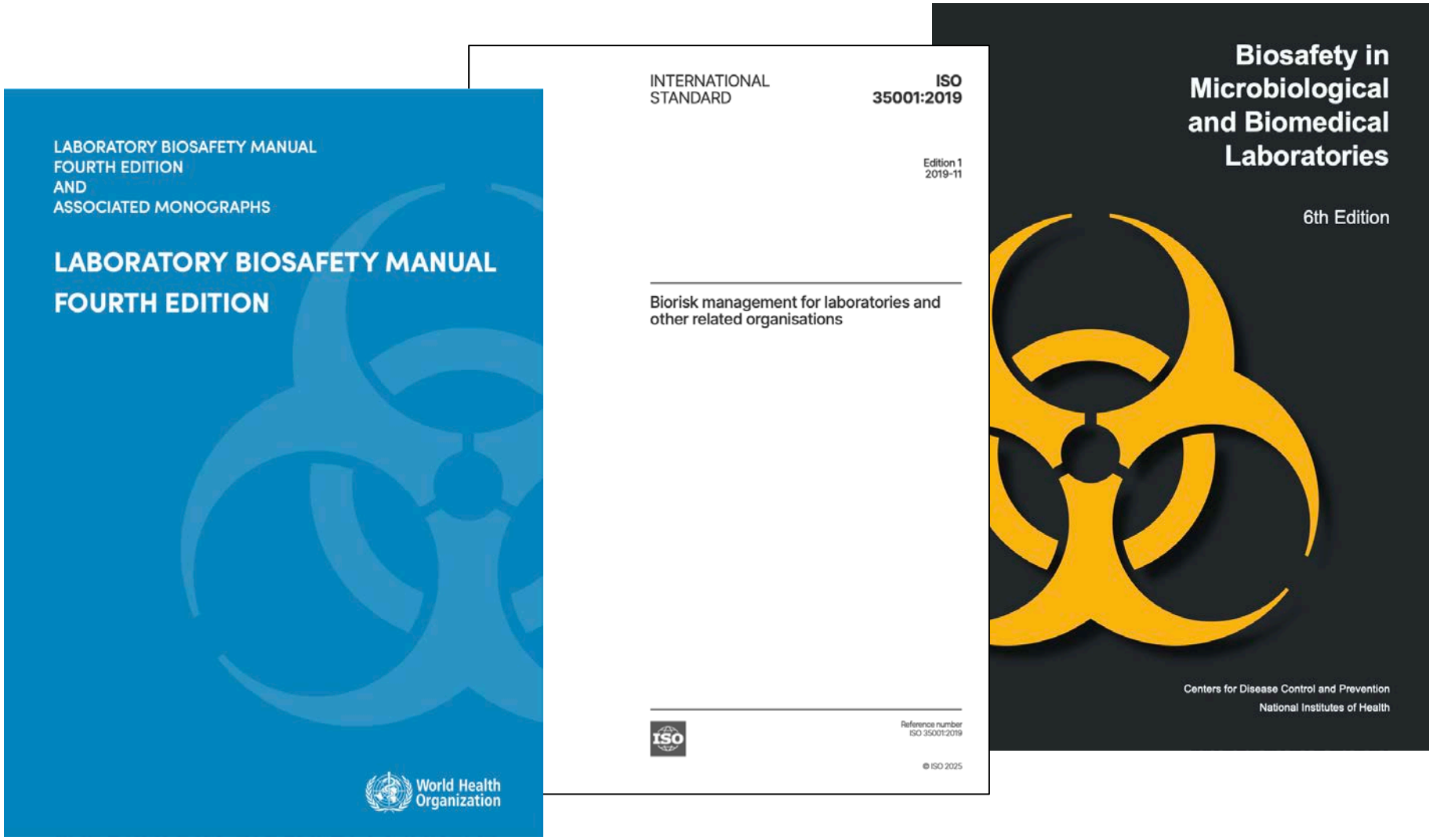
12 New

BSL4 labs planned across nine countries since the start of the pandemic



Have oversight standards for genetic engineering research kept pace with these developments?

Biosafety management



Biosafety scores by country

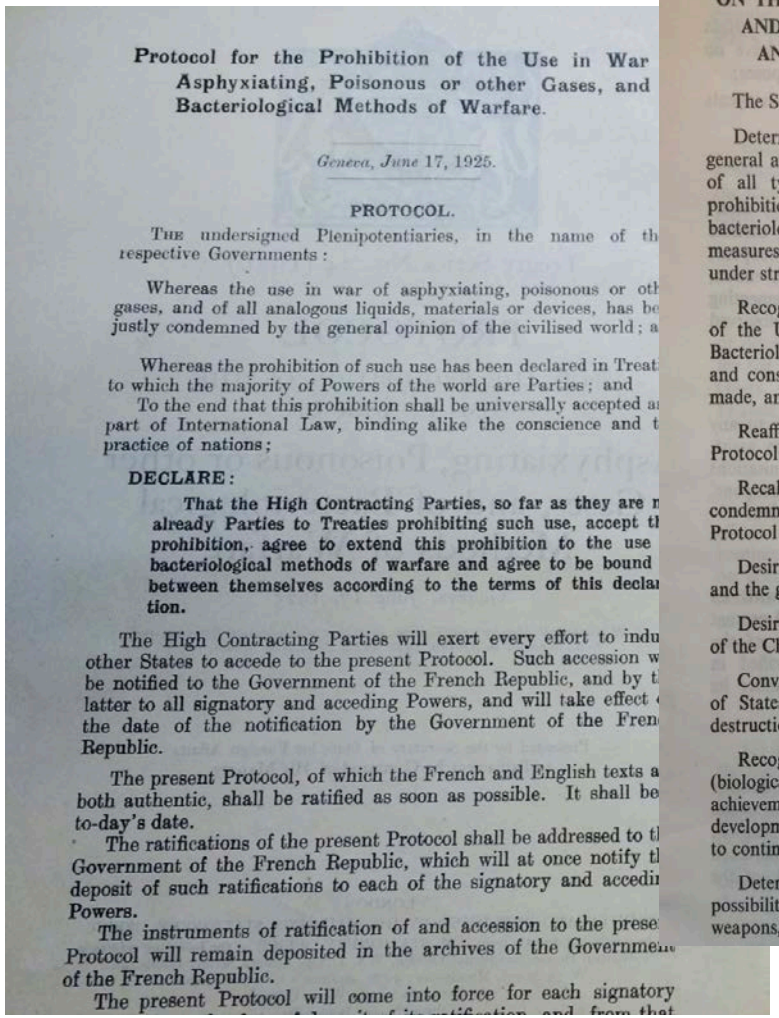
Biosafety (score out of 20)	
Country	**Score**
Australia	20
Canada	20
France	19
Germany	19
Japan	19
United States	19
Brazil	18
China	18
Italy	18
Singapore	18
Spain	18
Taiwan	18
United Kingdom	18
Sweden	17

Biosafety (score out of 20)	
Country	**Score**
Kazakhstan	16
South Africa	16
Switzerland	16
Hungary	15
Republic of Korea	15
Russian Federation	15
Belarus	14
Czech Republic	11
Philippines	7
India	5
Côte d'Ivoire	3
Gabon	3
Saudi Arabia	1

Table 3: Scoring metrics on biosafety

Biosafety	
Scoring metric	**Number of countries**
Governance Framework	
1. National biosafety legislation	23
2. National biosafety oversight entity	22
3. National list	22
4. Whistleblower protections	15
Implementation	
5. Physical/engineering controls	22
6. Good microbiological practices	20
7. Biosafety risk assessments	21
8. Administrative controls	21
9. Training	20
10. Personal protective equipment	19
11. Occupational health	22
12. Inventory	17
13. Transportation safety	22
14. Decontamination	21
15. Incident response plan	20
16. Incident reporting	21
17. **Biosafety Association**	
National	16
Regional	8
None	3
18. **International Engagement**	
Participation in 3 groups	7
Participation in 1 or 2 groups	14
No participation	6

Biosecurity management



Protocol for the Prohibition of the Use in War Asphyxiating, Poisonous or other Gases, and Bacteriological Methods of Warfare.

Geneva, June 17, 1925.

PROTOCOL.

THE undersigned Plenipotentiaries, in the name of th respective Governments :

Whereas the use in war of asphyxiating, poisonous or oth gases, and of all analogous liquids, materials or devices, has be justly condemned by the general opinion of the civilised world ; a

Whereas the prohibition of such use has been declared in Treat to which the majority of Powers of the world are Parties ; and

To the end that this prohibition shall be universally accepted a part of International Law, binding alike the conscience and t practice of nations ;

DECLARE :

That the High Contracting Parties, so far as they are n already Parties to Treaties prohibiting such use, accept th prohibition, agree to extend this prohibition to the use bacteriological methods of warfare and agree to be bound between themselves according to the terms of this declar tion.

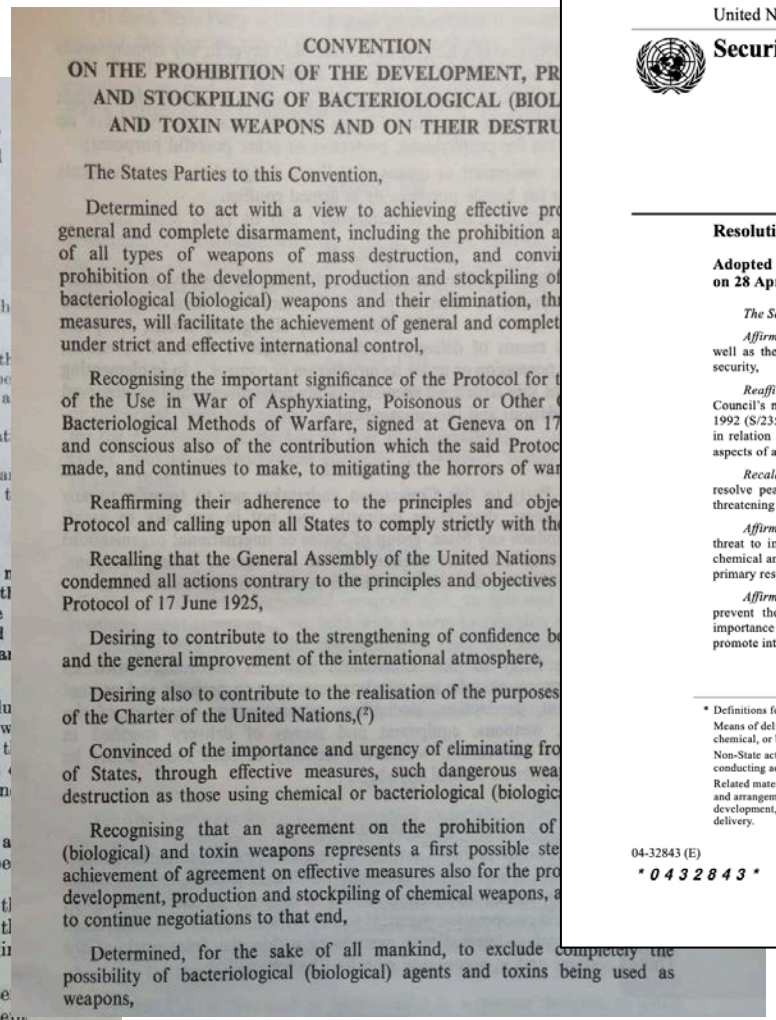
The High Contracting Parties will exert every effort to indu other States to accede to the present Protocol. Such accession w be notified to the Government of the French Republic, and by t latter to all signatory and acceding Powers, and will take effect the date of the notification by the Government of the Fren Republic.

The present Protocol, of which the French and English texts a both authentic, shall be ratified as soon as possible. It shall be to-day's date.

The ratifications of the present Protocol shall be addressed to th Government of the French Republic, which will at once notify th deposit of such ratifications to each of the signatory and accedi Powers.

The instruments of ratification of and accession to the prese Protocol will remain deposited in the archives of the Governmen of the French Republic.

The present Protocol will come into force for each signatory



CONVENTION

ON THE PROHIBITION OF THE DEVELOPMENT, PR AND STOCKPILING OF BACTERIOLOGICAL (BIOL AND TOXIN WEAPONS AND ON THEIR DESTRU

The States Parties to this Convention,

Determined to act with a view to achieving effective pr general and complete disarmament, including the prohibition a of all types of weapons of mass destruction, and convi prohibition of the development, production and stockpiling o bacteriological (biological) weapons and their elimination, th measures, will facilitate the achievement of general and complet under strict and effective international control,

Recognising the important significance of the Protocol for t of the Use in War of Asphyxiating, Poisonous or Other Bacteriological Methods of Warfare, signed at Geneva on 17 and conscious also of the contribution which the said Protoc made, and continues to make, to mitigating the horrors of war

Reaffirming their adherence to the principles and obje Protocol and calling upon all States to comply strictly with th

Recalling that the General Assembly of the United Nations condemned all actions contrary to the principles and objectives Protocol of 17 June 1925,

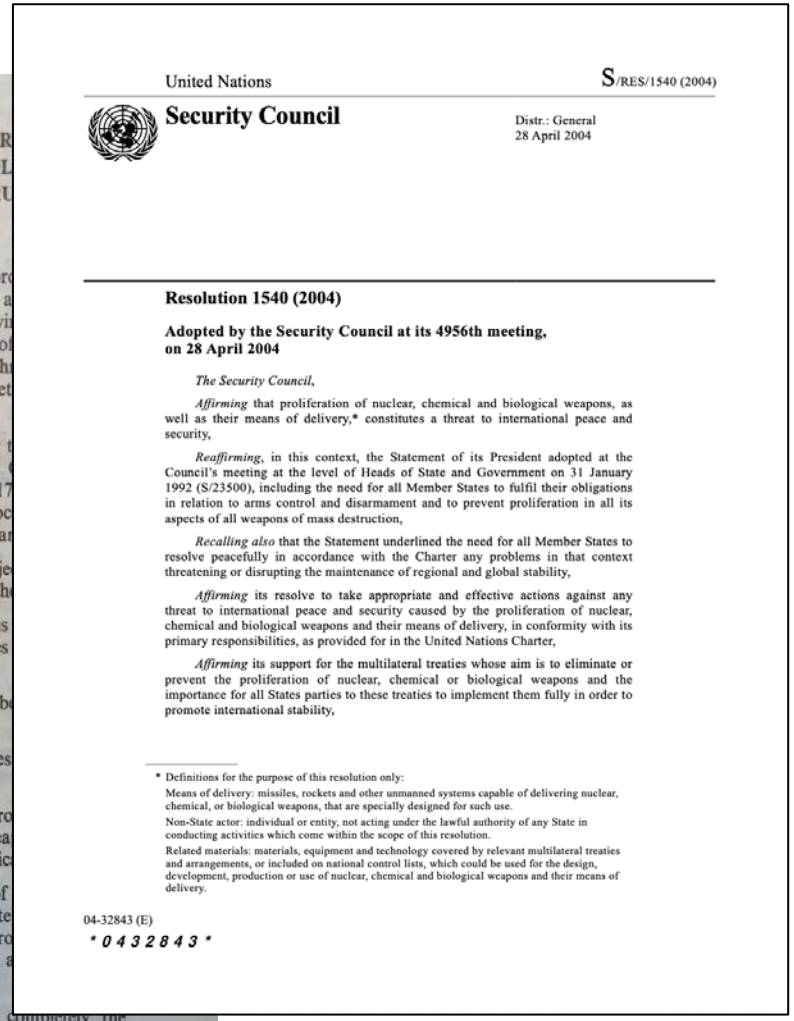
Desiring to contribute to the strengthening of confidence b and the general improvement of the international atmosphere,

Desiring also to contribute to the realisation of the purposes of the Charter of the United Nations,(2)

Convinced of the importance and urgency of eliminating fro of States, through effective measures, such dangerous wea destruction as those using chemical or bacteriological (biologic

Recognising that an agreement on the prohibition of (biological) and toxin weapons represents a first possible ste achievement of agreement on effective measures also for the pro development, production and stockpiling of chemical weapons, a to continue negotiations to that end,

Determined, for the sake of all mankind, to exclude completely the possibility of bacteriological (biological) agents and toxins being used as weapons,



United Nations S/RES/1540 (2004)

Security Council

Distr.: General
28 April 2004

Resolution 1540 (2004)

Adopted by the Security Council at its 4956th meeting, on 28 April 2004

The Security Council,

Affirming that proliferation of nuclear, chemical and biological weapons, as well as their means of delivery,* constitutes a threat to international peace and security,

Reaffirming, in this context, the Statement of its President adopted at the Council's meeting at the level of Heads of State and Government on 31 January 1992 (S/23500), including the need for all Member States to fulfil their obligations in relation to arms control and disarmament and to prevent proliferation in all its aspects of all weapons of mass destruction,

Recalling also that the Statement underlined the need for all Member States to resolve peacefully in accordance with the Charter any problems in that context threatening or disrupting the maintenance of regional and global stability,

Affirming its resolve to take appropriate and effective actions against any threat to international peace and security caused by the proliferation of nuclear, chemical and biological weapons and their means of delivery, in conformity with its primary responsibilities, as provided for in the United Nations Charter,

Affirming its support for the multilateral treaties whose aim is to eliminate or prevent the proliferation of nuclear, chemical or biological weapons and the importance for all States parties to these treaties to implement them fully in order to promote international stability,

* Definitions for the purpose of this resolution only:

Means of delivery: missiles, rockets and other unmanned systems capable of delivering nuclear, chemical, or biological weapons, that are specially designed for such use.

Non-State actor: individual or entity, not acting under the lawful authority of any State in conducting activities which come within the scope of this resolution.

Related materials: materials, equipment and technology covered by relevant multilateral treaties and arrangements, or included on national control lists, which could be used for the design, development, production or use of nuclear, chemical and biological weapons and their means of delivery.

04-32843 (E)

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Biosecurity scores by country

Biosecurity (score out of 18)	
Country	**Score**
France	18
United States	18
Australia	17
Canada	17
Japan	17
United Kingdom	17
China	15
Taiwan	14
Kazakhstan	13
Republic of Korea	13
Singapore	13
Taiwan	13
Spain	13
Sweden	13
Hungary	12

Biosecurity (score out of 18)	
Country	**Score**
Russian Federation	12
Sweden	12
Czech Republic	11
Belarus	9
Brazil	9
Germany	9
Italy	6
Switzerland	6
India	5
Philippines	4
South Africa	4
Saudi Arabia	2
Côte d'Ivoire	1
Gabon	1

Dual-use research scores by country

Dual-Use Research (score out of 10)	
Country	**Score**
Canada	9
United Kingdom	5
United States	5
Germany	4
Australia	3
Taiwan	3
Hungary	2
Italy	2
Japan	2
Switzerland	2
Brazil	1
Côte d'Ivoire	1
France	1
India	1

Dual-Use Research (score out of 10)	
Country	**Score**
Kazakhstan	1
Republic of Korea	1
Sweden	1
Belarus	0
China	0
Czech Republic	0
Gabon	0
Philippines	0
Russian Federation	0
Saudi Arabia	0
Singapore	0
Spain	0
Saudi Arabia	2

Overall biorisk management scores by country

Many of the countries building new labs, some for the first time (marked in bold), score poorly on biorisk management.

Overall Score (out of 48)	
Country	**Score**
Canada	46
United States	42
Australia	40
United Kingdom	40
France	38
Japan	38
Taiwan	35
China	33
Germany	32
Singapore	31
Spain	31
Kazakhstan	30
Sweden	30
Hungary	29

Overall Score (out of 48)	
Country	**Score**
Republic of Korea	29
Brazil	28
Russian Federation	27
Italy	26
Switzerland	24
Belarus	23
Czech Republic	22
South Africa	21
India	11
Philippines	11
Côte d'Ivoire	5
Gabon	4
Saudi Arabia	3

A global public good to mitigate biorisks

Consultative, participatory and multidisciplinary approach

2020

2021

2022

3 dual-use research of concern dialogues

5 thematic working groups (35 meetings)

2 consultative meetings

Public online consultation

External review group

Edit and design

Launch

Dissemination and Implementation

World Health Organization

Overarching aim

- Use life sciences knowledge, materials and skills for peaceful purposes and for the betterment of humans and the planet's biodiversity, ecosystems and environments.
- Preserve biodiversity where possible, both as a means to promote health, safety and security and as an intrinsic value.

World Health Organization

Values and principles

1. Health, safety and security
2. Responsible stewardship of science
3. Integrity
4. Fairness
5. Openness, transparency, honesty and accountability
6. Inclusiveness and collaboration
7. Social justice
8. Intergenerational justice
9. Public education, engagement and empowerment

World Health Organization

Research with pandemic risks encompasses…

- …research on pathogens known to be capable of causing a pandemic
- …research which manipulates pathogens that are not currently thought capable of pandemic spread in ways that can be anticipated to increase their capacity to cause a pandemic
- …research on pathogens with unknown characteristics; often newly discovered pathogens whose taxonomically close relatives include potential pandemic pathogens

Qualitatively different research

- When there is potential for harm to large numbers of people, and especially where it is questionable whether those at risk will benefit from the research, additional precautions, beyond occupational health and safety, is essential.
- Research with pandemic risk should have high-probability benefits for public health.
- Researchers and their institutions have an obligation to identify whether research with pandemic risks is proportionate to the potential benefits of the research, and to assess whether less-risky forms of research could be equally beneficial.

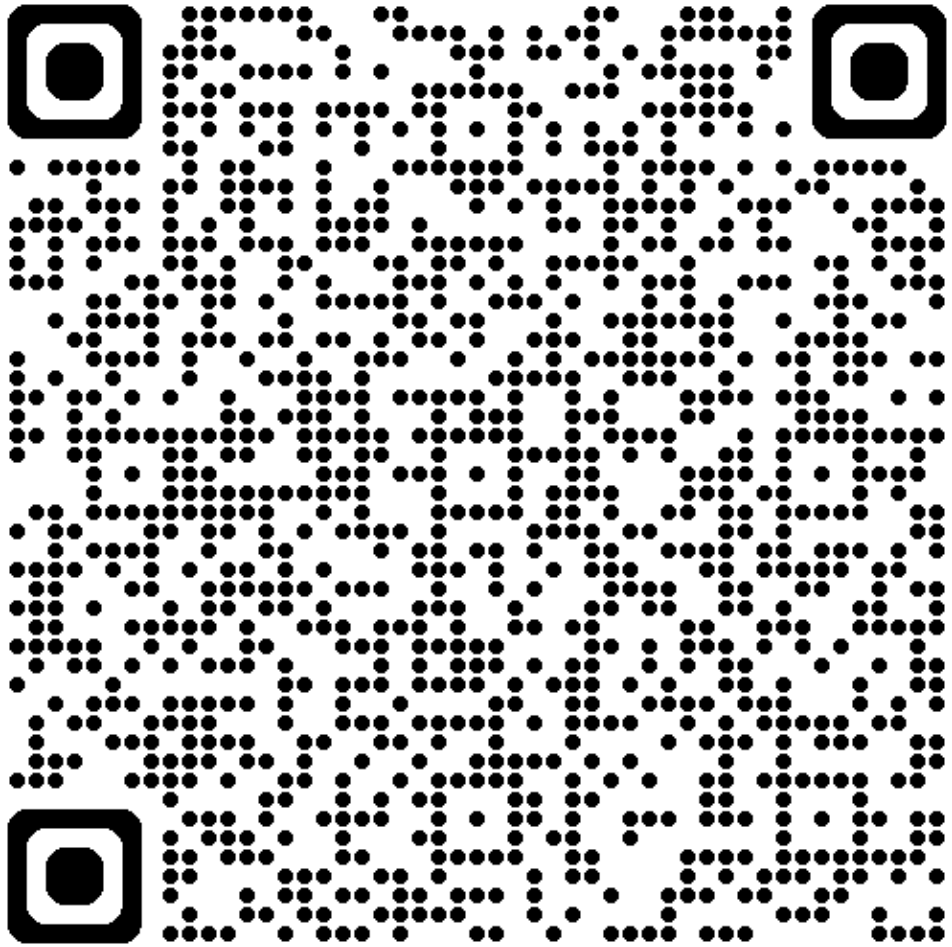
Qualitatively different kind of research

- For research with pandemic risks where the stakes are higher and inequities in harm–benefit distribution across stakeholders are greater, researchers and their institutions should not be the only ones conducting harm–benefit assessments
- In cases when there is not a proportionate harm-benefit ratio, researchers and their institutions have an ethical obligation to respect prohibitions on that particular piece of research.

Are there some genetic experiments that simply should not be done?

TAG-RULS DUR

- Provides independent and strategic advice to WHO around technical areas relevant to the monitoring and mitigation of biorisks, advances in the life sciences and related technologies, the governance of dual-use research and the responsible use of the life sciences.
- 20 members with broad expertise and perspectives
- Created at the end of 2023 and started its work in January 2024



World Health Organization