Natural Outbreaks and Bioterrorism:

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Chikungunya In Italy

An unusual natural outbreak

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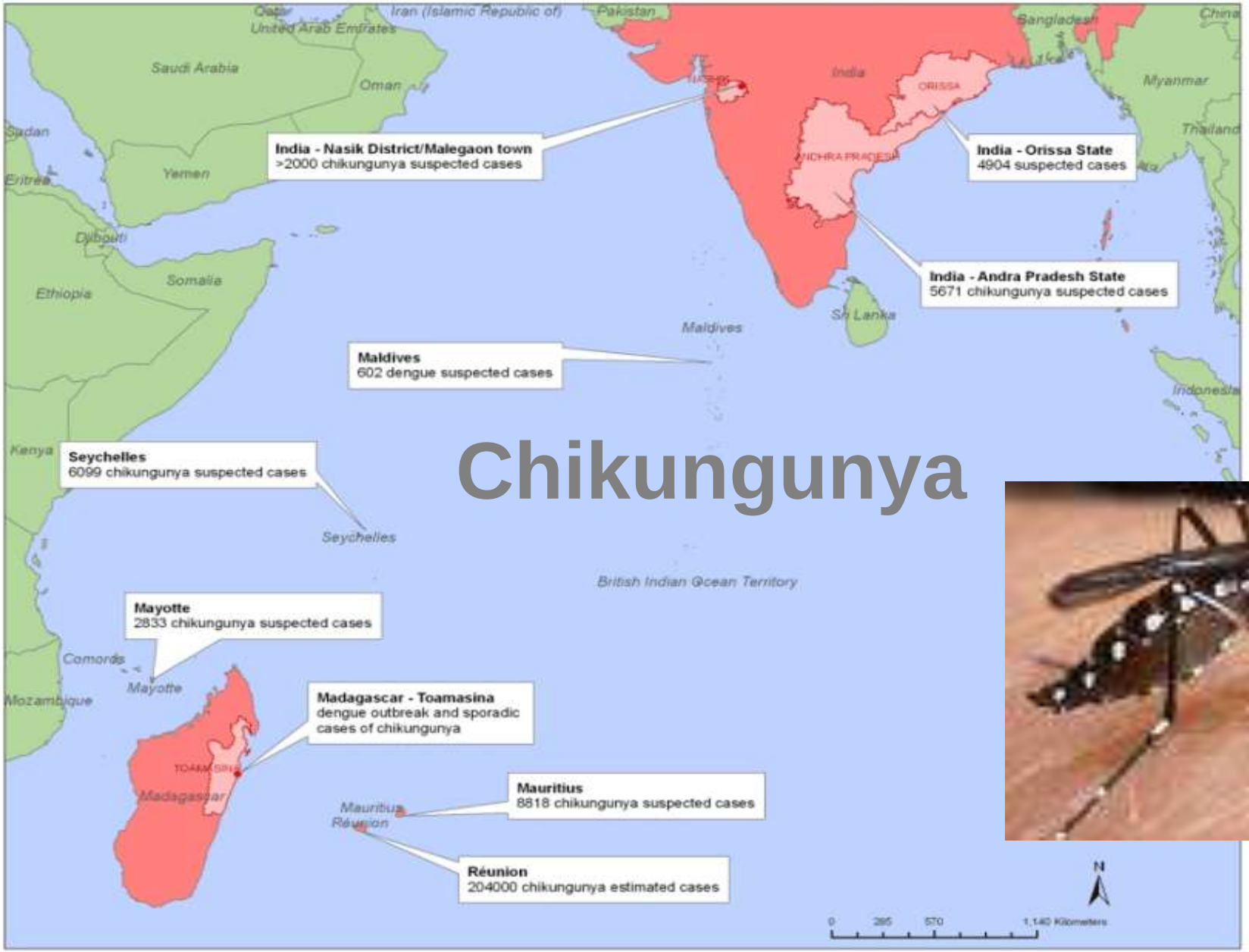
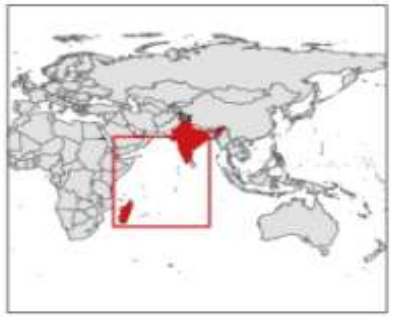
Chikungunya and Dengue - Indian Ocean update. Status as of 17 March 2006



Chikungunya



Country with occurence of dengue and/or chikungunya

Affected areas

Affected city

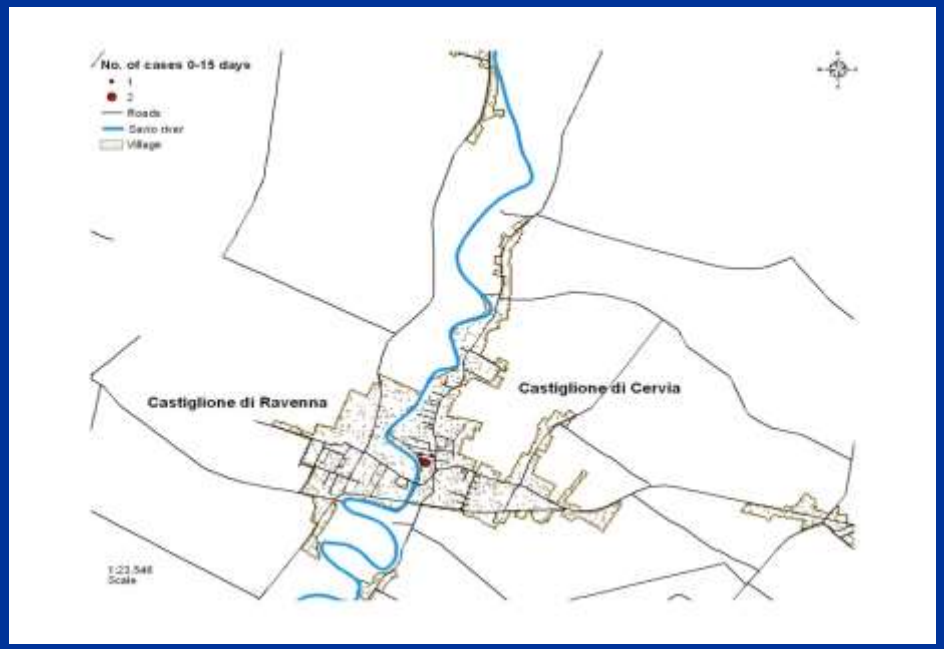
Country

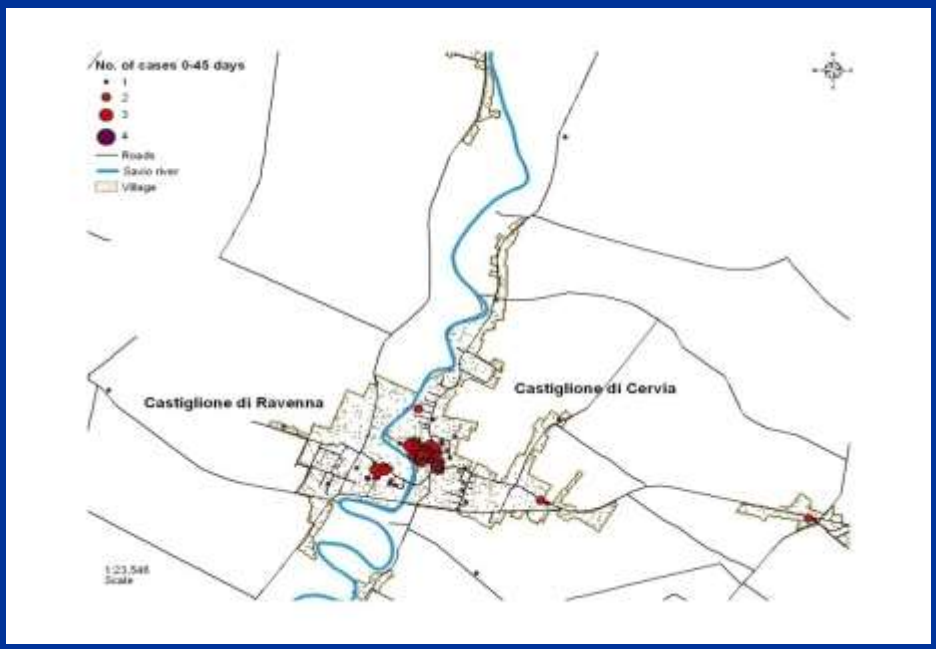
not yet be full agreement.

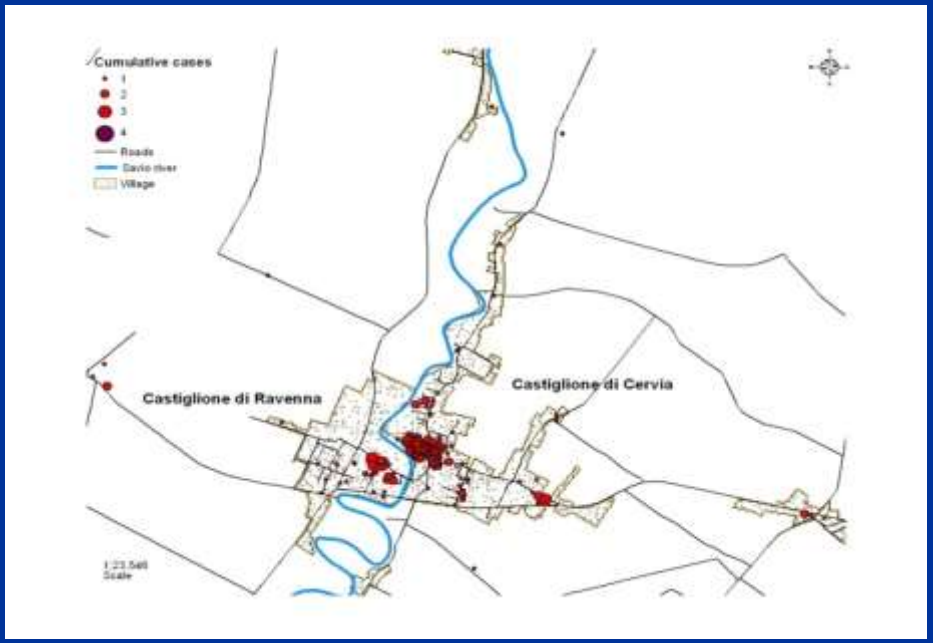
World Health Organization

Castiglione di Cervia

Castiglione di Ravenna


No. of cases 0-15 days
1
2
Roads
Savio river
Village
Castiglione di Ravenna
Castiglione di Cervia
1:23,546
Scale


No. of cases 0-45 days
1
2
3
4
Roads
Savio river
Village
Castiglione di Ravenna
Castiglione di Cervia
1:23,546
Scale


Cumulative cases
1
2
3
4
Roads
Savio river
Village
Castiglione di Ravenna
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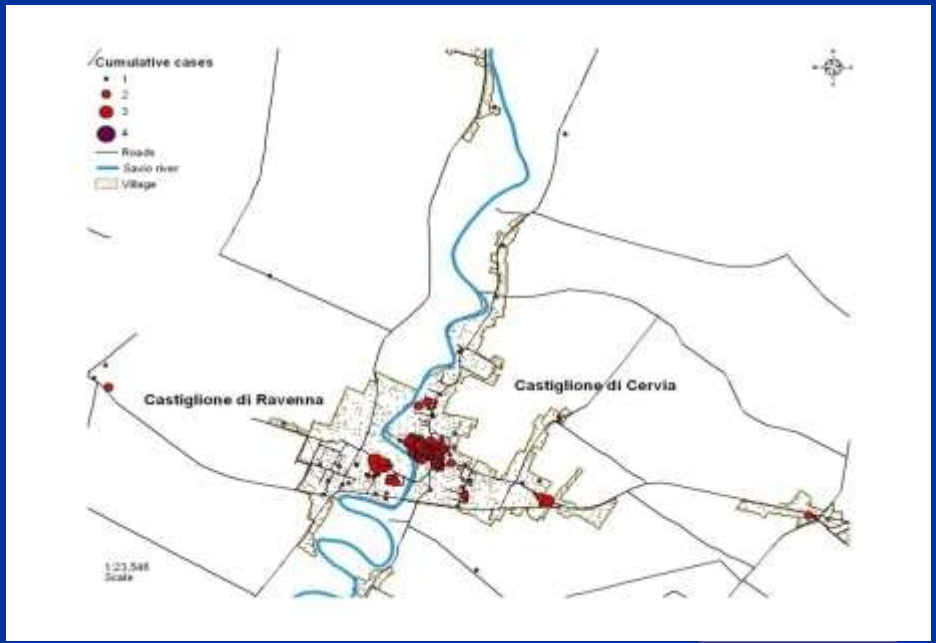
1:23,546
Scale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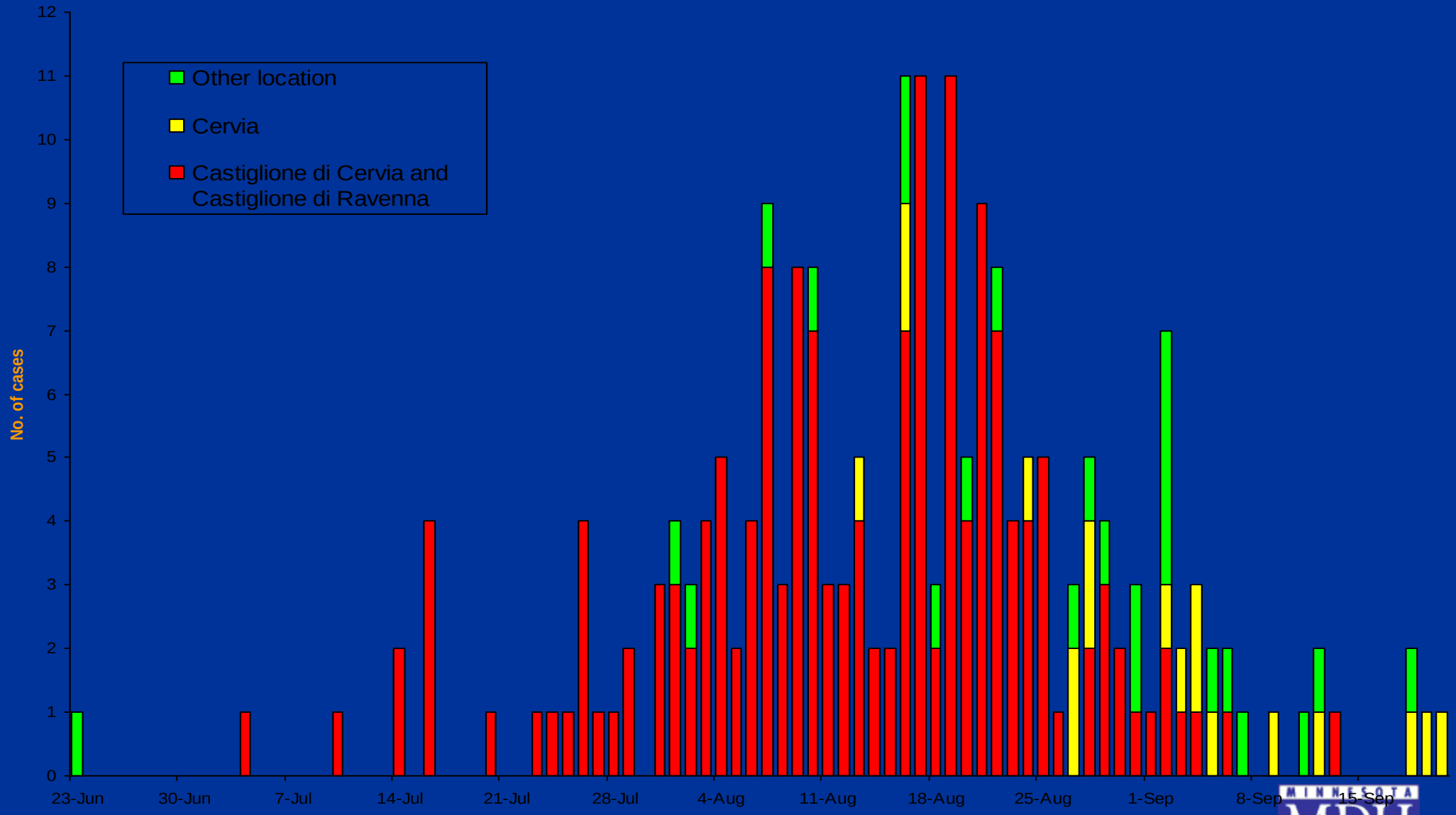
Scale

Epidemic Curve by Presumed Place of Infection



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History of Biological Warfare

- 1346 Siege of Kaffa; plague
- 1763 French and Indian War; smallpox
- WW I German program; anthrax, glanders
- 1925 Geneva protocol bans biological weapons
- WW II Japanese program; anthrax, plague, cholera, shigella

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History of Biological Warfare (cont.)

- **1941** George W. Merck named U.S. civilian head of Chemical Warfare Service later changed to War Research Service
- **1946** U.S. announces its involvement in bioweapons research
- **1969** Nixon eliminates offensive biological warfare program

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History of Biological Warfare (cont.)

- **1972** — Biological Weapons Convention
- **1979** — Accidental release of *B. anthracis* spores at bioweapons research center, Sverdlovsk, U.S.S.R
- **1989-92** — Scientists from the former U.S.S.R. involved in biological weapons research defect to the West

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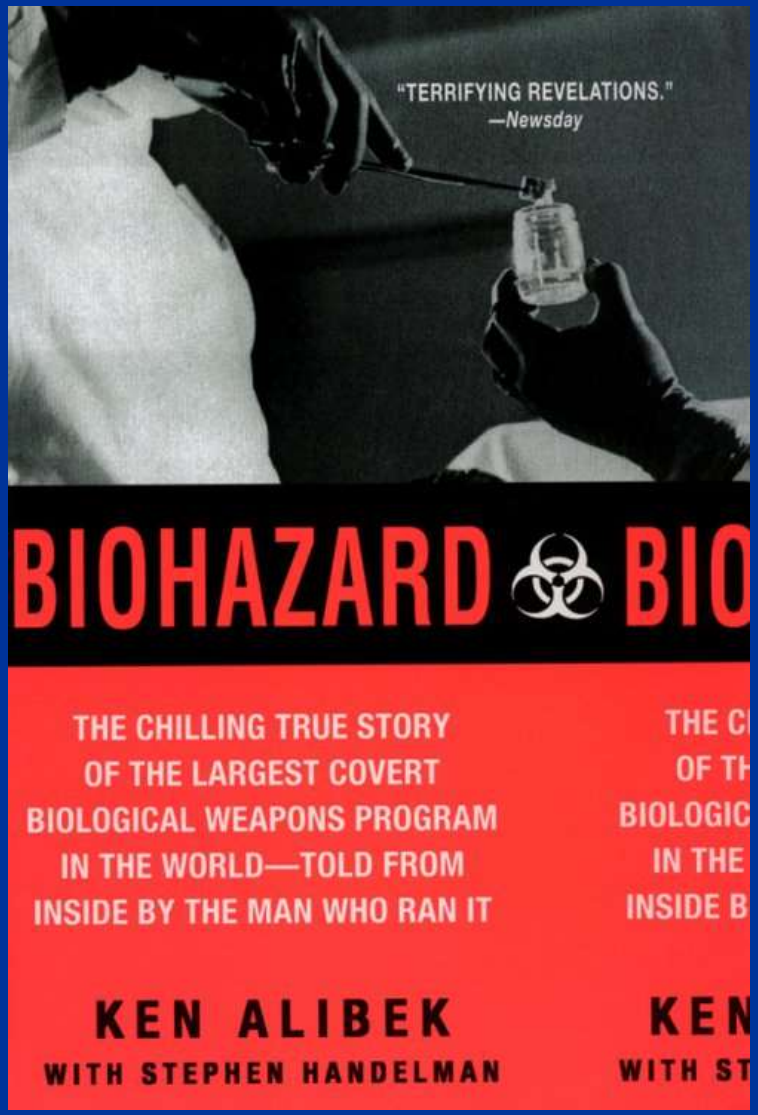
Ken Alibek - U.S.S.R. Program



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Domestic Biological Terrorism

- 1984 — Rajneeshee cult members contaminate salad bar with *Salmonella* typhimurium in Oregon
- 1992 — Ricin attack planned by Minnesota militia
- 2001 — Anthrax releases in FL, DC, NY, NJ

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Rajneeshee Cult, *Salmonella* - Oregon, 1984

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Anthrax, Florida 2001
American Media
POLICE
Luis M. Alvarez / AP

Biological Agents Ranking System

Public Health impact criteria based on:

- **Morbidity and mortality**
- **Delivery potential**
- **Public perception (fear, civil disruption)**
- **Public health preparedness needs**

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Biological Terrorism

- Use of biological agents to intentionally produce disease or intoxication in susceptible populations - humans, animals, or plants - to meet terrorist aims

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Advantages of Biologics As Weapons

- May be easier, faster to produce and more cost-effective than other weapons
- Potential for dissemination over large geographic area
- High morbidity and mortality
- Creates panic
- Person-to-person transmission possible (smallpox, plague, and viral hemorrhagic fever)
- Difficult to diagnose and/or treat

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Ideal Characteristics for Potential Biological Terrorism Agent

- Inexpensive and easy to produce
- Can be aerosolized (1-10 µm)
- Survives sunlight, drying, heat
- Cause lethal or disabling disease
- Person-to-person transmission
- No effective treatment or prophylaxis

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Operation Desert Storm

Gulf war, 1992

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Level A Bioterrorism Agents

- Anthrax (*Bacillus anthracis*)
- Smallpox (Variola major)
- Plague (*Yersinia pestis*)
- Botulism toxin (*Clostridium botulinum*)
- Tularemia (*Francisella tularensis*)
- Viral hemorrhagic fevers (VHF)

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Other Potential Bioterrorism Agents

- Brucellosis (*Brucella* species)
- Glanders (*Burkholderia mallei*)
- Q fever (*Coxiella burnetii*)
- Cholera (*Vibrio cholera*)
- *Salmonella* sp. and *Shigella* sp.
- Venezuelan Equine Encephalitis (VEE)
- Staphylococcal Enterotoxin B
- Ricin (from castor beans)
- T-2 Mycotoxins

(Note that this is not a complete listing)

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Estimated Casualties From a Hypothetical Bioterrorism Release*

Agent	Downwind Reach (km)	Dead	Sick**
Rift Valley Fever	1	100	10,000
Typhus	5	2,500	30,000
Brucellosis	10	150	27,000
Plague	10	6,500	27,000
Q Fever	>20	50	60,000
Tularemia	>20	4,500	60,000
Anthrax	>20	24,000	60,000

*50 kg by aircraft, 2 km line upwind of a city of 500,000
** Includes deaths

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Investigation of Potential Bioterrorism Incident

- Clinical
- Epidemiology
- Laboratory

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Symptoms of Potential Bioterrorism Diseases - Challenges of Detection

Agent	Clinical Effect	Initial Symptoms
Anthrax	Mediastinitis	Headache
Plague	Pneumonia	Fever
Q fever	Pleuritis, hepatitis	Malaise
Tularemia	Pneumonia	Cough
Smallpox	Pustules	

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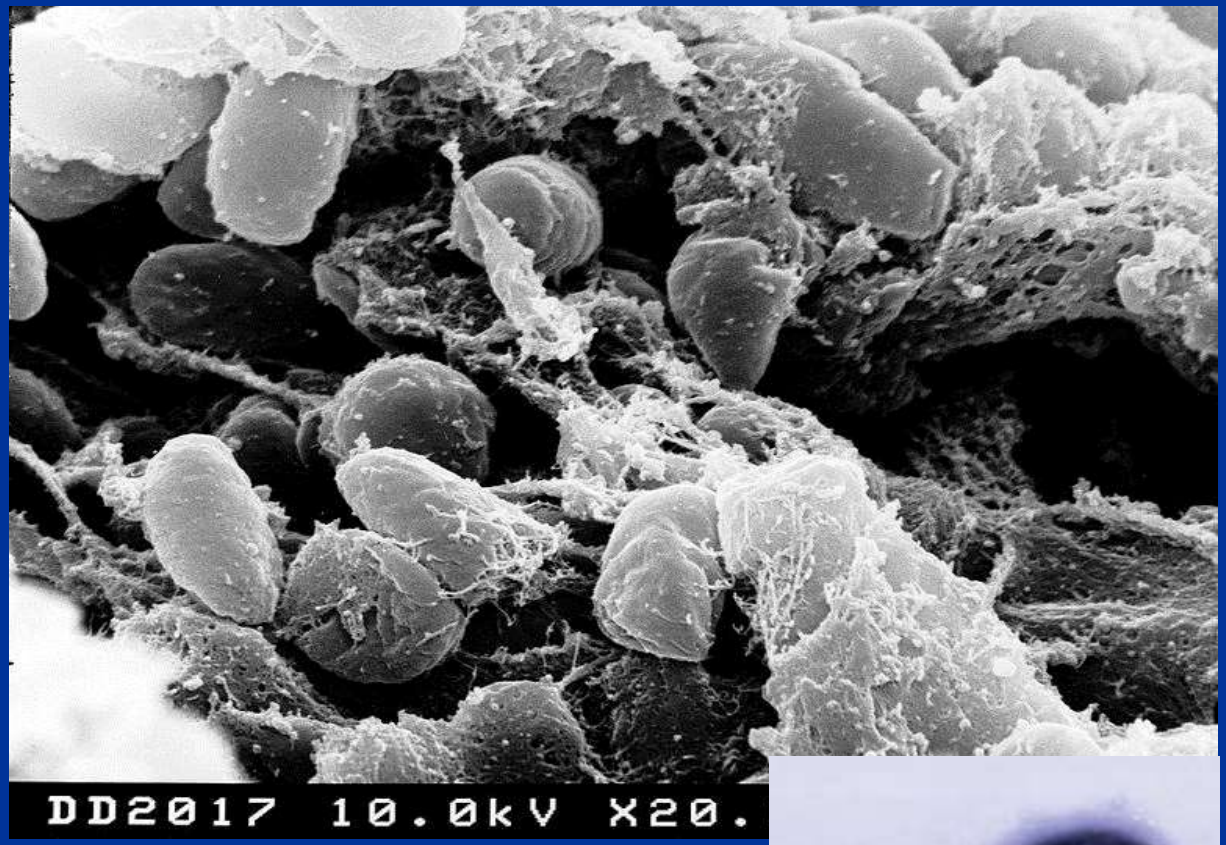
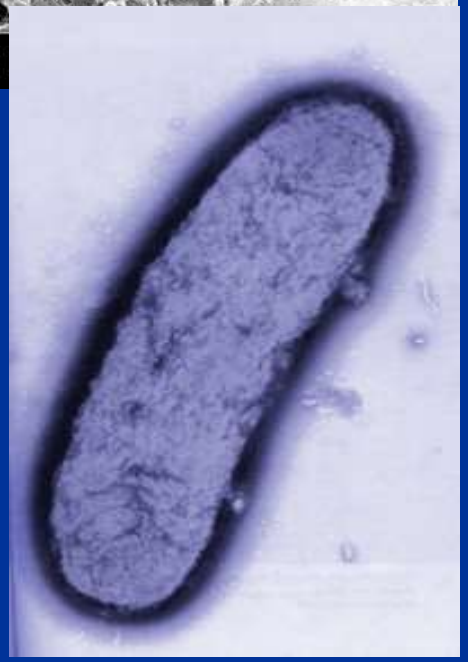
Yersinia pestis





“Bubbone”

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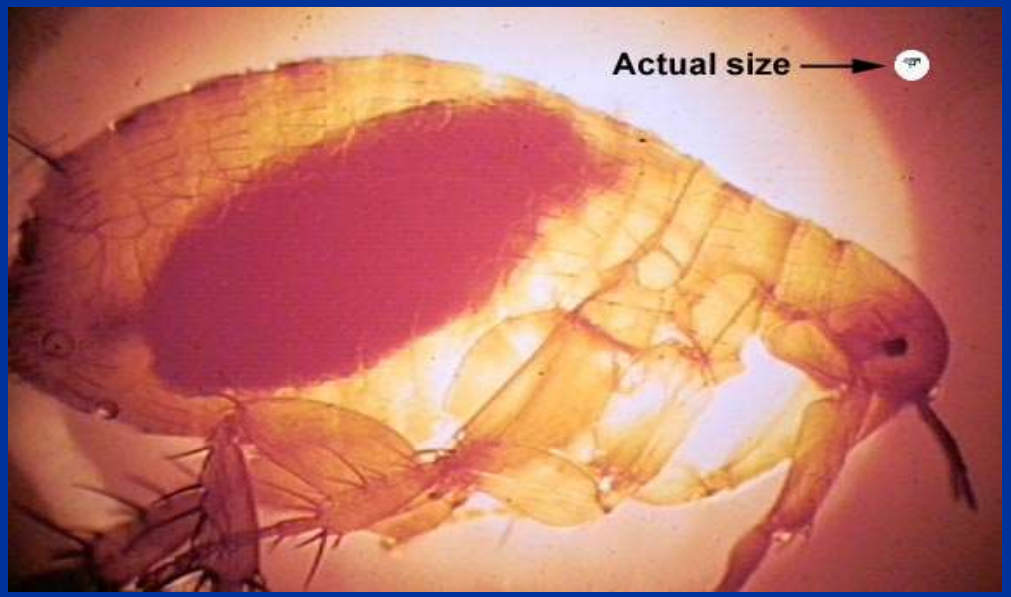
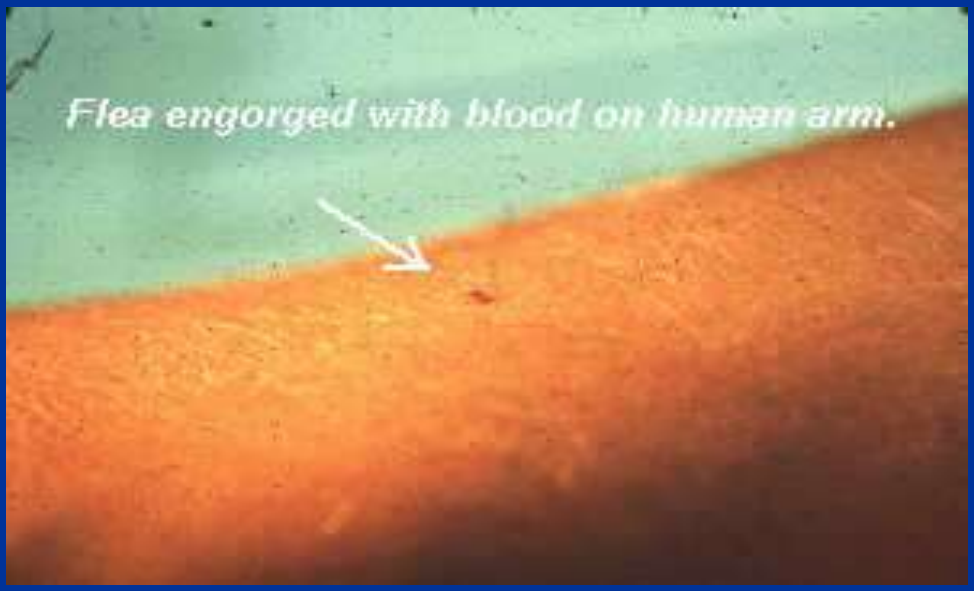
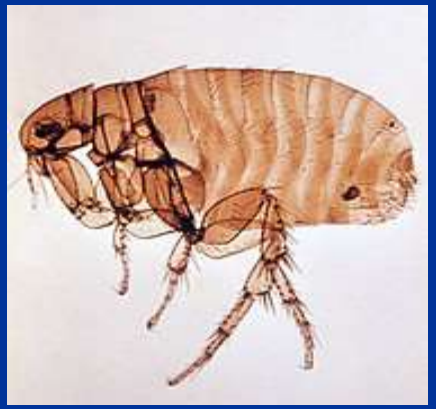
“*Reservoir*”

The vector (*Xenopsylla cheopis*), after a blood meal







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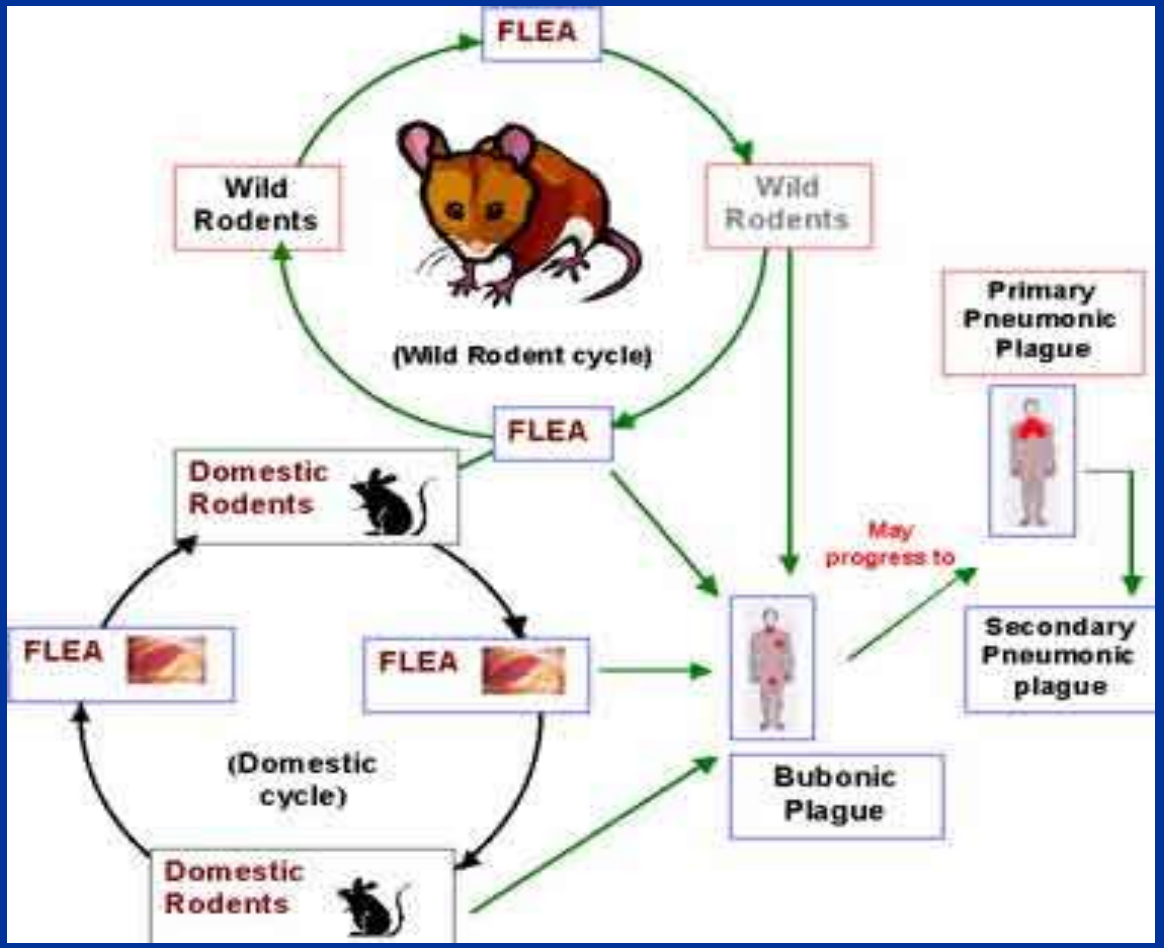
The plague "cycle"



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Anthrax

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Biological Terrorism?
Epidemiologic Clues

- Tight cluster of cases
- High infection rate
- Unusual or localized geography
- Unusual clinical presentation
- Unusual time of year
- Dead animals

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Conclusions

- Natural biological agents may be used for bioterroristic attacks, even though this is rather unlikely to occur
- Investigation of natural outbreaks is a good excercise for the study of biterrorism attacks

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