

Preventing Future Biological Weapons

Challenges for the disarmament regime

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Security Implications of 3D and Biotechnology

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19th century: Emerging scientific understanding of disease

- **3 critical characteristics of disease uncovered**

- Infectious disease is caused by an agent (*pathogen*)
- The agent can be transmitted from one living organism to another (*infectiveness*)
- One agent is responsible for one disease only

- **Manipulation of the pathogen**

- Isolation
- Cultivation (while maintaining its infectiveness)
- Production in large quantities
- Effective dissemination

Confluence of several trends

- **Scientific discoveries**
 - Characterisation of bacteria and understanding of disease (19th century)
 - Characterisation of viruses (1928)
 - Discovery DNA (1871) and characterisation of double helix structure (1953)
 - Emergence of genetic engineering (1960s, with breakthrough in 1972 – 73)
 - Understanding of disease on the sub-cellular level (biochemical processes)
- **The new industrial revolution**
 - Biotechnology & informatics are the driving force
 - Major impact on all aspects of life in developed and developing countries
 - Biotechnology has accelerated development of societies (emerging economies)
 - Exploitation of genome studies
 - Synthetic biology & nanotechnology
- **Military application of new scientific and technological developments has become commonplace (= exploitation of 'dual-use' potential)**
 - Pressures to exploit new biology and biotechnology for military goals will grow
 - Many arguments in favour framed in humanitarian discourse (e.g., so-called non-lethal weaponry)

Sources of the norm against BW

- International treaties
 - 1925 Geneva Protocol
 - Bans the use of CBW in war
 - 1972 Biological and Toxin Weapons Convention (BTWC)
 - Bans development, production and stockpiling of BW and toxins
 - Ban on use explicitly referred to at 4th Review Conference (1996)
 - 1993 Chemical Weapons Convention (CWC)
 - Bans development, production, stockpiling and use of toxins
- UN Security Council resolutions
- National laws
- Professional and scientific codes of ethics and conduct
- Industry standards and best practices

The BTWC as a disarmament treaty

- Biological and toxin weapons cannot be developed, produced, or stockpiled, or otherwise acquired or retained (Art. I)
 - Ban on use through reference to 1925 Geneva Protocol
 - Confirmation of ban on use at 1996 and 2006 Review Conferences
- Destruction or conversion obligation (Art. II)
 - Must have been fulfilled before a State can become a new Party to the BTWC (2006 Review Conference)
- Non-proliferation obligation (Art. III)
 - No transfer to any recipient (state or non-state actor) of BTW
 - No assistance, encouragement or inducement of states, groups of states or international organizations to acquire BTW
- National legislation and regulations makes these prohibitions applicable to individuals and legal entities in State Party (Art. IV)

Science & technology in BTWC

- Article XII

- Review conference (now every 5 years)
- “Such review shall take into account any new scientific and technological developments relevant to the Convention.”

- Purpose

- To be able to update the common understanding of the scope of the core **prohibition** (Article I), e.g.,
 - Methods of creation of pathogenic agents
 - Alteration of microbial agents
 - Sub-cellular understanding of disease
- To be able to update the **obligations** of states parties in line with update scope of the prohibition

- Perennial controversy about what S&T should cover

- 1st RevCon (1980): BW agents only or the whole field?
- Today: tendency to cover all
 - Emerging and re-emerging diseases (international public health)
 - Different trends in biotechnology research and application
 - Research topics, their goals and methodologies (e.g., H5N1 modification)
- Question: are these issues for a disarmament treaty or is it a matter of broader governance?

Shifts in focus

- **2001: Breakdown of the multilateral disarmament process**
 - Termination of Ad Hoc Group negotiations on a legally binding protocol to the BTWC
 - Failure of the 5th Review Conference
- **Establishment of the ‘Intersessional process’**
 - Annual meetings in years between review conferences
 - Meeting of Experts, followed by Meeting of States Parties
 - Focus on **actionable items**, to be implemented on level of state party
 - However, no decision-making capacity; concrete outcomes ignored by review conferences
- **Heavy focus on ‘national implementation’ (Article IV of BTWC)**
 - Brings in new categories of stakeholders
 - Broad-based S&T annual review → **relevancy for national actions**, rather than development of common understandings (treaty development)
 - Tendency: ‘*securitisation*’ of biotechnology R&D developments

Article IV of the BTWC

Each State Party to this Convention shall, in accordance with its constitutional processes, *take any necessary measures* to prohibit and prevent the development, production, stockpiling, acquisition, or retention of the agents, toxins, weapons, equipment and means of delivery specified in article I of the Convention, *within the territory of such State, under its jurisdiction or under its control anywhere.*

Types of legislative measures

- ‘Any necessary measures’ (**Article IV**)
 - Wide range of legislative and regulatory tools available
- **Penal legislation**
 - Deterrence and prevention
- **Criminal procedural legislation**
 - Enable investigation and prosecution of BW-related crimes
 - Before an incident (→ incorporation of the General Purpose Criterion)
 - After an incident
- **Transfer controls**
 - Import and export control legislation
 - Legislation governing domestic transfers of materials
- **Authorization of legitimate biological activities**
 - Registration and licensing of legal and natural persons and certain types of activity
 - Transport regulations
 - Biosafety and biosecurity measures

Other activities under Article IV

- Strengthening of methods and capacities for **surveillance and detection of outbreaks of disease** at the national, regional and international levels
- **Inclusion of information on the BTWC and the 1925 Geneva Protocol** in medical, scientific and military educational materials and programmes.
- **Promotion of the development of training and education** programmes for those granted access to biological agents and toxins relevant to the Convention and for those with the knowledge or capacity to modify such agents and toxins, in order to raise awareness of the risks, as well as of the BTWC obligations
- Support and encouragement of the development, promulgation, adoption and promotion of **codes of conduct and other self-regulatory mechanisms**

Impact on science and technology

- **H5N1 research (Gain of function)**
 - Genetic manipulation to enhance transmissibility among humans
 - Researchers met all conditions required for this type of research
- **Evolution of BTWC debate**
 - Acquired a security overlay
 - Later rather one of ethics than security (but also part of BTWC debates)
 - Netherlands: export licence required for publication
 - NL: applied & fundamental research; USA: applied research only
 - May have serious knock-on effect on EU legislation
- **Leaves many unanswered questions**
 - What about science-based threat analysis in US biodefence programmes?
 - What is at issue?
 - Type of research activity?
 - Publication of results?
 - Can scientific methodology still be published in full? What about 'review'?
 - Export control:
 - Licence required if article had been published in Netherlands journal?
 - What about conferences; circulation of drafts; other types of communication?
- **Fragmentation: Focus on national implementation, but where is the global standard?**
 - No enforcement of conclusions in current BTWC intersessional meetings
 - No compliance assessment , except on a national level
 - Countries make own assessments of what they will allow or not

General issues for consideration

- **Commercially-driven imperatives**
 - Determines type of research and development
 - Allows for niche research and development based on different imperatives
 - Within own society
 - In other countries (some of whom may be of potential concern)
 - Standardisation of DNA strands offers huge commercial incentive
 - Companies are already being created
- **Accessibility is increasing**
 - Broadening basis for biology & biotechnology
 - Research, production & commercialisation of standardised gene sequences
 - Access for individual 'hobbyists'

Specific issues for consideration

- **Proliferation of high-containment laboratories since 2001**
 - Widening base of people with knowledge & skills
 - Certain pathogens are being artificially recreated (e.g., polio and H1N1 influenza (1918) viruses)
 - Accidents (infections, releases) do happen
 - Terrorism concerns: decreasing transparency and public accountability; reduced peer review opportunities
- **Bio-defence: science-based analysis of the BW threat**
 - Genetic properties of pathogens are being altered to study infectivity, virulence, etc., thus creating modified life forms
 - Government-run programmes
 - Insights from bio-defence programmes are useful for offensive BW development
 - Limited transparency
 - Questions about adequacy of vetting procedures for researchers
 - Anthrax letters (2001) came from a government bio-defence laboratory
- **Limited knowledge among scientists about norms against BW**
 - Potential contribution to future BW development rejected out of hand
 - Development of enabling technologies: future tangibles or end products not yet known
 - Situation probably even worse among ‘hobbyists’

Specific challenges

- **New biology ≈ data**
 - Hacking into laboratory computers and databases
 - Digitising of (synthetic) gene sequences
 - Digital transfer via communications systems (e.g., internet)
 - Ease of carrying digital data media out of laboratory
 - *Critical infrastructure protection* becomes element of biological governance
- **Hobbyists ('bio-hackers')**
 - Literally work from home (compare with chemistry kits)
 - Laboratory equipment available from sites such as eBay
 - Dedicated bio-hacker forums
 - Standardised DNA strands easily available via Internet
 - Synthetic biology gave big boost to the movement
 - Currently known work is harmless, but oversight responsibility is unclear

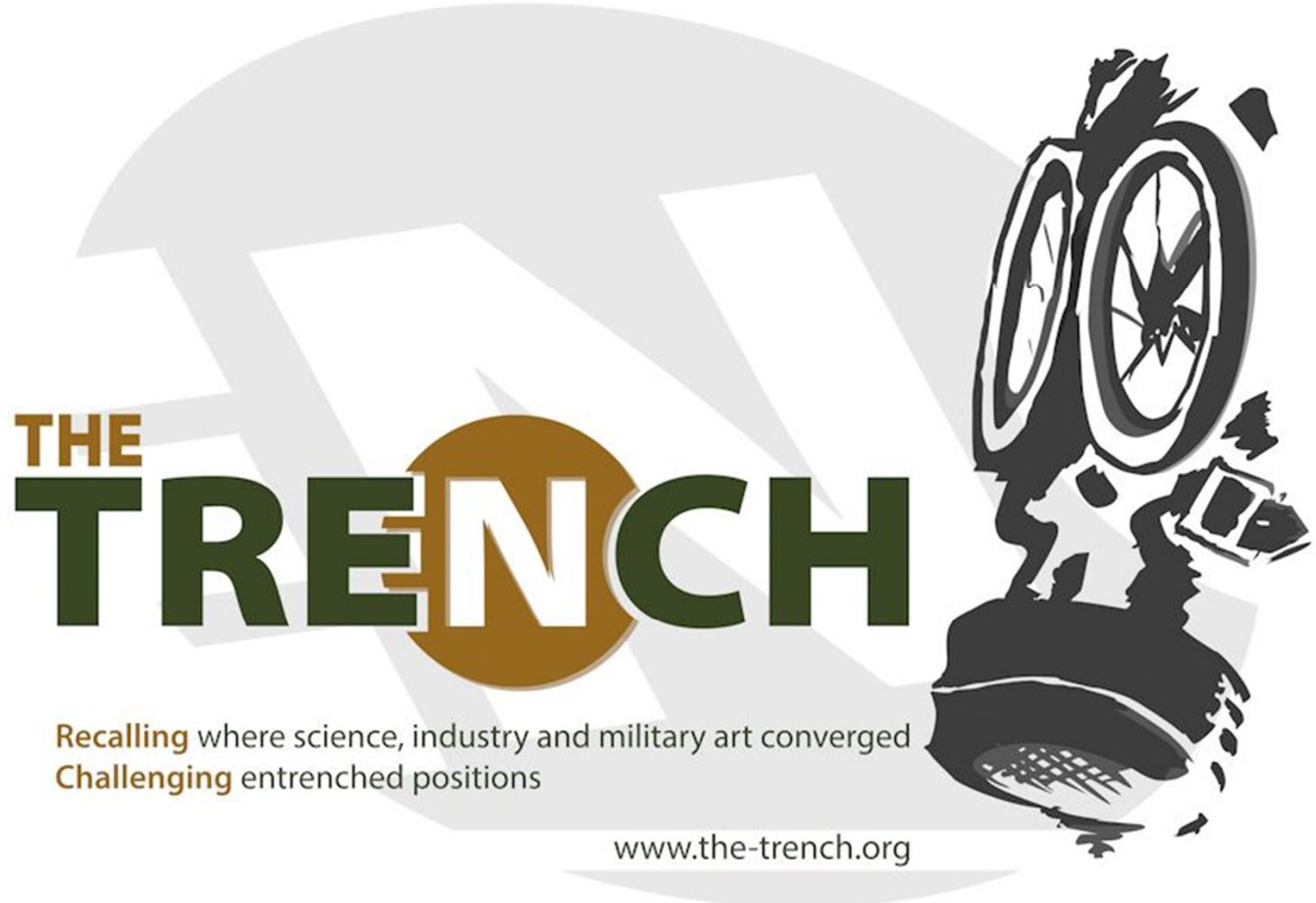
Potential for future weapon development

- Biology and biotechnology allow for the manipulation of disease on the sub-cellular level (genes, biochemical processes, etc.)
 - May make the effects of biological agents more controllable
 - May produce agents with higher infectivity or ability to overcome medical defences
- Interference with the natural immune system rather than dissemination of pathogen may become new mode of attack
- Improvements in production processes: higher quality & higher quantities in smaller units
- Possible application of synthetic biology and nanotechnology
 - In agent design
 - In dissemination technology
 - In defence, protection and prophylaxis
- May contribute to novel ways of agent dissemination
 - Aerosol techniques
 - Targeting of specific genes

Where is the main future threat?

- With terrorist & criminal entities?
- With loners?
- With state-run programmes
 - 'Pure' offensive programmes?
 - Hidden in biodefence programmes?
 - Independent programmes without overall central oversight?
- What may trigger a 'rebirth' of offensive BW programmes?
 - S&T base in place
 - Production capacity available
 - New confluence of trends in science & technology is already underway
 - Enabling platforms → difficult to foresee what may be available in, say, 5 years
 - However, what about
 - Doctrinal development and assimilation of BW into doctrine?
 - Dissemination systems?
 - Training of troops (small and large formations)?
- Can the current approach to disarmament / threat control meet these types of challenges?

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