

MSBS 5140

**Biological Terrorism and Weapons
of Mass Destruction**

Fall 2011
Introduction and History of BT and WMD





COMMISSION ON THE PREVENTION OF WEAPONS OF MASS DESTRUCTION PROLIFERATION AND TERRORISM

Weapons of Mass Destruction

- ▶ **C** – chemical agents
- ▶ **B** – biological agents
- ▶ **R** – radiological agents
- ▶ **N** – nuclear devices
- ▶ **(E** – high yield explosives)



CHEMICAL



BIOLOGICAL



RADIOLOGICAL



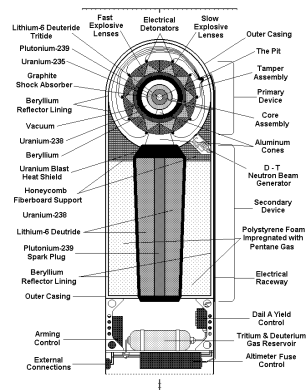
NUCLEAR



EXPLOSIVE

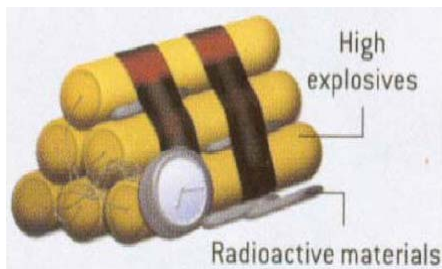
Nuclear Devices

- ▶ Nuclear warhead
- ▶ **SADM (“suitcase nuke”)**
- ▶ **IND**



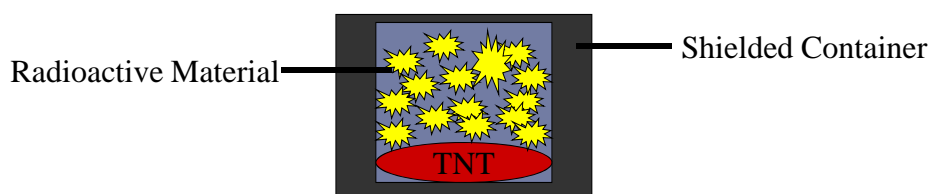
Radiological Agents

- ▶ Point source
- ▶ Nuclear facility sabotage
- ▶ **Radiological Disbursal Device (RDD)**



Radiological Disbursal Device

- ▶ Also know as the “**DIRTY BOMB**”
- ▶ Conventional explosives are combined with radioactive material
- ▶ The explosion can cause blast injuries, and radioactive contamination



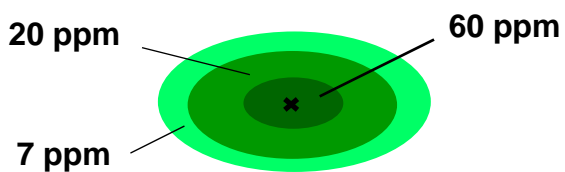
Chemical Weapons

- ▶ Incapacitating/Non-lethal
 - ▶ Tear gas; mace; pepper spray
- ▶ Toxic
 - ▶ Choking
 - ▶ Ex. Chlorine
 - ▶ Blood
 - ▶ Ex. Cyanide
 - ▶ Blister
 - ▶ Ex. Sulfur Mustard
 - ▶ Nerve
 - ▶ Ex. Sarin

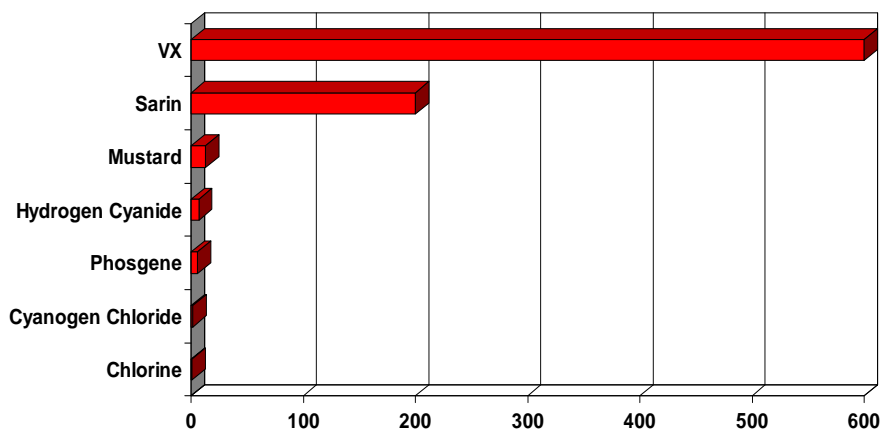


General Characteristics of Chemical Agents

- ▶ **Generally liquid (when containerized)**
- ▶ **Normally disseminated as aerosols or gas**
- ▶ **Influenced by weather conditions**
- ▶ **Can be protected against**



Relative Lethality in Relation to Chlorine (Respiratory)



Definition of Bioterrorism

- ▶ **The unlawful use, or threatened use, of microorganisms or toxins derived from living organisms to produce death or disease in humans, animals, or plants**
 - ▶ **The act is intended to create fear and/or intimidate governments or societies in the pursuit of political religious or ideological goals**
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Biological Weapons

WHY?

The psychological threat

- ▶ **The microbial world is mysterious and threatening**
 - ▶ **Deeply rooted fear of being destroyed by a powerful, evil, imperceptible force**
 - ▶ **Multiple organizations with conflicting roles increase the confusion and anxiety**
 - ▶ **Health care specialists must bring discipline and understanding to the situation**
-



Biological Agent Characteristics

- ▶ **Do not penetrate unbroken skin**
 - ▶ **Non-volatile**
 - ▶ **More toxic than chemicals by weight**
 - ▶ **Undetectable by senses**
 - ▶ **Limited field detection**
 - ▶ **Disseminate as aerosols**
 - ▶ **Range of effects**
 - ▶ **Obtained from nature**
 - ▶ **Relatively easy to produce**
 - ▶ **Have delayed effects**
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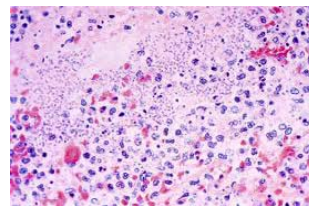
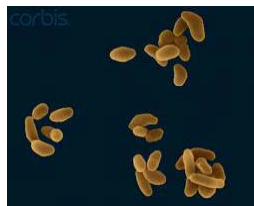
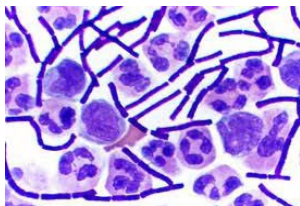
Biological Warfare Agents

- ▶ **Anthrax**
(*Bacillus anthracis*)
- ▶ **Brucellosis**
(*Brucella* spp.)
- ▶ **Plague**
(*Yersinia pestis*)
- ▶ **Q Fever**
(*Coxiella burnetii*)
- ▶ **Tularemia**
(*Francisella tularensis*)
- ▶ **Smallpox**
- ▶ **Glanders**
(*Burkholderia mallei*)
- ▶ **Viral encephalitides**
(Venezuelan, Eastern, and Western Equine encephalitis viruses)
- ▶ **Viral hemorrhagic fevers**
(e.g. Rift Valley Fever, Dengue, Hantavirus)
- ▶ **Botulinum toxins**
(*Clostridium botulinum*)
- ▶ **Staphylococcal Enterotoxin B**
(*Staphylococcus aureus*)



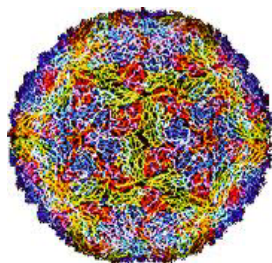
Bacteria

- ▶ **Symptoms are similar**
- ▶ **Variation in transmissibility, severity of disease**
- ▶ **Most bacteria are stable**
- ▶ **Easy to grow and to weaponize**



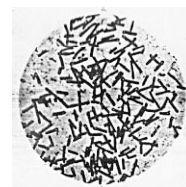
Viruses

- ▶ **Less stable than bacteria**
- ▶ **More difficult to weaponize**
- ▶ **Most are transmissible**
- ▶ **Most have animal reservoirs; easy to obtain**



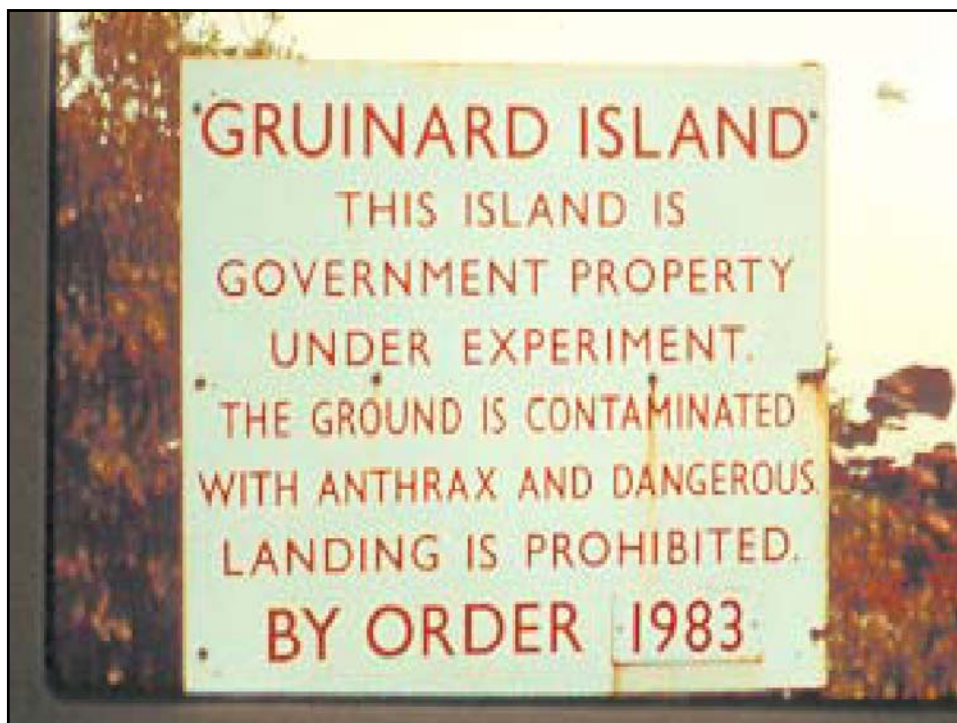
Toxins as Biological Agents

- ▶ **Proteins**
- ▶ **Chemicals**
- ▶ **Made by or from biological organisms**



Early Uses of Biological Weapons

- ▶ **1346 - siege of Kaffa**
 - ▶ Tatars catapulted bodies of plague victims into the city
- ▶ **18th century**
 - ▶ Sir Jeffrey Amherst caused smallpox epidemic by giving Native Americans contaminated hospital blankets

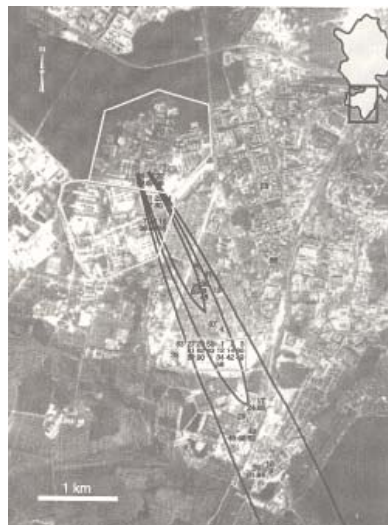


Kanatjan Alibekov



Sverdlovsk Investigation 1994

- ▶ **Geographical distribution of cases**
- ▶ **Interviews**
- ▶ **Medical Records**
- ▶ **Graveyards**
- ▶ **Meteorology**



Aum Shinrikyo

- ▶ **Sarin attack, Tokyo, March, 1995**
 - ▶ **Other agents: *Bacillus anthracis*, *Clostridium botulinum*, and *Coxiella burnetti***
 - ▶ **Arsenal with botulinum toxin and aircraft equipped with spray tanks**
 - ▶ **Ten previous unsuccessful attempts (*B. anthracis* and botulinum toxin)**
 - ▶ **Cult members in Zaire in 1992 to obtain Ebola virus**
-

Rajneeshees



Minnesota Patriots Council



Larry Wayne Harris



Other Cases

- ▶ **St. Paul Medical Center – Dallas, TX (1996)**
 - ▶ *Shigella dysenteriae*
- ▶ **Order of the Rising Sun (1972)**
 - ▶ Typhoid bacteria
- ▶ **Thomas Lavy**
 - ▶ Ricin



Anthrax - 2001



Anthrax - 2001

- ▶ **Dr. Bruce Ivins**
 - ▶ **USAMRIID**
- ▶ **22 Infected**
 - ▶ 11 inhalational
 - ▶ 11 cutaneous
 - ▶ 5 deaths (all from inhalation)



On-going Issues

- ▶ **Terrorism**
 - ▶ Overseas
 - ▶ Continental US
 - ▶ Bombs/IEDs
- ▶ **Radicalization**
 - ▶ Religion
 - ▶ Politics
 - ▶ Groups
 - ▶ Individuals
 - ▶ Foreign-born
 - ▶ Home-grown
- ▶ **Legacy**
 - ▶ Complacency
 - ▶ Preparedness
 - ▶ Budget
 - ▶ Public Health
- ▶ **Future**
 - ▶ Dual-use
 - ▶ Synthetic biology
 - ▶ Primary research
 - ▶ Prevention and mitigation

MSBS 5140 – Fall 2011

- ▶ Microbiology
- ▶ Pathogenesis
- ▶ Virulence
- ▶ Agents
- ▶ Vectors
- ▶ Treaties and Laws
- ▶ Public Health
- ▶ Risk
- ▶ Terror Medicine
- ▶ Biosurety



Major US Biodefense Labs

MAJOR U.S. BIODEFENSE LABS

