THE USE OF ANIMAL PATHOGENS AS BIOLOGICAL WEAPON AGENTS THROUGHOUT RECENT HISTORY

by

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Two Aspects to My Presentation

Zoonotic pathogens can be used as biological warfare agents against:

1. Animals or;
2. Humans.

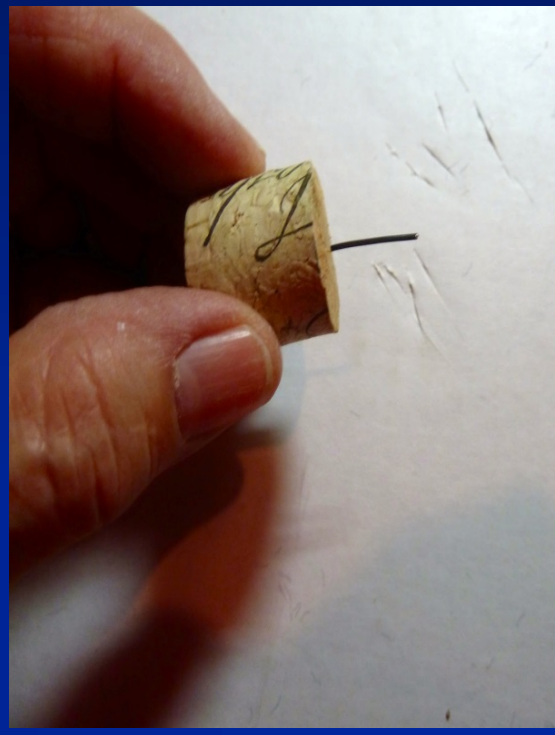
Biological Warfare in World War I by Germany

Germany's BW Program Directed by Army's General Staff

- 1899 Hague Convention interpreted by General Staff as prohibiting use of poison and poisoned arms against humans, but not animals.
- All known German biological sabotage were in Argentina, Norway, Romania, Spain, and U.S.A. – to sicken horses, mules, and reindeer that were needed by Allies for cavalry or as draft animals.

Biological Warfare Against U.S.A.

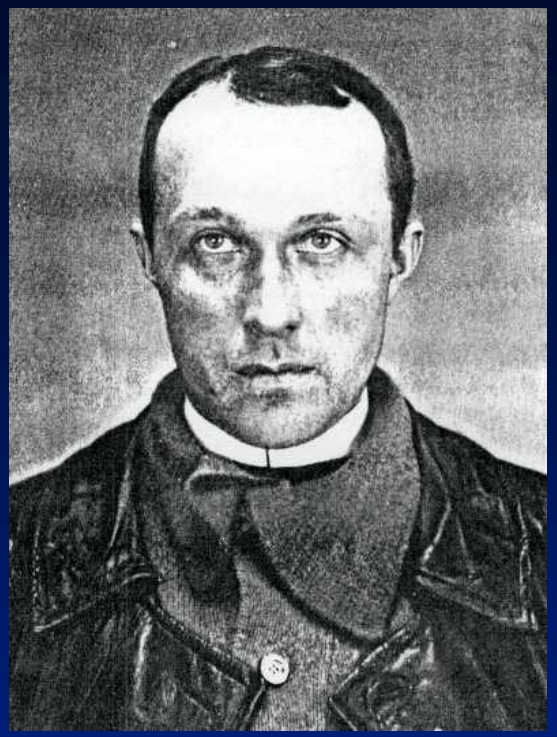
- Germany set up a sabotage network in the U.S. in 1915 to prevent flow of munitions and the shipping of horses and mules.
- Cultures of *Burkholderia mallei* and *Bacillus anthracis* were smuggled into U.S. and grown in Chevy Chase lab.
- Saboteurs filled small bottles with substrate containing pathogens and then closed them with corks holding needles. Operatives went to pens and jabbed animals with needles or dispensed liquid aliquots into food or water.
- End result: No recorded panzootics or human disease outbreaks of glanders or anthrax.



World War 1 - Norway

19 confiscated from luggage in 1917.

Sugar cubes containing tiny glass vials loaded with *B. anthracis* spores.



Baron Otto Karl von Rosen

Infect horses and reindeer used to transport military materiel from Sweden and Finland to Narvik and then to Allies.

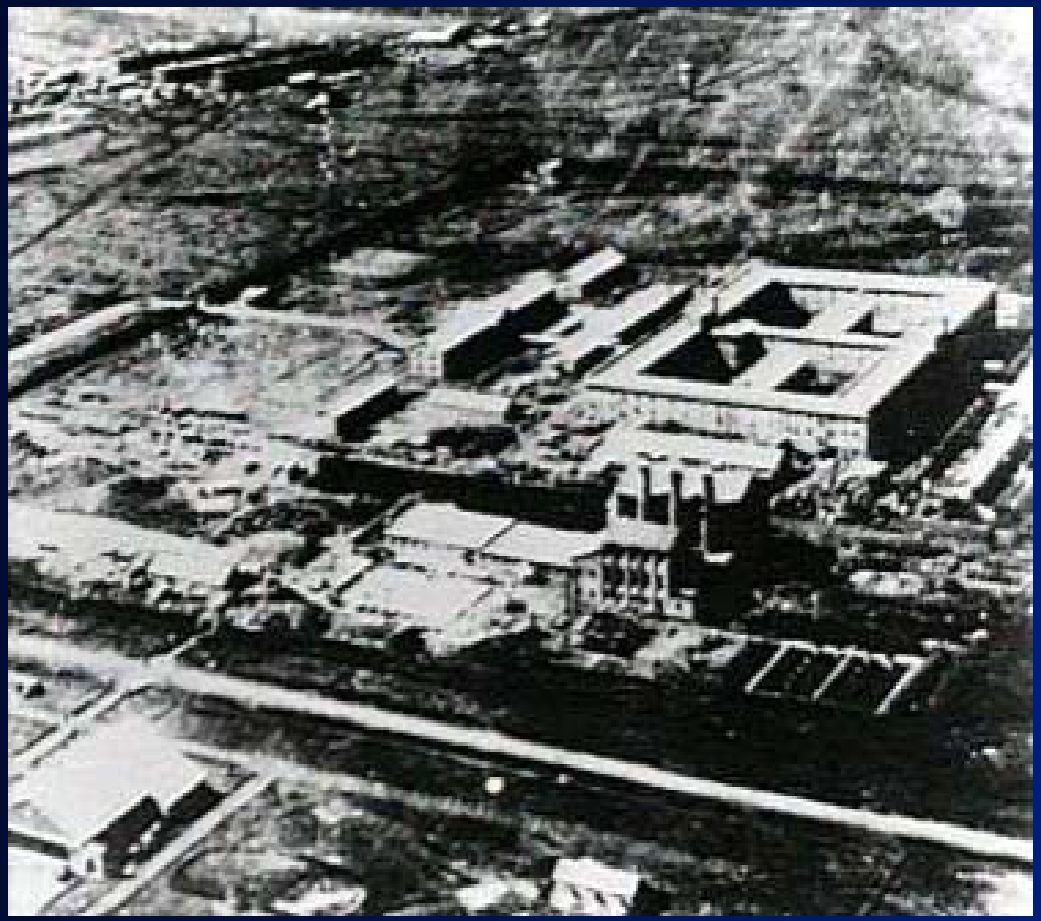
Post-World War I BW Programs

- USSR during 1928 – 1992
- Japan during 1932 – 1945
- United Kingdom during 1940 - 1958
- United States during 1941 – 1969
- South Africa's Project Coast during 1983 - 1993
- Iraq during 1978 – 1991

[All weaponized ≥1 zoonotic pathogens]

Japanese Biological Warfare Program

- Japan's BW program commenced in 1932. In 1936, its lead agency, Unit 731, moved its headquarters to Pingfan in Manchuria, headed by Shiro Ishii;



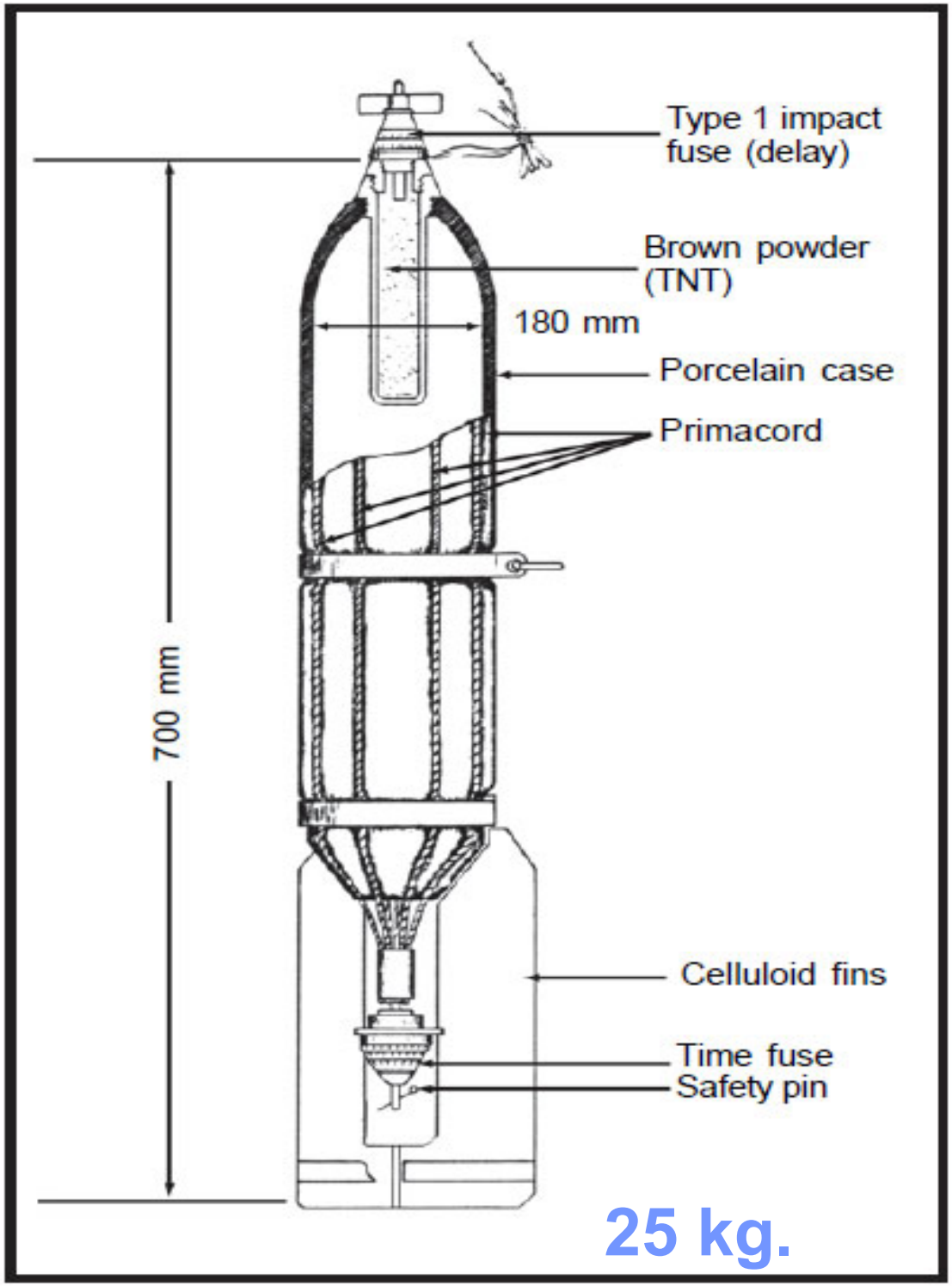
Shiro Ishii
mógłby wiele nauczyć dra Mengele

Japanese Biological Arms

- Investigated more than 30 bacterial species but settled on *B. anthracis* and *Yersinia pestis* for its primary BW payloads;
- Japanese claimed that Pingfan in one production cycle could produce "300 kg *Y. pestis*";
- Pingfan could produce 40 million fleas infected with *Y. pestis* per month; 3,000 fleas weighs 1 gr;
- 4,000 biological Uji porcelain bombs produced at Pingfan by 1945; most bombs carried fleas.
- BW killed >3,000 human subjects & ~ 250,000 Chinese soldiers and civilians (Chinese governm.)

Type 50 Uji Biological Bomb

The porcelain-cased bomb held 30,000 infected fleas. The Uji had an inner container wrapped in primacord (detonation cord), which exploded at a predetermined height of 200 meters, freeing the fleas. An estimated 80% of the fleas survived the airburst.



U.S. BW PROGRAM (1942-1969)

Had weaponized 7 BW agents against humans (none against animals):

- ***Bacillus anthracis***
- ***Brucella suis***
- ***Coxiella burnetii***
- ***Francisella tularensis***
- **Venezuelan equine encephalitis virus**

(plus two toxins)

Soviet BW Program had Two Generations
First Generation 1928-1971

First Generation utilized classical microbiology techniques of mutation, selection, and propagation to weaponize:

- *Bacillus anthracis*
- *Coxiella burnetii*
- *Francisella tularensis*
- *Yersinia pestis*
- Venezuelan equine encephalitis virus
- [Variola virus] (and others…)

Milton Leitenberg & Raymond A. Zilinskas, *The Soviet Biological Weapons Program: A History*, Harvard University Press, 2012.

Soviet BW Program's Second Generation (1972-1992)

Second Generation BW program used genetic engineering to endow frank and opportunistic pathogens with unique pathogenic properties, enhance infection and virulence, and endow them with new capabilities to defeat enemies' vaccines, antibiotics, and detectors. Two major programs codenamed:

Ferment – weaponize pathogens against humans;
Ekology – weaponize pathogens against animals & crops.

Soviet BW Program's Main Agencies

Ministry of Defense (15th Directorate in charge of the offensive BW program);

Biopreparat (lead agency for *Ferment*);

Ministry of Agriculture (lead agency for *Ekology*).

USSR Ministry of Defense Biological Warfare (BW) Facilities

- Institute of Microbiology, Kirov (bacterial pathogens)
- Virology Institute, Zagorsk (viral pathogens)
- Institute of Military Technical Problems, Sverdlovsk (production of pathogens)
- Aralsk-7, Vozrozhdeniye Island in Aral Sea, Uzbekhistan (open air test facility)

Biopreparat BW Facilities

- *Institute of Applied Microbiology, Obolensk (bacterial pathogens);
- Institute of Molecular Biology ("Vektor"), Koltsovo (viral pathogens);
- *Institute of Highly Pure Biopreparations, Leningrad (peptide studies, formulations);
- Institute of Engineering Immunology, Lyubuchany (immunological system studies, vaccines);
- *Progress Scientific and Production Base, Stepnogorsk, Kazakhstan (pilot plant & production plant)

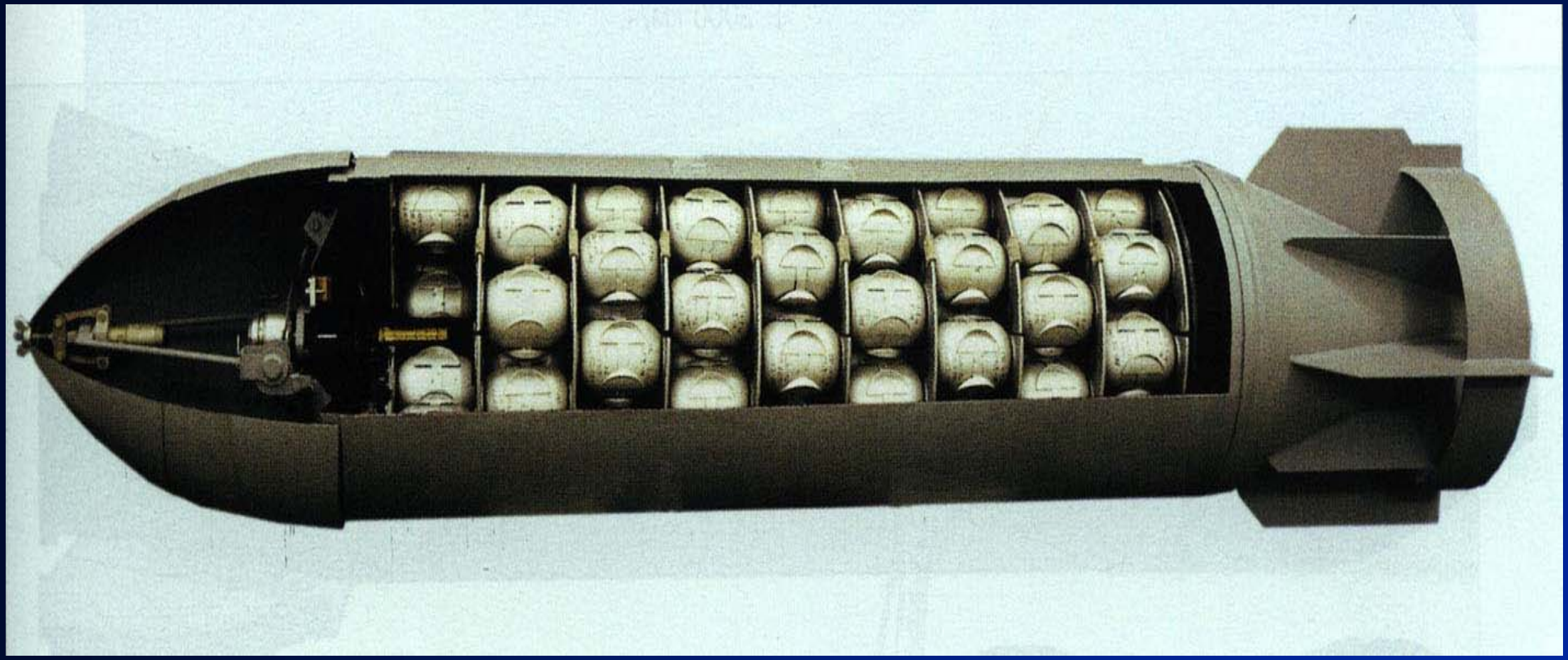
Ministry of Agriculture's Facilities

- All-Union Scientific Research Foot and Mouth Disease Institute, Vladimir (FMD virus, ASF virus, Rinderpest virus);
- All-Union Scientific Research Institute of Virology and Microbiology, Pokrov (*B. anthracis*);
- *Scientific Research Agricultural Institute, Otar, Kazakhstan (Capripoxviruses);
- Scientific Institute of Phytopathology, Golitsino (anti-crop weapons);
- Scientific Institute of Phytopathology, Tashkent, Uzbekistan (anti-crop weapons).

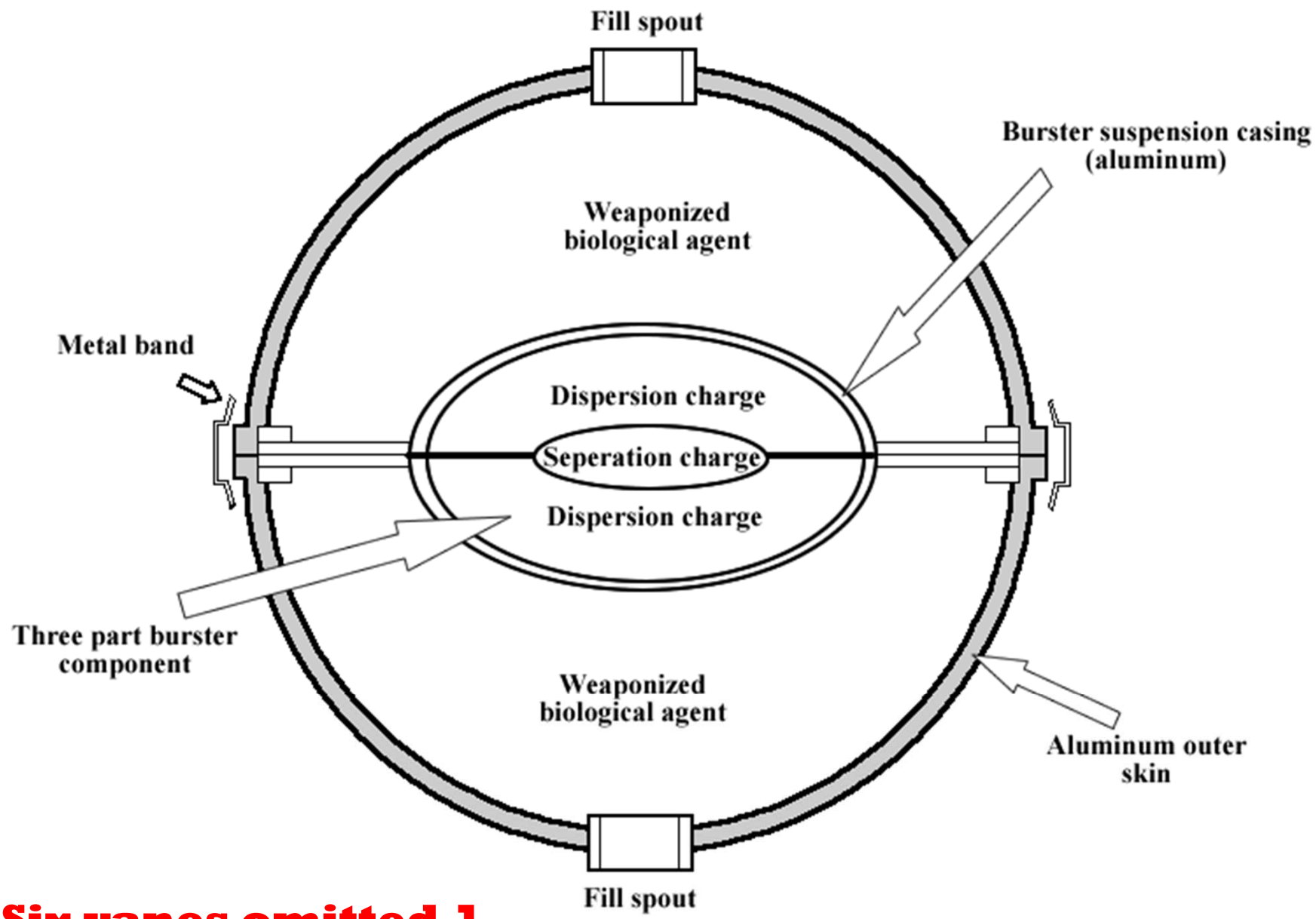
Soviet 2nd Generation Program's Pathogens

Viruses against humans	Viruses against animals
Marburgvirus VEE virus Variola virus	African Swine Fever virus Capripoxviruses Foot and Mouth disease virus Rinderpest virus
Bacteria	
Bacillus anthracis	***Coxiella burnetii***
Brucella species	***Francisella tularensis***
Burkholderia mallei	***Yersinia pestis***
Burkholderia pseudomallei	

Soviet Cluster Bomb with Chemical Bomblets



Biological Bomblet *Gshch*-304 (*ГЩ*-304)



[Six vanes omitted.]

Admission and Denial of Soviet Union's Offensive BW Program

- USSR signed Biological and Toxin Weapons Convention in 1972; in accordance Article 2, stated that it did not have, and had never had, a BW program.
- President Boris Yeltsin, 1992: "The Soviet Union violated the Biological and Toxin Weapons Convention." Accordingly, Yeltsin ordered the BW program to be closed down. Parts of BW program revealed in the 1994 annual report to UN.
- Presidents Vladimir Putin and Dmitry Medvedev, 2000 – today: "The Soviet Union conducted only defensive research, development, and testing and therefore never violated Biological and Toxin Weapons Convention. Its development of pathogens was done because they were needed in order to develop defenses against them."

U.S. Military Medical Services

In the era of emerging diseases and biological weapons threats, dual-objective research priorities in 2015 are:

1. **Understanding *Y. pestis* virulence factors, pathogenesis, & ecology;**
2. **Determining genetic basis of *B. anthracis* virulence & understanding protective mechanism of anti-PA antibodies;**
3. **Identifying subunit and/or attenuated vaccine candidates for plague, Q fever, Ebola, Marburg…**
4. **Developing pre-exposure and post-exposure immunoprophylaxis & chemoprophylaxis for anthrax exposure;**
5. **Developing trivalent vaccine against Ebola, Marburg, & Sudan virus diseases.**

(George W. Christopher, personal communication, June 15, 2015)