



Biological Weapons

*Their threat, their control
and the need for stakeholder involvement*

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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)
- 



Main prohibitions against BW

- **1925 Geneva Protocol**

- Prohibits the use in armed conflict of chemical and biological weapons (CBW)

- **1972 Biological and Toxin Weapons Convention (BWC)**

- Comprehensive ban on development, production and possession of biological weapons (BW) and toxins
- Ban on BW use in Geneva Protocol + Final Declaration of 4th Review Conference (1996)

- **1993 Chemical Weapons Convention (CWC)**

- Comprehensive ban on development, production, possession, and use of chemical weapons (CW)
- The definition of chemical weapon also includes toxins
 - Links up with the BWC



The BW threat spectrum

- War scenarios
- Terrorism
- Criminal acts

- Each will consider and have the availability of different biological or toxin 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 biological 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 biological agents available
- Exploitation of fear and lack of adequate preparations
- Effectiveness of hoaxes





Modern biological weapons and warfare: Confluence of several trends

- **The scientific understanding of disease**
 - Three critical characteristics of disease uncovered in 19th century (Koch postulates):
 - 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
- **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)
 - Convergence with other scientific disciplines (e.g., chemistry, informatics, etc.)
- **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 → convergence with chemistry for incapacitating agents)



Perspectives on the BW threat

- **Use of biological and toxin weapons has so far been extremely rare**
 - Since 1975, > 100 persons have been killed through deliberate disease
 - Most cases involved toxins
 - Most cases were criminal in nature
 - Major terrorist BTW programmes have been total failures (Rajneesh Cult; Aum Shinrikyo)
 - However, anthrax letters (USA, 2001) demonstrate the potential for low-casualty — high-impact events
 - Most bioterror events do not involve actual agents (hoaxes)
- **We have arrived in a post-proliferation stage**
 - Biotechnology (equipment, processes, products, knowledge) has become universal
 - Developing countries (Cuba, India, Indonesia, Iran, Malaysia, Pakistan, etc.) have become original sources of innovation and, in some cases, technology exports



Nature poses the greatest challenge

- **Infectious diseases are responsible for**
 - > 13 million deaths annually (\approx number of fatalities in the Twin Towers attacks on 9/11 every two hours)
 - $\frac{1}{4}$ of all deaths worldwide
 - $\frac{1}{2}$ of all deaths in developing countries
- **1918: Spanish Flu** caused more fatalities worldwide than World War 1
- **Emerging diseases:** SARS; West Nile Virus; Avian flu (H5N1 and H7N9), Zika
- **AIDS in Africa:** threat to social fabric of societies
- **Ebola in West Africa**
 - Pointed to shortcomings in international assistance
 - Impacted on consideration of implementation of BWC Article VII
- **Economic impact of non-human disease outbreaks:**
 - Swine Fever outbreaks in Taiwan (1994 – 2001)
 - Foot and Mouth Disease outbreak in the UK (2001)



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 analytical and production processes:**
 - Higher quality & higher quantities in smaller units
 - Technologies become common place (classroom equipment; bio-hacker laboratories)
- **Possible application of synthetic biology and nanotechnology in agent design or dissemination technology, as well as in defence, protection and prophylaxis**
- **May contribute to novel ways of agent dissemination**
 - Aerosol techniques
 - Targeting of specific genes



Preventing biological weapons

- **Logical point of entry: weapons and their application**
 - However, treaties only govern inter-state behaviour
 - Biological warfare (states) / terrorism / crime
 - need for domestic (criminal, penal) legislation
 - *Prevention* of terrorism:
 - also responsibility of the individual
- **Possible additional points of entry**
 - Prevention of disease (irrespective of origin of outbreak)
 - Preserving biology and biotechnology for peaceful purposes (societal advancement, economic development, health security, food security, etc.)
 - Environmental security (impact of accidental or purposeful introduction of organisms in new biotopes or of modified organisms)



Towards a multi-layered & multi-sectorial governance model?

- **Weapon control**
 - Multilateral agreements (Geneva protocol, BTWC, CWC)
 - Proliferation prevention arrangements (Australia Group, PSI, Global Partnership, etc.)
 - UN agencies: UNSC, UNODA, 1540 Committee, UNEP, UNDA, etc.
 - National laws and regulations (criminal, penal, trade, safety, etc.)
- **Disease prevention**
 - WHO, FAO, OIE + their regional organisations/initiatives
- **Crime and terrorism**
 - UNSC Resolutions (1540, terrorism resolutions, etc.)
 - Interpol, Europol, etc.
- **International transfers**
 - WTO, WCO, etc.
- **Economic actors**
 - Companies (national, multinational, transnational)
 - Research institutions
 - Individuals
- **Instruments of collective & individual governance**
 - Codes of conduct; Professional codes; Ethics
 - Awareness-raising & education
 - Whistle-blower protection schemes





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