Future Disarmament Challenges for Chemical & Biological Weapons

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Part 1

WHAT IS CHEMICAL AND BIOLOGICAL WARFARE?
What is chemical warfare?

Intentional application for hostile purposes of toxic substances against humans and their environment

- **Blood agents**: prevention of oxygen transfer to tissues (e.g. phosgene)
- **Choking agents**: interfere with breathing (e.g. chlorine)
- **Nerve agents**: attack the central nervous system (e.g. sarin)
- **Vesicants**: produce blisters (e.g. mustard agents)
- **Incapacitating agents**: induce temporary physical disability or mental disorientation (e.g. LSD, BZ, Fentanyl)
- **Irritating agents**: induce temporary irritation (e.g. tear gas)
- **Anti-plant agents**: herbicides, growth inhibitors, etc.
Chemical warfare
What is biological warfare?

Intentional application against humans, animals or plants for hostile purposes of

- **Disease-causing micro-organisms** (e.g. bacteria);

- **Other entities that can replicate themselves** (e.g. viruses, infectious nucleic acids and prions)

- **Toxins**, poisonous substances produced by living organisms (and their synthetically manufactured counterparts), including
  - micro-organisms (e.g. botulinum toxin),
  - plants (e.g. ricin derived from castor beans), and
  - animals (e.g. snake venom)
Visions of Biological Warfare

Anthrax

Plague
Visions of Biological Warfare – 2

Smallpox
The CBW threat spectrum

- War scenarios
- Terrorism
- Criminal acts

- Each will consider and have the availability of different CB agents, with different degrees of pathogenicity or toxicity
  - Depends on intent
  - Depends on availability
  - Depends on technical skills and structure of the organisation
Alternative uses of CB agents

• **Against humans**
  • Potential for mass casualties exists, but not necessarily most likely scenario as agents difficult to acquire
  • Incapacitation
    • Wider range of agents available
    • Easier to collect from nature and cultivate
    • Delivery uncomplicated
    • Lower requirements for skills and functional specialisation

• **Against animals and plants**
  • Economic impact
  • Agents easier to acquire; less of a risk to perpetrator
  • Easy to deploy
    • Many vulnerabilities in the food chain

• **Economic and societal disruption**
  • Goal is to disrupt functioning of utilities, commercial enterprises, public agencies
  • Wider range of CB agents available
    • Several can be commercially obtained
  • Exploitation of fear and lack of adequate preparations
  • Effectiveness of hoaxes
Part 2

PROHIBITING
CHEMICAL AND BIOLOGICAL WARFARE
Non-conventional weapons
Main prohibitions against CBW

• **1925 Geneva Protocol**
  - Prohibits the use in war of CBW

• **1972 Biological & Toxin Weapons Convention (BTWC)**
  - Comprehensive ban on development, production and possession of BW

• **1993 Chemical Weapons Convention (CWC)**
  - Comprehensive ban on development, production, possession, and use of CW
Genesis CBW Prohibition

Customary law prohibiting poison use

1899 Hague Peace Conference

Hague Declaration IV.2
Ban use of projectiles whose sole purpose is diffusion of asphyxiating gases

Convention Laws of War (1899 & 1907)
Poisoned weapons use banned

1925 Geneva Protocol
Ban on use of asphyxiating gases and bacteriological methods of warfare

1972 Biological and Toxin Weapons Convention (BTWC)

1993 Chemical Weapons Convention (CWC)

1945-46 Nürnberg trials
Poisoned weapons use ban declared universal

1998 Rome Statute Establishes International Criminal Court
CW: Confluence of several trends

- **Emergence of chemistry as a science**
  - End 18th century; rapid development in 19th century
  - Development of new analytical and production methods
  - Toxic chemicals are manufactured; not derived from nature

- **Discovery and synthesis of new chemicals**
  - *Chlorine*: first preparation in 1774
  - *Phosgene*: first preparation in 1811
  - *Mustard gas*: compound first described in 1822; first useful synthesis process of sulphur mustard in 1886

- **Industrialisation**
  - Second industrial revolution in the 2nd half of the 19th century
  - Commercial application of chemistry
  - Integration of science and large-scale production based on economic rationale

- **Education**
  - Permeation of science and technology throughout society
  - Impact on problem identification, analysis, and application of technical solutions in all sectors of society

- **World War 1**
  - Industrialisation of warfare (total war)
  - Forced integration of science, industry and military art
Foundations of biological warfare

- Three critical characteristics of disease uncovered in late 19th century:
  - 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

- Furthermore, it requires the ability to manipulate the pathogen
  - Isolation
  - Cultivation (while maintaining its infectiveness)
  - Production in large quantities
  - Effective dissemination
The ‘dual-use’ challenge

- **Dual-use issues** arise when the attempts to control a particular technology confront the non-military commercial and scientific interests in such technology

- **Non-proliferation**
  - Control of access to technologies that may contribute to undesired weapon development in another state or non-state entity
  - Primary policy tool for weapon categories whose use in war or possession has not been wholly delegitimised (e.g., nuclear weapons, ballistic missiles)

- **Disarmament**
  - Total ban on development, production, transfer and possession of a weapon and preparations for its use in warfare (BTWC, CWC)
  - ‘Dual-use’ issue emerges when
    - Civilian facilities and installations need to be verified
    - Technologies underlying banned weapons have legitimate applications
    - Need to prevent the (inadvertent) assistance to development of banned weapon by another state or non-state entity
  - Ban of weapon (= single-use technology) is central; control of dual-use technology supports that central goal → use of the concept of the General Purpose Criterion
New confluences in science and technology

• **Convergence of several scientific and technological domains:**
  - Biology and chemistry
    - Development of new generation of incapacitating agents
    - Manipulation of biochemical processes on sub-cellular levels
  - Nanotechnology (chemistry and physics)
    - Construction of artefacts on the level of individual molecules or atoms
    - May also be useful for new CBW defence technologies, protection or detection
  - Informatics
    - Computer-assisted creation of new compounds and study of their properties
    - Increasingly fast design of new molecules / gene sequences: 250,000 new genes sequenced/day; 15,000 new chemicals registered (CAS)/day
    - Simulation of processes
  - Engineering and process designs

• **Evolution of production processes:**
  - Modular production processes → may pose challenges for verification thresholds in treaties
  - Computer-steered production processes: consistent quality, reduced need for cleaning or interruptions for feeding (e.g., incubation or fermentation processes)
Armament vs. Disarmament

• **Armament**
  - Process of assimilation whereby an arm or arms category becomes fully integrated into military doctrine
    • Political (security policies, bureaucratic interests, etc.) and military (doctrine) imperatives must be reconciled with each other
  - Outcome: weapon technology deployed with military forces → stockpiling, training, etc.

• **Disarmament**
  - Removal of an arms category from military doctrine (Go to zero)
    • Weapon destruction is one facet of disarmament (= backward looking dimension)
    • Prevention of re-armament or re-emergence of weapon technology is also a goal (= forward looking dimension)
  - Outcomes:
    • Removal of pull / push factors that stimulate the armament dynamic
    • Military forces lose capacity to use weapon: no weapon testing, no training, no tactical development
    • A ban on weapon technology and its use becomes a major moral & legal disincentive for future armament (political and societal opposition)
  - Consequence: gap in security policy; has to be addressed by alternative, non-prohibited means
    • Diplomacy; alliance policies; armament with non-prohibited weaponry that performs a similar function in military doctrine

• **(Arms control)**
  - Maintenance of specific levels of weaponry (mostly weapon reductions, but may involve increases)
  - Weapon technology not removed from military doctrine
Disarmament strategies

- **Eliminating destabilising types of weaponry**
  - Armament categories that may contribute to the outbreak of war
    - 1910s: battleships
    - Biological Weapons (BW); Chemical Weapons (CW); Nuclear weapons (NW)
    - Certain types of delivery systems
    - *Current challenges*: cyber weapons; space weapons
  - Armament categories that risk to escalate conflict if they were used
    - CW; Certain sub-categories of NW (e.g. tactical weapons)

- **Removing weapon categories that are excessively injurious (to non-combatants)**
  - Post-conflict weapon recovery and destruction
    - Small arms collection and destruction
    - Demining operations
  - Rendering acquisition, possession and use illegal under international law, with additional requirement to destroy existing stockpiles
    - Landmines; Cluster munitions
    - Nuclear Weapons
    - Lethal Autonomous Weapons (so-called ‘Killer robots’); Artificial Intelligence in weapon systems
Disarmament / Non-proliferation paradigm shift after 1990

• **Paradigm shift from disarmament to non-proliferation**
  - Focus shift from weapon elimination to prevention of capability building
    - Technology rather than the weapon itself becomes central concern
    - Potential possessor rather than the weapon becomes the issue
    - Impact on BTWC (Protocol) and CWC
  - **Objective vs. subjective goals**
    - Disarmament: goals specified in treaty and apply equally to all parties
    - Non-proliferation: Different approaches to different countries based on *subjective judgment of intent*
  - Non-proliferation: CBW threat can never disappear
    - Resolution of one proliferation threat does not affect other ones
    - Even if all resolved today, there is always tomorrow’s threat

• **Consequences:**
  - Framing of the threat is in function of the dominant power
    - Limited consensus on nature and size of threat
    - Threat appreciation differs according to
      - View of state as global, regional, or local power
      - Acceptance of security dependency (e.g., participation in security alliances)
    - Different perceptions of urgency to take measures and nature of those measures
  - ‘Traditional’ verification mechanisms no longer seen as adequate
Entrance of the post-proliferation era?

**Biological:**
- Biology and biotechnology critical to development & health
- Many developing countries conduct leading-edge research
- Education expanding everywhere:
  - Geographical spread of knowledge to manipulate pathogens, including genetics
  - Banalisation of many research and development processes (e.g., introduction into secondary education; drop in cost of equipment and processes; etc.)
- Biotechnology is essentially information: no physical goods to cross borders
- Corporate acquisition and sell-offs

**Chemical:**
- Similar to biological
- Many large (older types of) production facilities with potential for CW manufacture now in developing world (impact on organisation & cost of verification)
BTWC & CWC in a polycentric world

- No unified model for governance of weapon control anymore
- New stakeholders and security actors
- Increased role of non-state national & transnational actors
- Shifting relative balances of powers (economy, politics, military) and multiple power centres
- Geographical decentralisation of business and industry activities
- South-south trade patterns and impact on technology diffusion

Declining role of states in shaping developments, but many states reject formal governance responsibilities for non-state actors under BTWC & CWC
Recalling where science, industry and military art converged
Challenging entrenched positions

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