

# Biological warfare, bioterrorism, and biocrime

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## Journal Club

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MSc. Juan Manuel Mendoza Méndez

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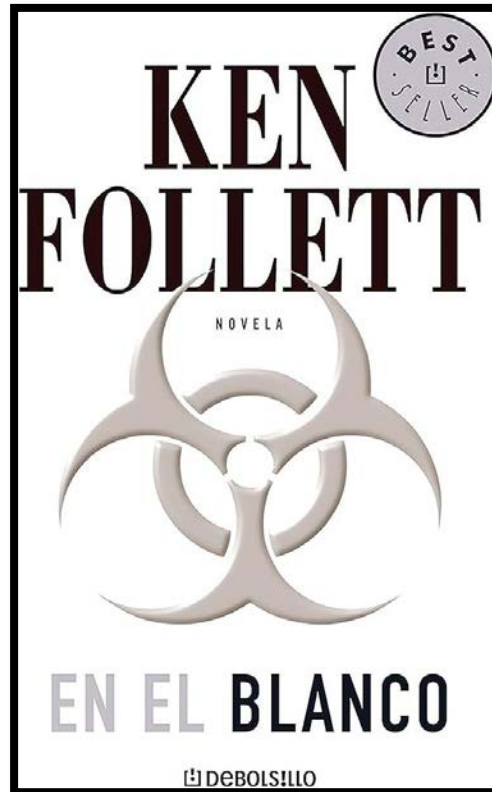
Laboratorio de Genómica Viral y Humana  
Facultad de Medicina  
Universidad Autónoma de San Luis Potosí

# Brief Introduction

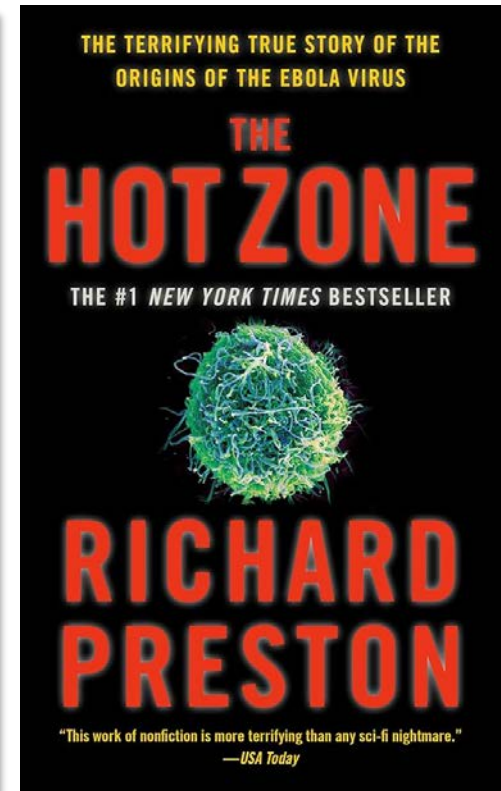
- Why am I so interested in biosafety, outbreaks and bioterrorism?



Dir. Steven Soderbergh (2011)



Ken Follet (2004)



Richard Preston (1994)



# Brief Introduction

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- Why am I so interested in biosafety, outbreaks and bioterrorism?

CDC classifies organisms related to bioterrorism in three categories:

## Category A

Pathogens that are rarely seen in the United States:

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 (*Bacillus anthracis*)

Botulism (*Clostridium botulinum* toxin)

Plague (*Yersinia pestis*)

Smallpox (*variola major*)

Filoviruses (Ebola, Marburg)

Arenaviruses (Lassa, Machupo)

## Category B

Second highest priority agents include those that

- are moderately easy to disseminate;
- result in moderate morbidity rates and low mortality rates; and
- require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance.

Brucellosis (*Brucella* species)

Epsilon toxin of *Clostridium perfringens*

Food safety threats (*Salmonella* species,

*Escherichia coli* O157:H7, *Shigella*)

## Category C

Third highest priority agents include emerging pathogens that could be engineered for mass dissemination in the future because of

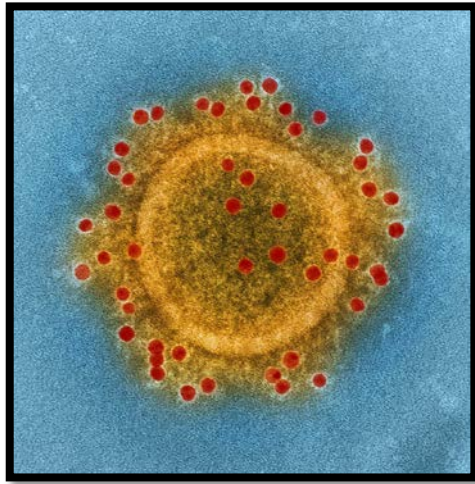
- availability;
- ease of production and dissemination; and
- potential for high morbidity and mortality rates and major health impact.

Nipah virus

**Hantavirus**

# Introduction

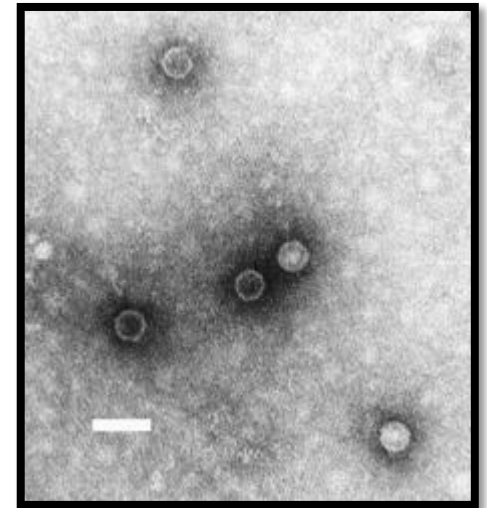
- Outbreaks of infectious diseases represents a constant threat to global health.



MERS CoV



Ébola Zaire



Polio Virus



# Introduction

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- Most epidemics emerge because of external, often climatological or geographical, factors. Some others, human interference can spread the disease.



Some zoonosis jump to a human host because the rainforest habitat of wild animal hosts is reduced.

Close contact to wild animals and what they carry.

# Introduction

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## Articles

### Financial influence on global risks of zoonotic emerging and re-emerging diseases: an integrative analysis



Victor Galaz, Juan Rocha, Paula Andrea Sánchez-García, Alice Dauriach, Tarik Roukny, Peter Søgaard Jørgensen



*“There is increased recognition, however, that various forms of anthropogenic changes—including deforestation, expansion of agricultural land, and increased hunting and trading of wildlife—can be associated with the emergence and re-emergence of such diseases, in particular of zoonotic and vector-borne diseases.”*



# Introduction

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- Most epidemics emerge because of external, often climatological or geographical, factors. Some others, human interference can spread the disease.
- A very special category of human-made outbreaks of disease is the manipulation and distribution of pathogens with the intention of disrupting societies. This is what government calls “**biological warfare**” (BW).

# Biological Weapons and BW

- Geneva Protocol (1925)



65 of 121 countries  
signed.

It prohibits the  
development,  
production and use in  
war of biological and  
chemical weapons.

- In the WHO definition, biological weapons achieve their intended target effects through the infectivity of disease-causing microorganisms.





# Biological Weapons and BW

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Definition and objective.

- BW is carried out by nation states that seek to undermine the will and abilities of an opponent to fight back.
- They may seek to kill or make ill large numbers of the opponent's armed forces, population, crops and livestock by the release of biological agents.

“The weaker, the better”

# Biological Weapons and BW: Historical data.

- Until WWII, the number of soldiers dying from a disease outweighed the number of killed in combat.
- The 95% and 82% of US hospitalizations on WWII and the Korean War, respectively, had been related to morbidity caused by a disease.

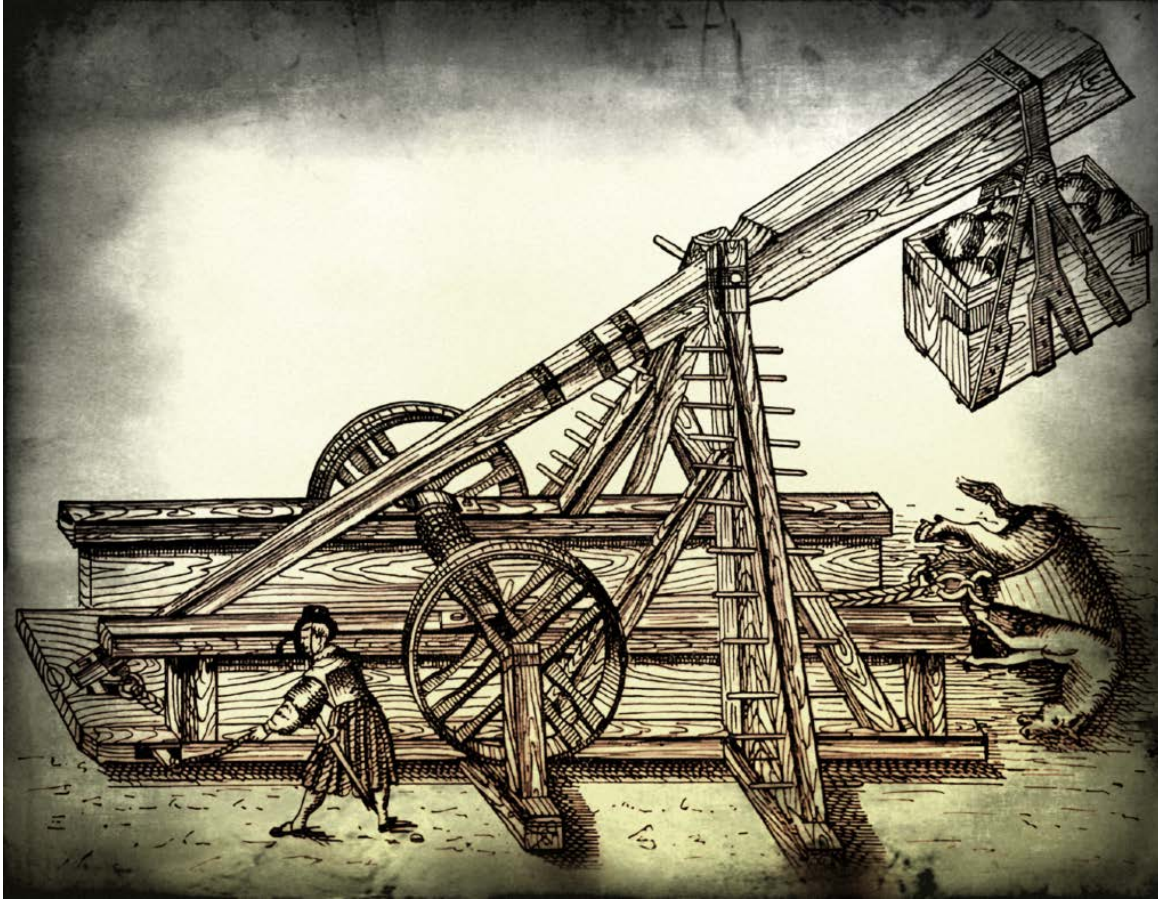


(B.J. Greenway Rasmussen Collection, Military Women's Memorial)

Malaria contributed to 56-75% of all hospital admissions of US force in the Vietnam War, by itself.

# Biological Weapons and BW: Historical data.

- Knowing how to use a disease to affect an army is not new.



Catapulting corpses  
of plague victims.  
(V – XV centuries)



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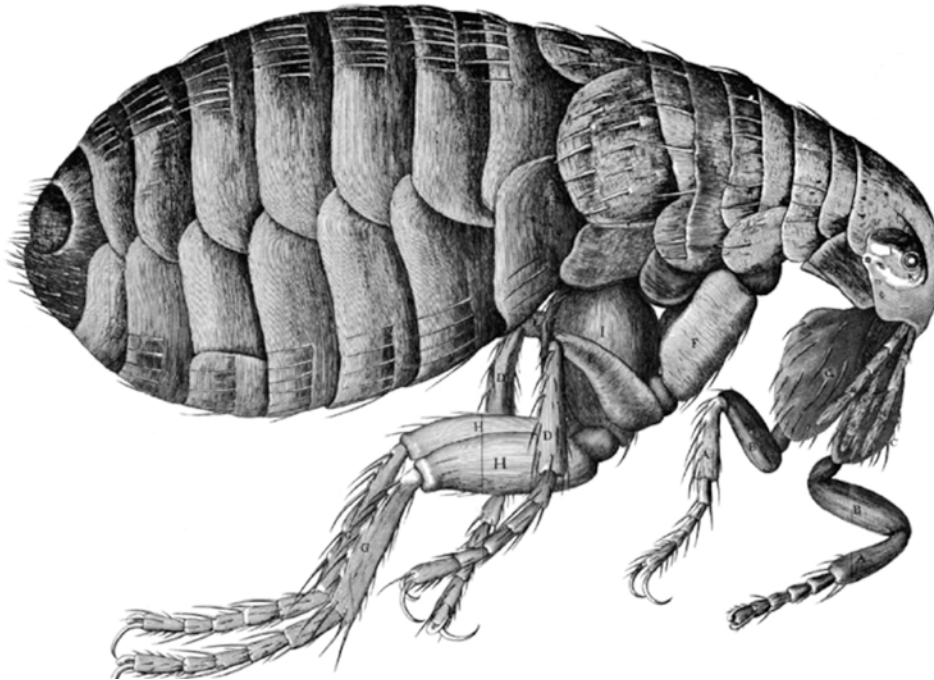
Blankets infected  
with smallpox given  
to Native  
Americans.  
(1763-1764)

Available at: <https://www.nlm.nih.gov/nativevoices/timeline/229.html>

# Biological Weapons and BW: Historical data.

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- Knowing how to use a disease to affect an army is not new.



Distribution of fleas  
infected with plague  
on WWII  
(Kaimingjie biological  
attack, 1940)

Available at: [https://en.wikipedia.org/wiki/Kaimingjie\\_germ\\_weapon\\_attack](https://en.wikipedia.org/wiki/Kaimingjie_germ_weapon_attack)



# Offensive biological programs?

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- Yes. Countries like USA and the former Soviet Union did have such programs (and maybe they still do).



In 1972, 170 countries signed to the Biological and Toxin Weapon Convention (BTWC).

Funny thing: USA “stopped” these programs in 1972. Soviet Union, until 1992.

# BTCW key articles.

## Treaty obligations [\[ edit \]](#)

With only 15 articles, the BWC is relatively short. Over time, the treaty has been interpreted and supplemented by additional politically binding agreements and understandings reached by its States Parties at eight subsequent Review Conferences.<sup>[33][34]</sup>

## Summary of key articles [\[ edit \]](#)

- **Article I:** Never under any circumstances to develop, produce, stockpile, acquire, or retain biological weapons.<sup>[35]</sup>
- **Article II:** To destroy or divert to peaceful purposes biological weapons and associated resources prior to joining.<sup>[36]</sup>
- **Article III:** Not to transfer, or in any way assist, encourage, or induce anyone else to acquire or retain biological weapons.<sup>[37]</sup>
- **Article IV:** To take any national measures necessary to implement the provisions of the BWC domestically.<sup>[38]</sup>
- **Article V:** Undertaking to consult bilaterally and multilaterally and cooperate in solving any problems which may arise in relation to the objective, or in the application, of the BWC.<sup>[39]</sup>
- **Article VI:** Right to request the [United Nations Security Council](#) to investigate alleged breaches of the BWC and undertaking to cooperate in carrying out any investigation initiated by the Security Council.<sup>[40]</sup>
- **Article VII:** To assist States which have been exposed to danger as a result of a violation of the BWC.<sup>[41]</sup>
- **Article X:** Undertaking to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and information for peaceful purposes.<sup>[42]</sup>



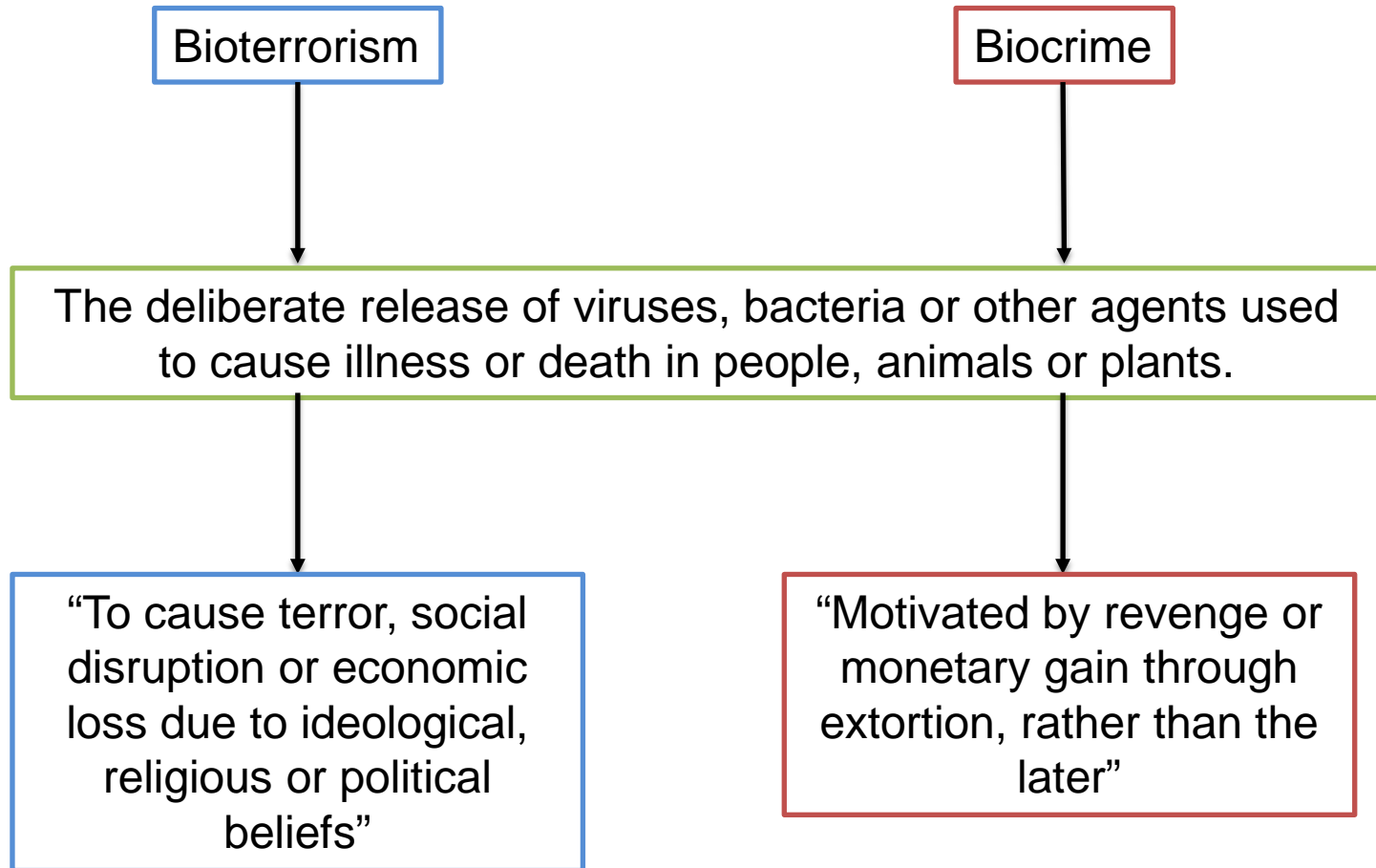
## The problem?

- The BTWC has no inspection mechanisms.
- As the BTCW states that the nations cannot use organisms as a biological weapon, such document does not specify which one, quantity, etc... Basically, any nation could be developing a biological weapon **right now**.

Available at: [https://en.wikipedia.org/wiki/Biological\\_Weapons\\_Convention](https://en.wikipedia.org/wiki/Biological_Weapons_Convention)

# Bioterrorism and biocrime.

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# Requerimientos for Potential Agents for Use In Bioterrorism.

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1. High morbidity or highly lethal.
2. Highly infectious or high toxicity (low ID50).
3. Suited for mass production and storage w/o lost of pathogenic potential.
4. Suited for methods aimed at wide-area delivery.
5. Relatively stable in the environment after dissemination for a period long enough to infect humans.
6. Suitable for genetic engineering and weaponization processes.

The US Department of Health and Human Services and the US Department of Agriculture declared three categories:

- a) Those that affect humans.
- b) Those that affect animals.
- c) Those that affect both.



# CDC Classification for Potential Agents for Use In Bioterrorism.

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Nipah virus

**Hantavirus**



# Examples of Bioterrorism.

The screenshot displays the Global Terrorism Database (GTD) website. At the top, the GTD logo and navigation links (ABOUT GTD, USING GTD, FAQ, TERMS OF USE, CONTACT) are visible, along with a 'START HOME PAGE' button. The main content area is divided into two sections. On the left, a red box contains a search bar with a 'SEARCH' button, a link for 'I'm a New User', an 'ADVANCED SEARCH' button, and a 'Browse by:' dropdown menu with a 'Go' button. On the right, a grey box titled 'Information on more than 200,000 Terrorist Attacks' provides a description of the database and a 'Learn more' link. Below these sections, the 'GTD DATA VISUALIZATIONS' section features a world map titled 'Terrorist Attacks, 2020 Concentration and Intensity' with a color-coded legend. The 'FEATURED' section on the right highlights a 'Data Update: A Look Back at 2020' with a list of key events including 'GLOBAL PANDEMIC: COVID-19', 'PROTEST-RELATED VIOLENCE & HATE CRIME', 'UNITED STATES - TALIBAN AGREEMENT', and 'ISLAMIC STATE POST-"CALIPHATE"'.

National Consortium for The Study of Terrorism and Responses to Terrorism.

# Examples of Bioterrorism.

## 1984/09/29: Osho cult biological attack on salad bars.

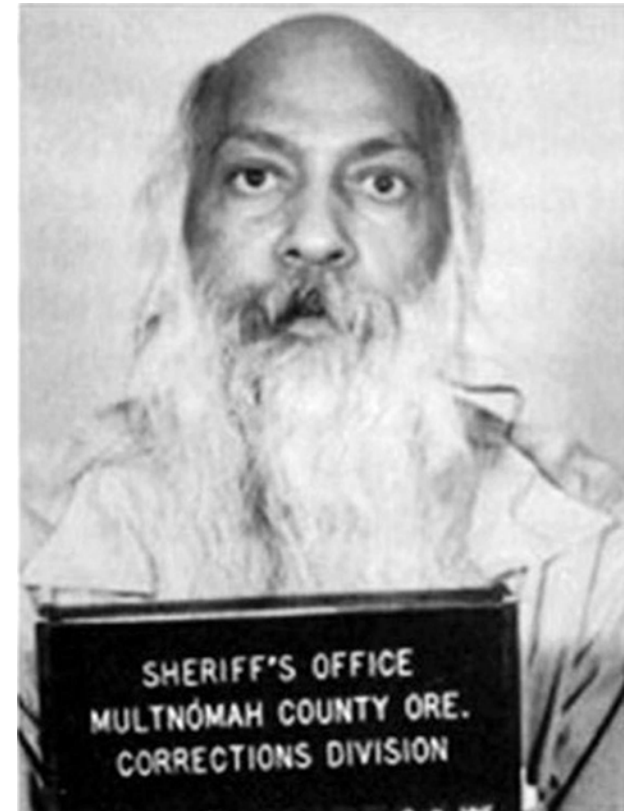
Incident summary: at least 751 people fell ill due to salmonellosis after eating on salad bars, in The Dalles, Oregon.

### Perpetrator group information

Group name	Claimed responsibility
Bhagwan Shree Rajneesh “Osho” cult.	Yes (until 1986).

### Motivation.

To dissuade the population to vote. The cult wanted to had two of the three seats at the Wasco County Circuit Court.



# Examples of Bioterrorism.

## 1995/03/20: Aum Shinrikyo group sarin attack.

Incident summary: 13 people killed in a coordinated attack in Tokyo, Japan.

### Perpetrator group information

Group name	Claimed responsibility
Aum Shinrikyo.	Yes

### Motivation.

Led by Shoko Asahara, his cult wanted to start the WWIII.

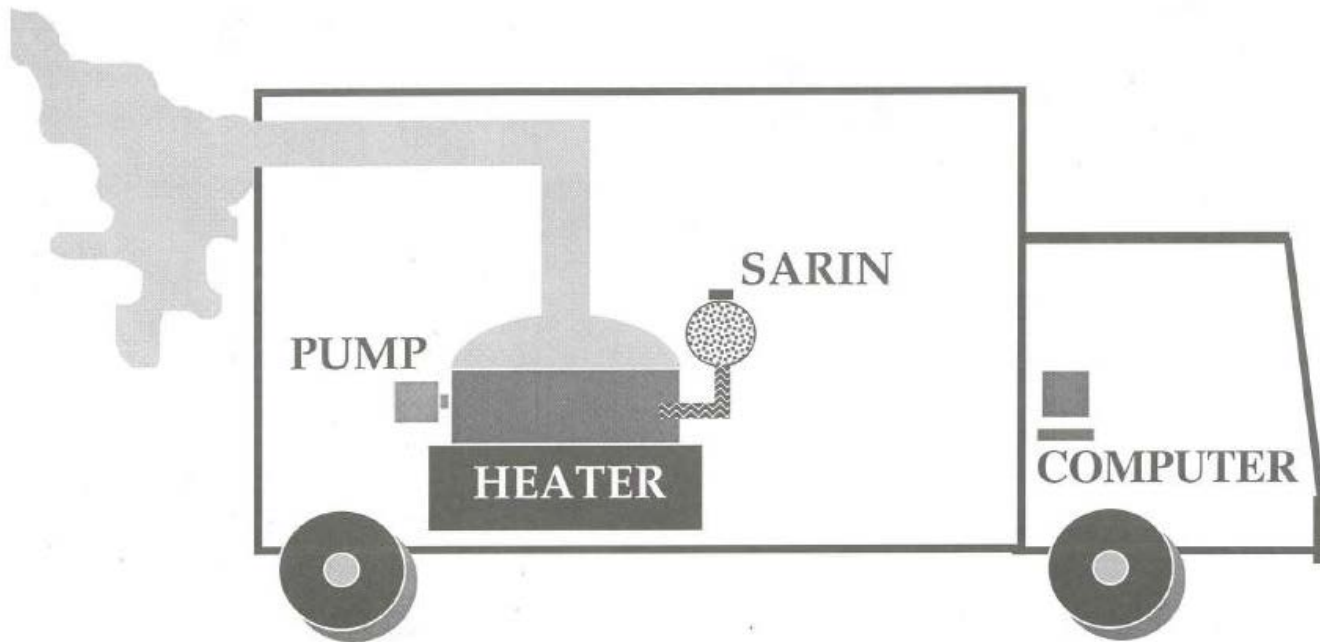


# Examples of Bioterrorism.

## 1995/03/20: Aum Shinrikyo group sarin attack.

Incident summary: 13 people killed in a coordinated attack in Tokyo, Japan.

How did they do it?





# Examples of Bioterrorism.

## 1995/03/20: Aum Shinrikyo group sarin attack.

Incident summary: 13 people killed in a coordinated attack in Tokyo, Japan.

Confirmed chemical attacks executed by Aum Shinrikyo<sup>[17]</sup>

Date	Agent	Location	Comments
Late 1993-early 1994	Sarin	Tokyo	Two failed attempts to assassinate Daisaku Ikeda, leader of <a href="#">Soka Gakkai</a> .
9 May 1994	Sarin	Tokyo	Attempted assassination of Taro Takimoto, an attorney working on behalf of victims of the group – Takimoto was hospitalized but made a full recovery.
27 June 1994	Sarin	Matsumoto	<a href="#">Matsumoto sarin attack</a>
20 September 1994	<a href="#">Phosgene</a>	Yokohama	Attempted assassination of Shoko Egawa, a journalist who had covered the <a href="#">1989 disappearance of Tsutsumi Sakamoto</a> .
Late 1994	VX	Various	VX was used to assassinate up to 20 dissident Aum members. <sup>[citation needed]</sup>
12 December 1994	VX	Osaka	Posing as joggers, Aum members sprayed Tadahito Hamaguchi, a man who the cult believed was spying on them, with VX from a syringe. He was pronounced dead four days later.
4 January 1995	VX	Tokyo	Attempted assassination of Hiroyuki Nagaoka, head of the 'Aum Shinrikyo Victim's Group' – Nagaoka was hospitalized for several weeks.
February 1995	VX	Tokyo	Attempted assassination of Ryuho Okawa, leader of the <a href="#">Institute for Research into Human Happiness</a> , who had criticized the group – Okawa suffered no ill effects.
20 March 1995	Sarin	Tokyo	<b>Tokyo subway sarin attack</b>
5 May 1995	<a href="#">Hydrogen cyanide</a>	Tokyo	Two vinyl bags – one containing sulfuric acid and the other containing sodium cyanide – were found, on fire, in the toilet of a subway station. Four injuries.



# Examples of Bioterrorism.

## 2001/09/18: Anthrax-contaminated letters.

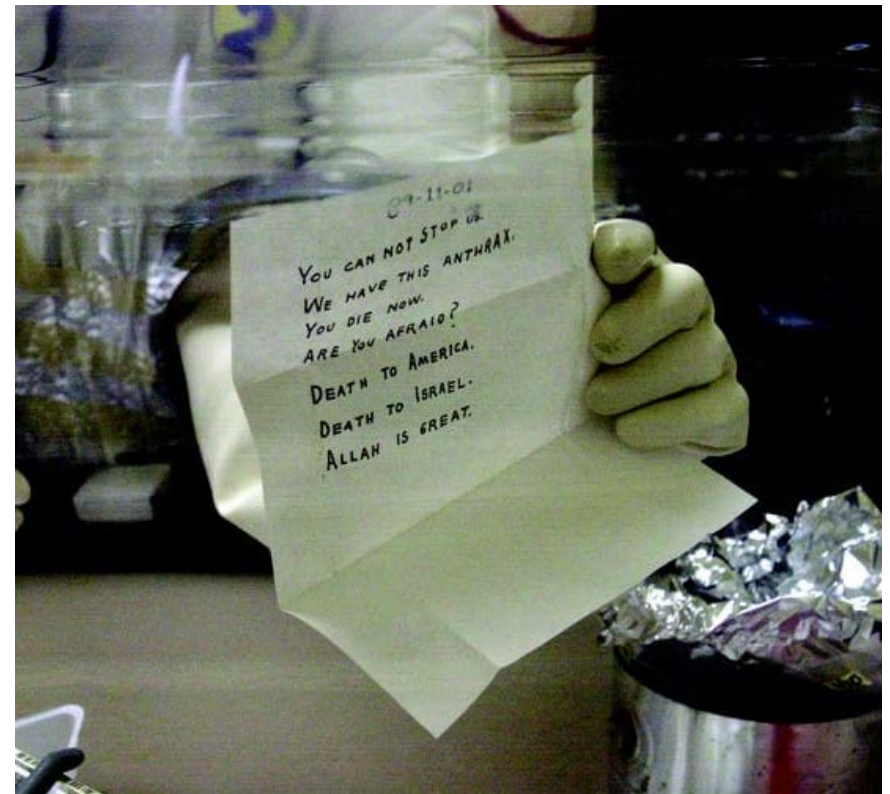
Incident summary: 5 people killed and other injured after receiving letters contaminated with anthrax.

### Perpetrator group information

Responsible name	Claimed responsibility
Dr. Bruce Edwards Ivins.	No (suicide, 2008)

### Motivation.

According to FBI, restart the anthrax vaccine program, led by Dr. Ivins.





# Conclusion.

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- Biological warfare, bioterrorism and biocrime are not something new.
- Even when there are several classifications, conventions and prohibitions regarding the creation, storage and usage of biological weapons, none of these can be proven around the globe.
- This means that, right now, while we are presenting this, some dude in Middle East, Central Africa or Mexico is working on a new strain of MERS-CoV, Ebola or Influenza.

# RVPVE

## Red de Vigilancia de Patógenos Virales Emergentes



CEFPE - SLP



CIAAS - CIACYT



Christian García-Sepúlveda — Laboratorio de Genómica Viral & Humana, Medicina UASLP

Juan Carlos Cuevas Tello — Grupo de Bioinformática, Ingeniería UASLP

Ignacio Amezcua Osorio — Comité Estatal para el Fomento y Protección Pecuaria de San Luis Potosí.

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Dulce Ma. Hernández Piña — Lab manager, LGVH UASLP

Sandra Guerra-Palomares — Virología molecular, LGVH UASLP

J. Manuel Mendoza Méndez — Coronavirus en murciélagos, LGVH UASLP

Nidya Jurado-Sánchez — Vigilancia de vectores y arbovirus, LGVH UASLP

Mariel Pacheco-Cortez — Tamizaje de hantavirus y arenavirus en roedores, LGVH UASLP

Samuel Mora Andrade — Patógenos Virales Emergentes en Murciélagos. Asesor externo

Salomón Altamirano Flores — Algoritmos de inteligencia artificial y datos genéticos, Ingeniería UASLP

Daniel Bandala Álvarez — Predicción epidemiológica algoritmos de inteligencia artificial, Ingeniería UASLP