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Biological weapons

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Introduction

- **Biological and toxin weapons** are either microorganisms like virus, bacteria or fungi, or toxic substances produced by living organisms that are produced and released deliberately to cause disease and death in humans, animals or plants.
- Biological agents like anthrax, botulinum toxin and plague can **pose a difficult public health challenge** causing large numbers of deaths in a short amount of time.
- Biological agents which are capable of secondary transmission **can lead to epidemics.**
- In case of war and conflict, high-threat pathogens laboratories can be targeted, which might lead to serious public health consequences.

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Background

- The use of biological agents as bioweapons **has its roots in ancient times**, when the concepts of bacteria, toxin or virus were not known yet.
- Over 2,000 years ago, rudimentary techniques of biological warfare resolved the first disputes among people.
- In the last few decades, the development of innovative biotechnology techniques has provided the knowledge to create more aggressive bioweapons.
- Although **international conventions prohibit the use of biological agents** for offensive purposes, it is known that many terrorist groups continue their research about the possible use of biological agents as bioweapons.

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Examples of use biological weapons in the history:

- **more than 2 and a half millennia -** Assyrians infected their enemy's wells with a rye **ergot fungus**, which contains chemicals related to LSD. Consumption of the tainted water leaded to confused mental state, hallucinations, and death.
- **In the 1300s,** Tartar (Mongol) warriors besieged the Crimean city of Kaffa. During the siege, many Tartars died at the hands of **plague,** and their lifeless, infected bodies were hurled over the city walls.
- Some researchers believe that this tactic may have been responsible for the spread of Black Death plague into Europe. If so, this early use of biological warfare caused the eventual deaths of around 25 million Europeans.
- Moving forward to **1763**, the British Army attempted **to use smallpox** as a weapon against Native Americans at the Siege of Fort Pitt. In order to spread the disease to the locals, the Brits presented blankets from a smallpox hospital as gifts. It was an ineffective way to spread the disease.

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- **During World War II**, many of the parties involved looked at biological warfare with a great interest. The Allies built facilities capable of massive producing **anthrax spores**, **brucellosis**, and **botulism toxins.** Thankfully, the war ended before they were used.
- The Japanese army poisoned more than 1,000 water wells in Chinese villages to study **cholera** and **typhus outbreaks**. Some of the epidemics they caused persisted for years and continued to kill more than 30,000 people **in 1947**, long after the Japanese had surrendered."
- **In 1986**, 715 people in Oregon contracted **salmonellosis** from a deliberately contaminated lettuce.
- Distribution of powder with **anthrax** disputes in postal items **in 2001** in the USA).

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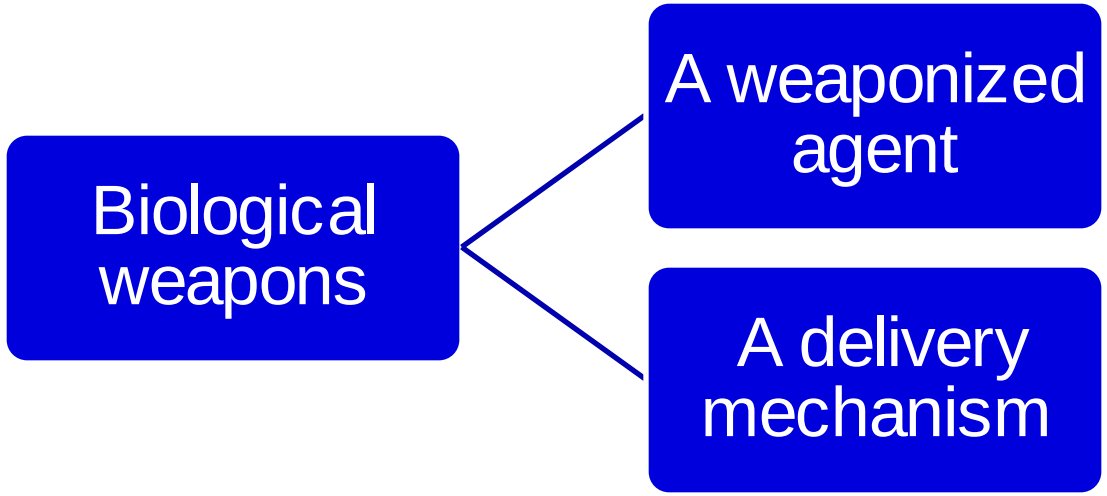
Characteristics

- **Biological agents** have a unique feature when compared to other non-conventional weapons (chemical or radiological); with the exception of toxins, they **are able to multiply in the host** and in turn be transmitted to other individuals, generating in this way with unpredictable effects on the population, both in terms of number of victims and geographical spread.



Weaponized agent and delivery mechanism

Weaponized agent

- Almost any disease-causing organism (such as bacteria, viruses, fungi, prions or rickettsiae) or toxin (poisons derived from animals, plants or microorganisms, or similar substances produced synthetically).
- The agents can be enhanced from their natural state to make them more suitable for mass production, storage, and dissemination as weapons.

Delivery mechanism

Past programmes have constructed missiles, bombs, hand grenades and rockets to deliver biological weapons. Also designed spray-tanks to be fitted to aircraft, cars, trucks and boats. Variety of sprays, brushes and injection systems as well as means for contaminating food and clothing.

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Biological weapons can be used for:

- Political assassinations
- The infection of livestock or agricultural produce to cause food shortages and economic loss
- The creation of environmental catastrophes
- The introduction of widespread illness
- Fear and mistrust among the public

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Categories of biological agents:

Category A

- Agents that can be easily disseminated or transmitted from person to person.
- Result in high mortality rates and have the potential for major public health impact.
- Might cause public panic and social disruption, and require special action for public health preparedness
- Anthrax, Botulism, Plague, Smallpox, Viral hemorrhagic fevers, etc.

Category B

- Agents that are moderately easy to disseminate.
- Result in moderate morbidity rates and low mortality
- Require specific enhanced diagnostic capacity and disease surveillance.
- Brucellosis, Food safety threats (Salmonella), Water safety threats (Vibrio cholerae), etc.

Category C

- Emerging agents that could be engineered for mass dissemination in the future because of their availability.
- Easy to produce and disseminate.
- Potentially linked to high morbidity and mortality rates, and major health impact
- Emerging infectious diseases (Nipahvirus and Hantavirus), etc.

Source: Center for Disease Control and Prevention (CDC)

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Biological agents (included those used as bioweapons) can be further classified according to certain characteristics that define the hazard to health (NATO, 1996):

- **Infectivity:** The aptitude of an agent to penetrate and multiply in the host.
- **Pathogenicity:** The ability of the agent to cause a disease after penetrating into the body.
- **Transmissibility:** The ability of the agent to be transmitted from an infected individual to a healthy one
- **Ability to neutralise**: Its means to have preventive tools and / or therapeutic purposes.

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Ways of transmission:

- **Parenteral:** Agents that are transmitted through body fluids or blood.
- **Airway (by droplets):** Agents that are emitted by infected people, which can then be inhaled by surrounding people.
- **Contact:** Through which the agents present on the surface of the infected organism can infect another organism.
- **Faecal-oral route:** Through objects, foods or other items contaminated with the faeces of infected patients, or through sexual contact.

Biological event

Should a suspicious disease event occur, it would be difficult to determine if it was caused by nature, an accident, sabotage, or an act of biological warfare or terrorism.

Consequently, **the response to a biological event**, would involve the coordination of actors from many sectors who together possess the capability to determine the cause and attribute it to a specific source. **The preparedness for and prevention** of such an event should also involve multi-sectoral coordination.

Spectrum of biological risks

Bioterrorism

- the **deliberate release** of viruses, bacteria, toxins or other harmful agents to cause illness or death in people, animals, or plants.
- can be spread **through the air, water, or in food**.
- extremely **difficult to detect** and do not cause illness for several hours to several days.
- utilizing such weapons holds a certain **appeal to terrorists.**
- **fairly cheap to produce** when compared with missiles or other more hi-tech equipment.

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Preparedness:

WHO advises **strengthening public health surveillance and response activities**, with an emphasis on:

- more **effective national surveillance of outbreaks of illness**, including alert and response systems at all levels that can detect diseases that may be deliberately caused;
- **improved biosafety and biosecurity** throughout the health sector;
- **better communication between multiple sectors**, including public health, animal health, water supply, food safety, poison control, civil protection, law enforcement, and security services;
- **improved assessments of vulnerability**, and **effective communication about risks and threats** to both professionals and the public;
- **preparation for handling the psychosocial consequences** of the deliberate use of pathogens to cause harm;
- **contingency plans** for an enhanced response capacity by all sectors.

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Response:

- **working with relevant international or national organizations** to better characterize the nature, scope and impact of the event;
- **facilitating the public health investigation** of the event, including referral to appropriate laboratories for confirmation and characterization of the pathogen;
- **offering targeted training to public health responders**;
- **facilitating the identification and acquisition of necessary materials** (such as personal protective equipment) appropriate to the event;
- supporting the continued **delivery of essential health services**;
- **developing guidance material** specific to the pathogen or toxin in question.

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International coordination

- The Geneva Protocol (formally known as the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare), entered into force in February 1928. It represented the first important milestone towards a comprehensive ban on biological weapons by prohibiting their use.
- **The Biological Weapons Convention (BWC)** relies primarily on a network approach based on coordination with international, regional, and nongovernmental organizations and initiatives in order to address the interconnected nature of biological threats in a holistic manner.
- The **Biological Weapons Convention (BWC)**, which effectively prohibits biological and toxin weapons, was opened for signature on 10 April 1972 and entered into force on 26 March 1975.

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Thank you for your attention!

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