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

- **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 (≈ number of fatalities in the Twin Towers attacks on 9/11 every two hours)
  - ¼ of all deaths worldwide
  - ½ 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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