

Building biological security education network in Africa and beyond: rethinking of BWC^{aa} after covid pandemic

Professor Lijun Shang

London Metropolitan University

United Kingdom



12-14 Jun.



OUTLINE

- Introduction
 - Pandemic
 - History reflection of threats and responses
- The Conventions Today
 - Advances in Biotechnology
 - Review Conferences
- The Web of Prevention
 - Awareness raising
 - Education today
- Collaborating with Africa
 - Synbio Africa- LMU fellowship
 - IBSEN



Effects of the COVID-19 Pandemic

- World Deaths (World Health Organization, May 2023)
6,938,353
767,364,883 (Cases)
- UK Deaths (UK Government, May 2023)
226,622
- Long Covid
Highly Variable Effects and Mechanisms



UK Biological Security Strategy, 2023

There are many **different definitions** of biological security. In this strategy we use the term to cover the protection of the UK and UK interests from biological risks (particularly significant disease outbreaks) whether these arise **naturally**, or through the less likely event of an **accidental release** of hazardous biological material from laboratory facilities, or a **deliberate biological** attack. These risks could affect humans, animals or plants.



Deliberate Biological Disease

Andy Weber, Former US Assistant Secretary of Defense, *Arms Control Today*, January/February 2021.

“...As bad as the pandemic is, imagine if instead it were caused by the deliberate release of a sophisticated biological weapon. About **2 percent** of those infected have died of COVID-19, while a disease such as smallpox kills at a **30 percent** rate. **A bioengineered pathogen could be even more lethal.** This fact, as well as the increasing availability of advanced biotechnologies, contributes to a growing threat. **Furthermore, the taboo against developing and using biological weapons is eroding...**”



Biological and Toxin Weapons

The US Biological Weapons Program, J. E. vC. Moon (2006) in *Deadly Cultures: Biological Weapons Since 1945*, Harvard University Press.

- **Pathogens**

Bacillus anthracis (lethal), *Francisella tularensis* (lethal), *Brucella suis* (incapacitating), *Coxiella burnetii* (incapacitating), Yellow Fever virus (lethal), Venezuelan equine encephalitis (incapacitating).

- **Toxins**

Botulinum toxin (lethal), Staphylococcal enterotoxin Type B (incapacitating), Saxitoxin (lethal).



The 1925 Geneva Protocol

Whereas the **use in war of asphyxiating, poisonous or other gases**, and of all analogous liquids, materials or devices, **has been justly condemned by the general opinion of the civilized world**; andTo the end that this prohibition shall be **universally accepted as a part of International Law**, binding alike the conscience and the practice of nations; Declare: That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, **agree to extend this prohibition to the use of bacteriological methods of warfare** and agree to be bound as between themselves to the terms of this declaration...



The 1970s Biological and Toxin Weapons Convention (BTWC)

Article I

Each State Party to this Convention undertakes never in any circumstances

to develop, produce, stockpile or otherwise acquire or retain:

Microbial or other biological agents, or toxins whatever their origin or

method of production, of types and in quantities that have no justification

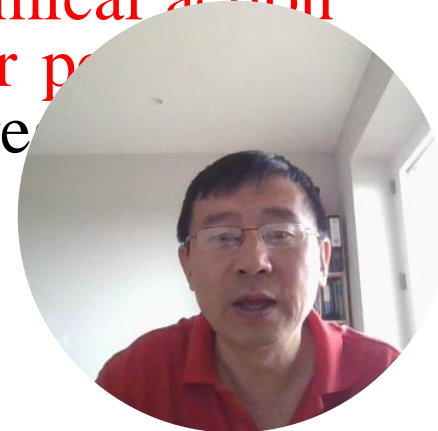
for prophylactic, protective or other peaceful purposes...



The 1990s Chemical Weapons Convention

Article I of the Convention prohibits the development, production, acquisition, stockpiling, retention or transfer or use of “Chemical Weapons,” which are defined under Article II as:

1. ‘Chemical Weapons’ means the following, together or separately: **Toxic chemicals and their precursors**, except where intended for purposes not prohibited under the Convention, as long as the types and quantities are consistent with such purposes...” And:
2. ‘Toxic Chemical’ means: **Any chemical which through its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals**. This includes all such chemicals, regardless of their origin or of their method of production, and regardless of whether they are produced in facilities, in munitions or elsewhere.



The Meaning of “Toxin” in the Conventions

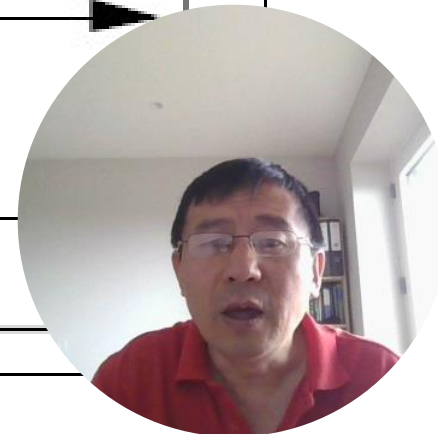
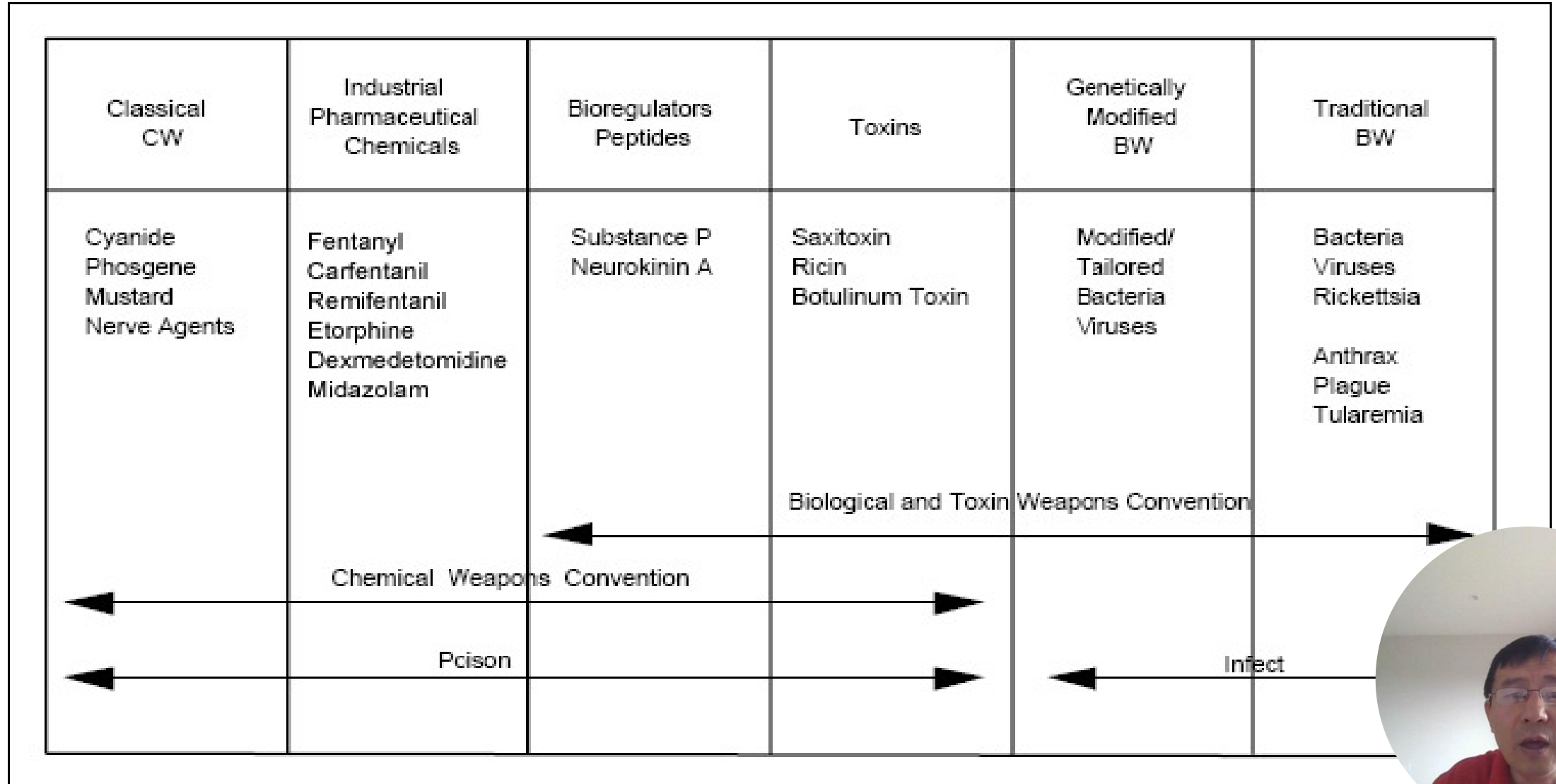
World Health Organization (2004) *Public Health Response to Biological and Chemical Weapons: WHO Guidance*.

In the sense of the Biological and Toxin Weapons Convention, ‘toxin’ includes substances to which scientists would not normally apply the term.

For example, there are chemicals that occur naturally in the human body that would have toxic effects if administered in large enough quantity. While a scientist might see a bioregulator, say, the treaty would see it as a poisonous substance produced by a living organism, in other words – nor is this unreasonable. Wasp venom, for example, is clearly a toxin – its active principle is histamine, which is also a human bioregulator.



The Biochemical Threat Spectrum and Response



Two Turn-of-the-Century Forecasts (i)

Meselson (2000) Averting the hostile exploitation of biotechnology. *The CBW Conventions Bulletin*, **48**, 16 – 19

...During the century ahead, as our ability to modify fundamental life processes continues its rapid advance, we will be able not only to devise additional ways to destroy life **but will also become able to manipulate it** – including the processes of cognition, development, reproduction and inheritance....**Therein could lie unprecedented opportunities for violence, coercion, repression, or subjugation...**



Two Turn-of-the-Century Forecasts (ii)

Petro *et al* (2003) Biotechnology: Impact on biological warfare and biodefense. *Biosecurity and Bioterrorism*, **1**, 161 – 168

...Emerging biotechnologies likely will lead to a paradigm shift in BW agent development; **future biological agents could be rationally engineered to target specific human biological systems at the molecular level...**



Implications of the Biotechnology Revolution

Julian Perry Robinson (2008) *The CBW Conventions Bulletin*

Yet dreadful though that [WMD] is, it is not the primary risk inherent in CBW. **Their main danger is precisely that they need not be weapons of mass destruction**, for what is unique about them is that **they could in principle serve to subjugate or coerce people, even very large numbers of people, *without necessarily threatening their lives***. A capability for exerting that force could become attractive in circles where the capability for mass destruction is unattractive. (Original emphasis)



The BTWC 9th Review Conference, 2022

United Nations Institute for Disarmament Research (2022) Potential Outcomes of the Review Conference

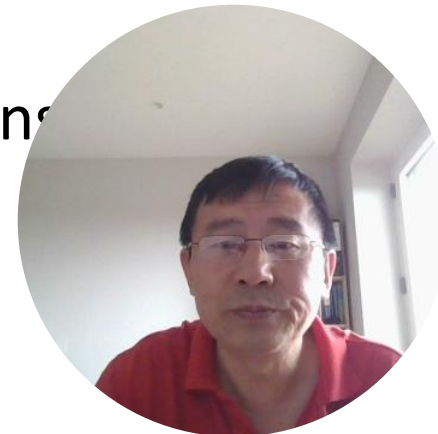
- A very limited outcome...
- A status quo outcome of a final declaration and a continuation of the Meetings of Experts and annual Meeting of States Parties. This would be very similar to the practice over the last two decades, where States Parties agree to discuss and promote common understandings and effective action on identified issues. This approach has diminishing value to all involved
- A forward-looking outcome of a final declaration and a newly mandated programme...
- A negotiation outcome that includes a final declaration and a mandated negotiations on ways to enhance biological disarmament.



The CWC 5th Review Conference, 2023

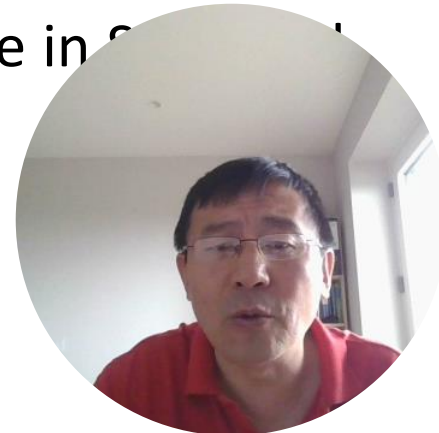
UNIDIR (2023) *Potential Outcomes*

- The ideal scenario of a substantive, strategically orientated document adopted by consensus
- A chairperson's report containing major developments in CWC implementation and reflecting deliberations during the review process
- A variation of outcome 2 with additional decisions on bounded issues of strategic importance
- Adoption of a watered-down outcome document adopted by consensus
- Adoption of a substantial outcome document by vote



Summary of the Current Situation

- The Biological and Toxin Weapons Convention
 - Weak: Only a small organization in Geneva and inadequate verification.
 - Stalemate since the failure to negotiate a verification system in the 1990s.
 - Progress in dealing with the biotechnology revolution likely to remain slow.
- The Chemical Weapons Convention
 - Stronger than the BTWC: Large organization in The Hague and good verification system for the destruction of 20th Century chemical weapons.
 - Having to resort to majority voting to deal with chemical weapons use in Syria and CNS-Acting chemicals.
 - Has ability to carry out present functions but slow progress likely in the impact of the biotechnology revolution.



The Concept of a Web of Prevention

- Originated in the early 1990s as the 'web of deterrence'
- Refers to the different strands / lines of action that are required for effective biological risk management, regardless of whether biological risks occur naturally, or are accidentally or deliberately caused
- Provides a basis for the development of a conceptual framework for the integrated and comprehensive implementation of international biosafety and biosecurity standards, regulations, policies, and guidelines
- Includes the development of codes of conduct for scientists under the BWC and CWC.



Scientists' Lack of Awareness

World Health Organization (2022) Global guidance framework for the responsible use of the life sciences: Mitigating biorisks and governing dual-use research

A chronic and fundamental challenge in biorisk management is a widespread lack of awareness that work in the area of the life sciences could be conducted or misused in ways that result in health and security risks to the public. The lack of awareness is unsurprising, given that biorisks are often overlooked or underemphasized in both educational curricula and on-the-job training. If they are unaware of the potential for misuse and potential malicious application, stakeholders cannot accurately weigh the risks and benefits of proposed research or order...



The Hague Ethical Guidelines for Chemists, 2015

- Elements

- Awareness and Engagement
- Sustainability
- Ethics
- Education
- Safety and Security

- Support

- The Organization for the Prohibition of Chemical Weapons has an Advisory Board for Education and Outreach (ABEO) **to assist in all aspects of education and outreach relevant to the Chemical Weapons Convention and to develop a portfolio of activities.**



The Tianjin Ethical Guidelines for Life Scientists

The guidelines have been endorsed by the **InterAcademy Partnership** and presented at the Biological Weapons Convention Meeting of Experts on Science and Technology on June 29, 2021.

Elements

Ethical Standards; Laws and Norms; Responsible Conduct of Research; Respect for Research Participants; Research Process Management; **Education and Training**; Research Findings Dissemination; Public Engagement on Science and Technology; Role of Institutions; International Cooperation



Element 6 of the Tianjin Guidelines

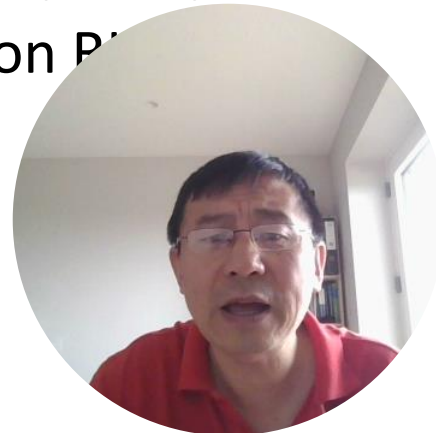
6. Education and Training

Scientists, along with their professional associations in industry and academia, should work to maintain a well-educated, fully trained scientific community that is well versed in relevant laws, regulations, international obligations and norms. Education and training of staff at all levels should consider the input of experts from multiple fields, including social and human sciences, to provide a more robust understanding of the implications of biological research. Scientists should receive training on a regular basis.



World Health Organization, June 2023

- Consultant – WHO Training on responsible use of the life sciences and dual-use research
- External Consultant for 6 months
- To contribute to the development of an online training course on the responsible use of the life sciences (RULS) and dual-use research (DUR)
 - Deliverable 1: Development of the draft content of the training course on RULS and DUR
 - Expected by: End of August 2023



Biosecurity Education in the 21st Century (i)

Shang *et al* (2022) Biosecurity Education Survey

...how close are we to the ideal situation which we would like to be in, should the States Parties to the BTWC decide to adopt and begin to implement the Tianjin Guidelines? Our survey indicates... that most of the organisers of the biosecurity awareness-raising and educational activities undertaken to date were academic life scientists. **Therefore, there is probably a good cohort of life scientists with knowledge of how to set up these activities that can be called upon to assist in new ventures. Moreover, as the projects were carried out in a wide range of different countries, this expertise should also be widely spread in different countries around the world....**



Biosecurity Education in the 21st Century (ii)

Shang *et al* (2022) Biosecurity Education Survey

- ...it should be noted that **the original language used in these projects was usually English and very few involved making translations of the material used even into the six official UN languages.** This is a problem that will have to be addressed if the kind of progress needed is to be achieved.
- It seems to us that to meet the scale of the awareness-raising and education requirements in biosecurity for life and associated scientists, **much more effort will have to be put into finding ways of engaging larger numbers of people** such as through developing innovative materials including manga, cartoons, animations and films and making them available on the internet...



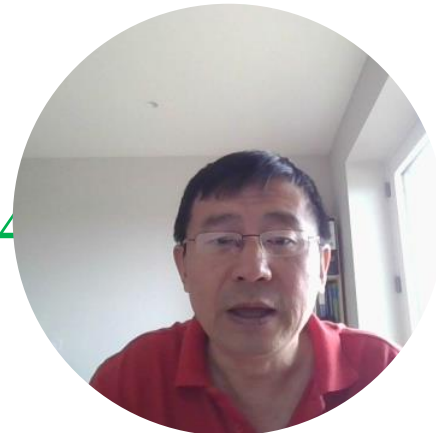
A Biosecurity Cartoons Series: In 12 Languages



A Biosecurity Education Resource Book

- Section 1: Introduction
 - Chapter 1: Biosecurity after the Pandemic
- Section 2: The Threat
 - Chapters 2 - 8
- Section 3: The International Response
 - Chapters 9 - 12
- Section 4: The Role of Scientists
 - Chapters 13 - 18
- Section 5: The Future
 - Chapters 19 - 20

Shang, et al, Wiley, 2024



Collaboration with Synbio Africa

- Developing training course

SynBio Africa in collaboration with London Metropolitan University is establishing a **Biosecurity Fellowship** for **Early Career African Researchers**

an annual Biosecurity program aimed at equipping **the young African researchers** with practical skills and knowledge in biosafety and biosecurity.

- Exchanging programme with UK university

SynBio Africa in collaboration with London Metropolitan University is exploring staff exchanging programme through various funding bodies globally





Building up the **IBSEN**

International

**Biological
Network**

Security

Education

International Comparisons: OPCW, WHO, IAEA

Established connection: China, USA, Japan, Germany, etc

Further connection: Africa, Latin America





LONDON
METROPOLITAN
UNIVERSITY

Thank you !

Contact details:

l.shang@londonmet.ac.uk

