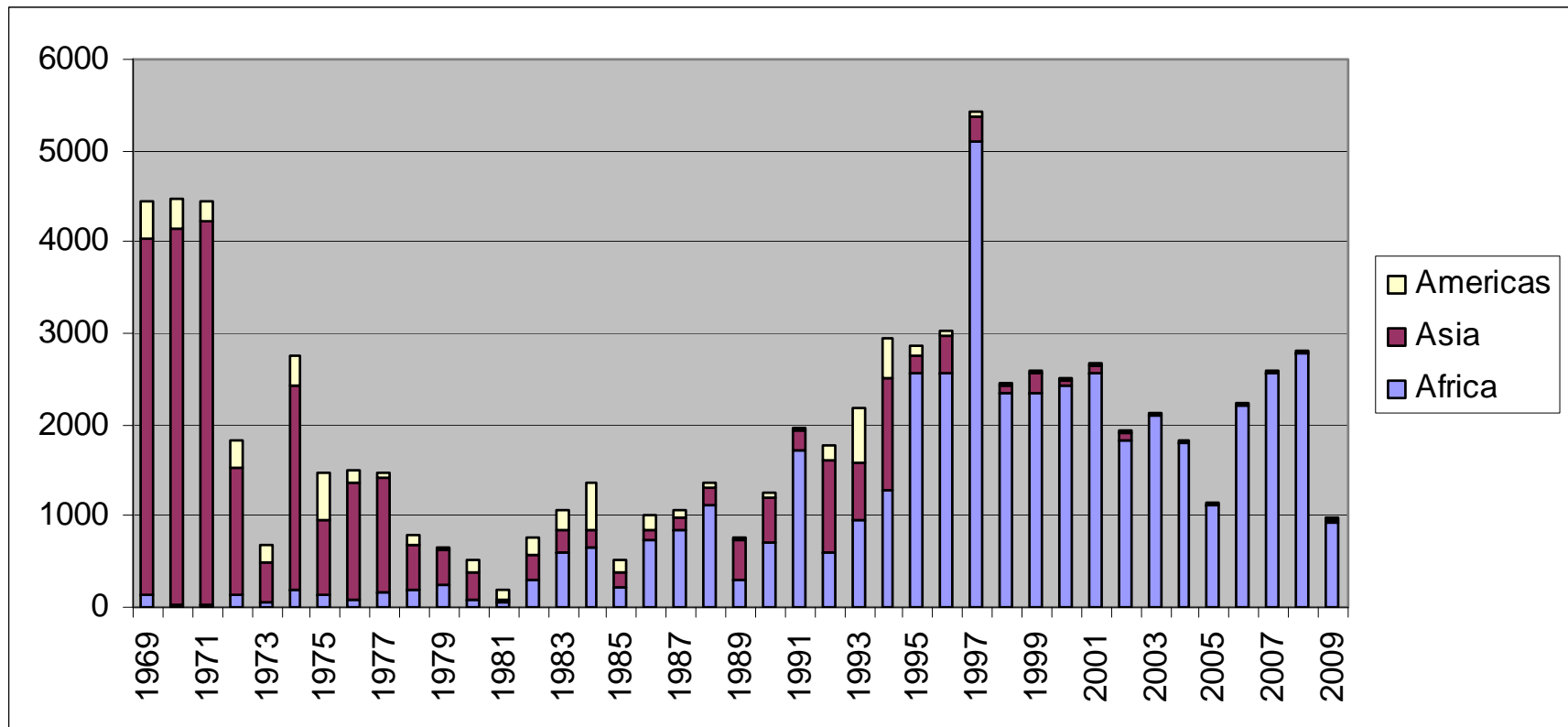

Human Plague in the 21st century

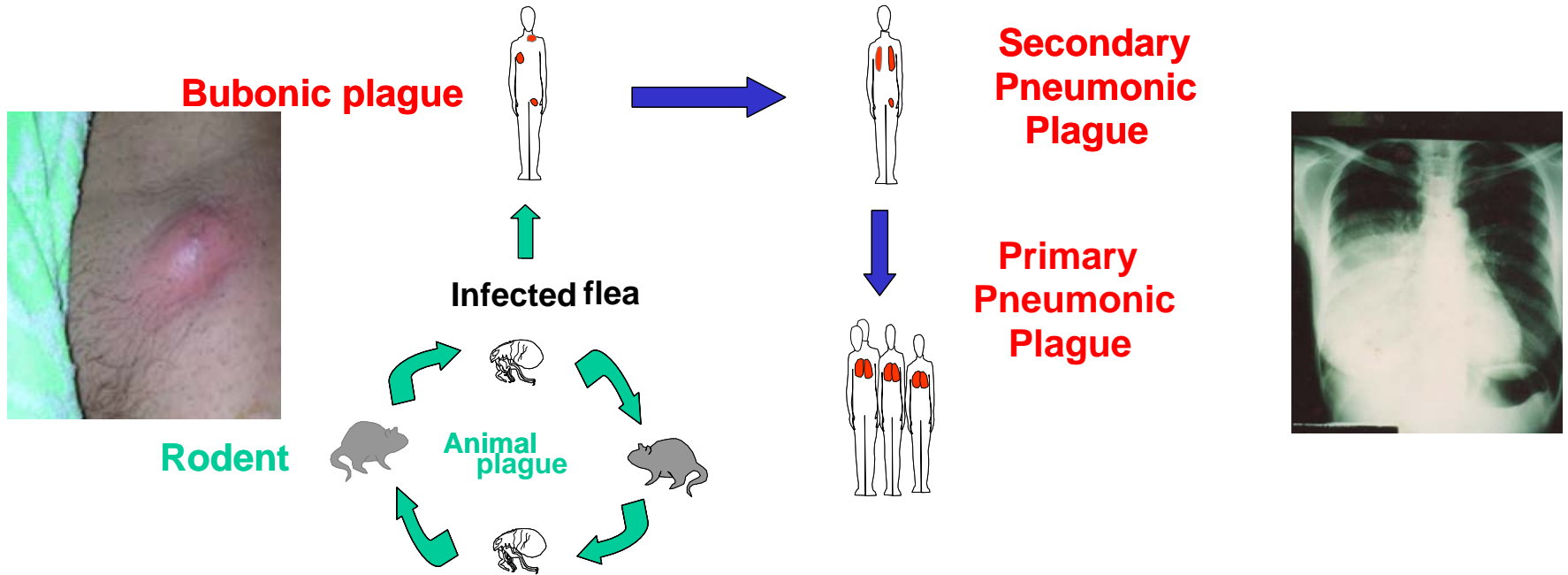
Eric BERTHERAT
Global Alert and Response
WHO Geneva

World notification of plague 1969-2009

2009: 984 cases (71 deaths)



Plague: an anthroozoonosis



Medical / Public health emergency

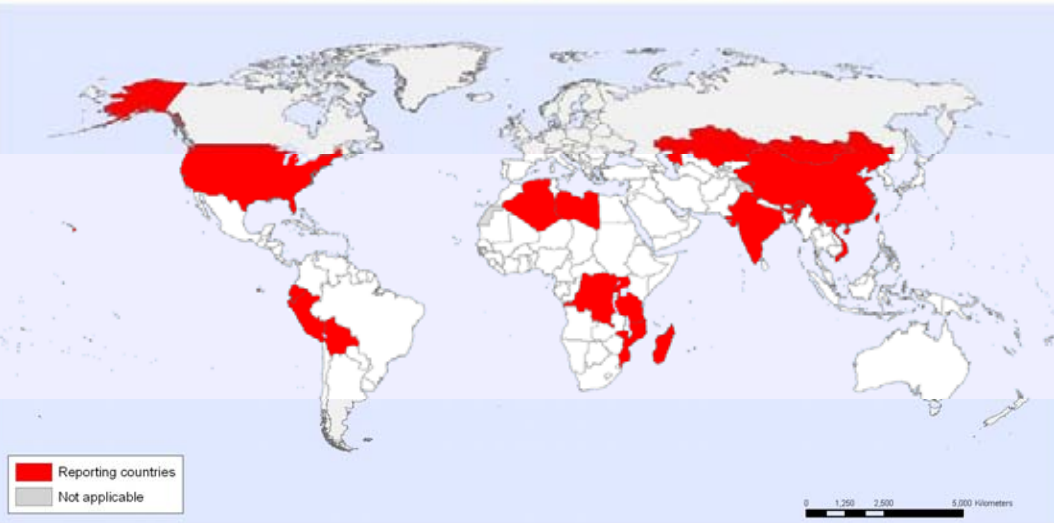
Lethality of human plague in 2009

Global CFR = 7.2 %

DR. Congo	4.4 %	27/618	90 % are suspected cases	Pulmonary form: 7 %	Endemic area
Libya	20.0 %	1/5	All confirmed.	Bubonic	Cluster, unexpected
Madagascar	13.1 %	38/289	confirmed cases: CFR 16 %	Pulmonary form: 7 %	Endemic area
Uganda	3.8 %	1/26	all confirmed		Endemic area
Tanzania	0 %	0/2	no confirmed case	Bubonic	Sporadic
Peru	0%	0/25	no confirmed case	Bubonic	Endemic area
USA	14.3 %	1/7	all confirmed		Sporadic
China	25.0 %	3/12	all confirmed	Pneumonic	Endemic area

Geographical distribution

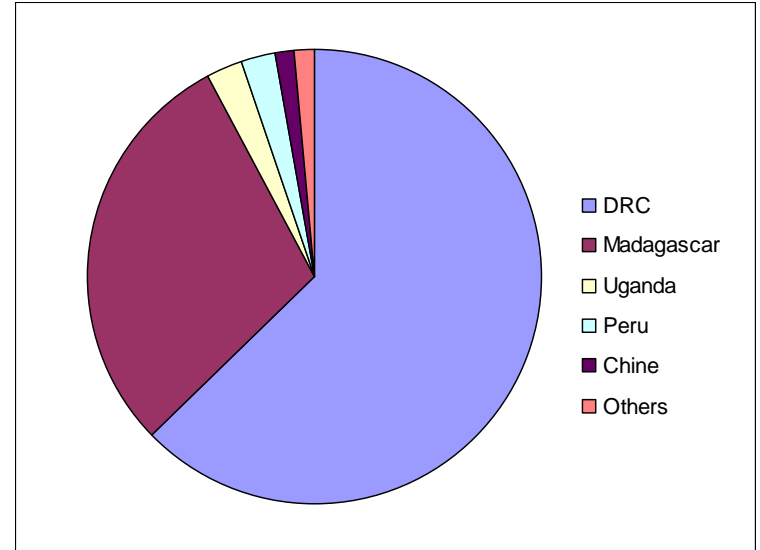
Human plague, reporting countries 2002-2010



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization

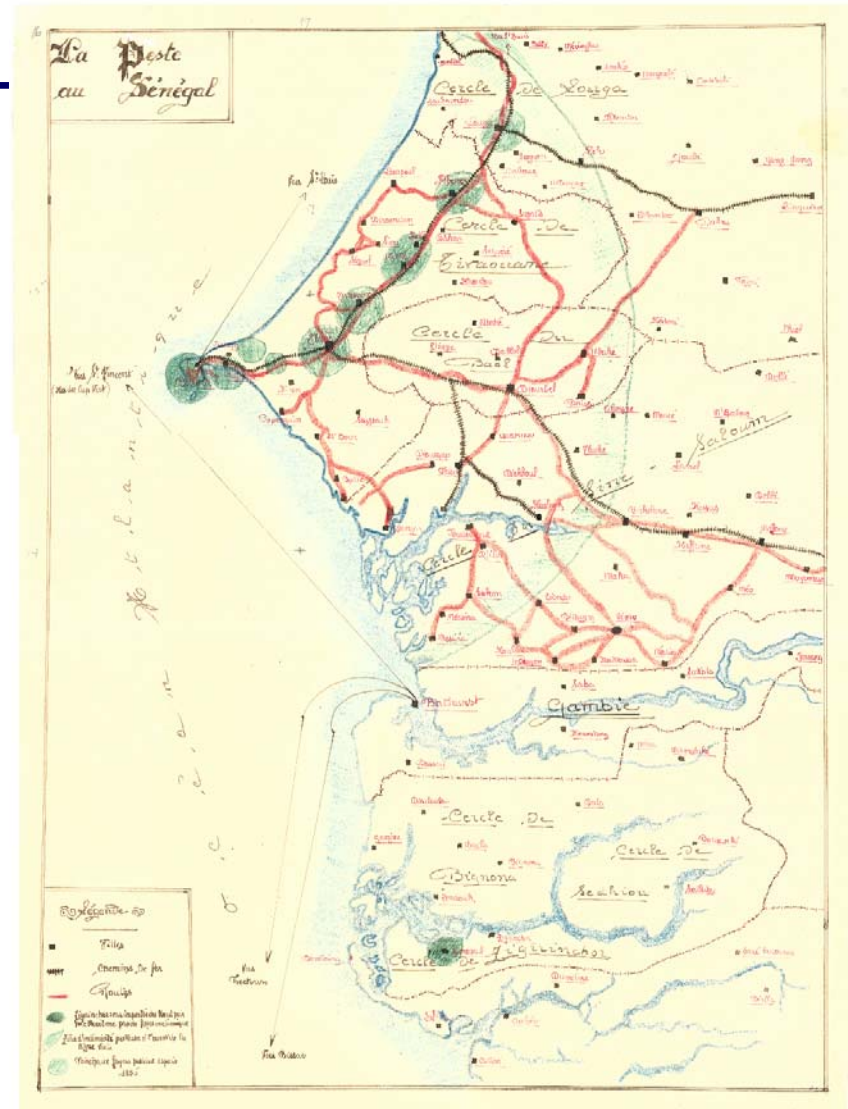
 World Health
Organization
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Distribution of human plague cases by country,
2009

Focal distribution of human plague

- Some countries + plague cases
 - In these countries, some regions,
 - In these regions, some districts,
 - In these districts, some villages
-
- Human plague distribution only a proxy of the true plague distribution:
 - Human cases not diagnosed
 - Human transmission, a rare event
 - Absence of human population



Plague natural focus

Y. pestis + Sensible animal species + Adapted flea species



Absence of any animal surveillance in most of the endemic countries

Epidemiological silence

Emergence / Re-emergence ?

Botswana 1989:	>45 years "absence"
Kenya 1990:	10 years of "absence"
Uganda 1982:	22 years of "absence"
South Africa 1982:	10 years of "absence"
India 1994:	27 years of "absence"
Malawi 1994:	31 years of "absence"
Indonesia 1997:	27 years of "absence"
Zambia 1997:	>33 years of "absence"
Algeria 2003:	>50 years of "absence"
Lybia 2009:	>20 years of "absence"

Re-emergence of human plague in the last decades

Prevention and Control

**Human plague in the world:
one disease
but different public health challenges**

Different reservoirs:

→ Risk of human transmission different

Rich/Poor:

→ Different control capacities

Central Asia

Wild rodents in the steppe → Huge natural foci but a sporadic disease affecting farmers and hunters.



Central Asia: Plague in Kazakhstan

- 40 % of the territory = 1 million km²
- Last human cases in 2003
- Every year:
 - half million rodents and fleas trapped and analysed
 - Hundreds of thousands km² desinsectized
 - 125 000 persons vaccinated ... + a lot of camels !
- Economic impact



Northern Africa

- Small clusters of bubonic plague in rural / nomadic population
- Role of domestic rodents
- Proximity of international ports



Northern Africa

Algeria

Oran 2003: 18 cases / 1 death

After 50 yrs of silence

Laghouat 2008: 4 cases / 1 death



Libya

Tobruk 2009: 5 cases / 1 death

After 25 yrs of silence

Sub Saharan Africa

Domestic rodents + poverty → High endemicity + severe outbreaks.

Rural + Urban.

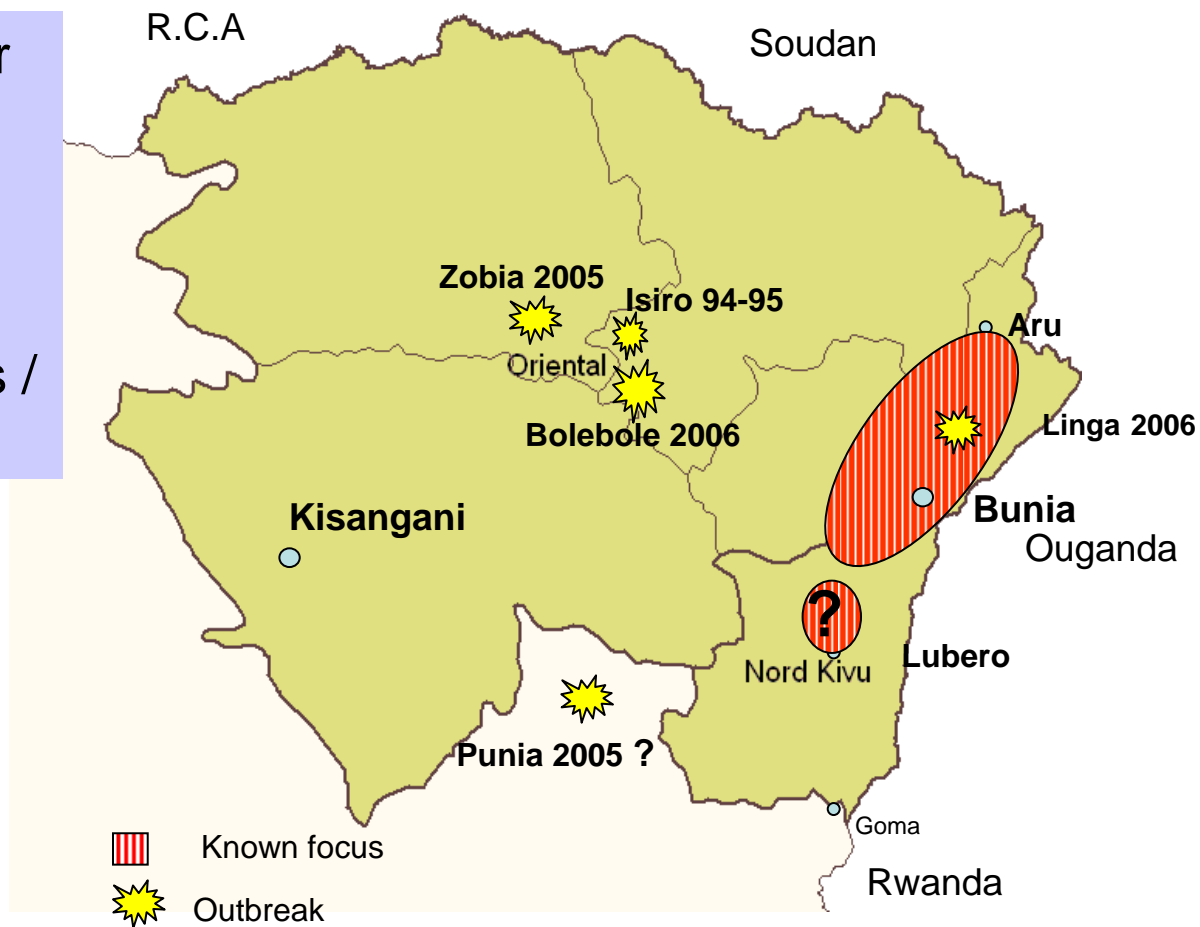
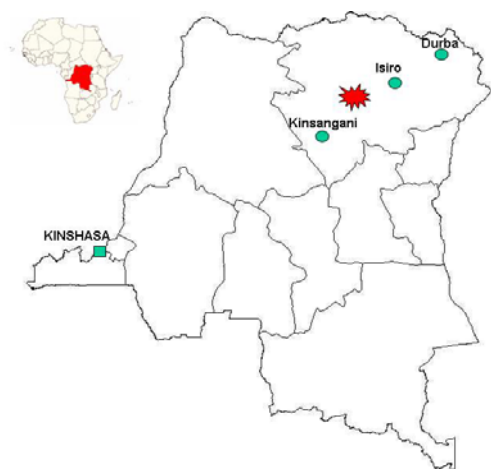


The Democratic Republic of Congo: High endemicity + severe outbreaks

Ituri: +/- 1000 cases / year

Zobia 2005:
130 cases / 57 deaths

Bolebole 2006: 162 cases /
54 deaths



Prevention and Control of plague: principles

Prevention

Living conditions: better sanitation, rat proofing

Vaccine

- Live, attenuated
 - Doesn't protect against pneumonic plague. Variably immunogenic.
 - Neurological side effects.
 - Not suitable for use during outbreaks
- Recombinant (phase II), DNA vaccine under development: Public health ??

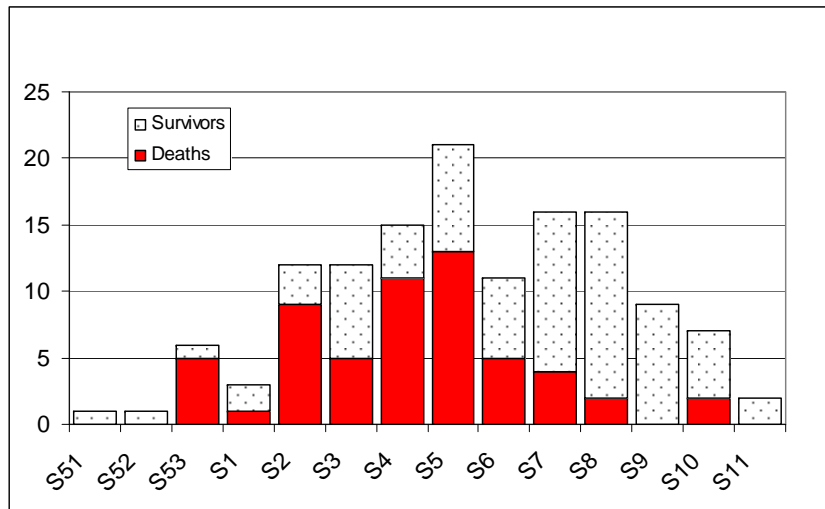
Control

- Improvement of early detection
- Improvement of control strategy
- Risk assessment



Early detection and confirmation in remote areas

Pneumonic plague outbreak
Zobia, DRC, 2005



↑
alert

↑
International team
on the field



Collection kits and Rapid tests
Training

Improvement of control strategy

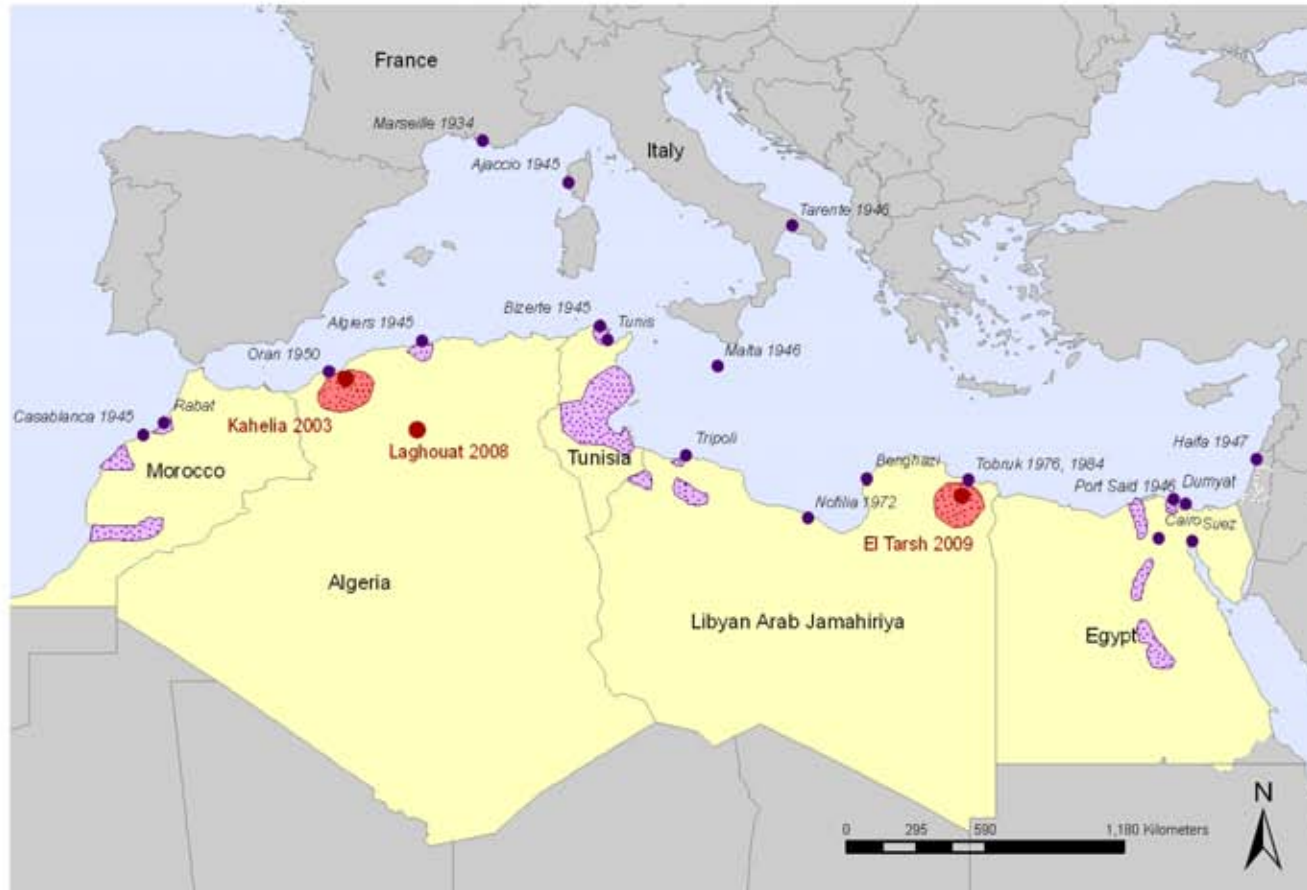
Vector and rodent control



Risk assessment

- Surveillance of circulating strains
 - antibioresistance
 - Madagascar 1995
 - resistant to chloramphenicol, streptomycin, tetracycline, and sulfonamides
 - plasmid containing the resistance came from an enterobacteria.
 - F1 negative strains in nature and lab
- Mapping and monitoring of natural foci / human population distribution: localization, limits, ecological characteristics

Historical and current distribution of plague



- Main affected city in the third pandemic
 - Recent human plague outbreak
 - Historical natural focus
 - Current identified natural focus (limits unknown)
- 1945: Date of last human plague occurrence

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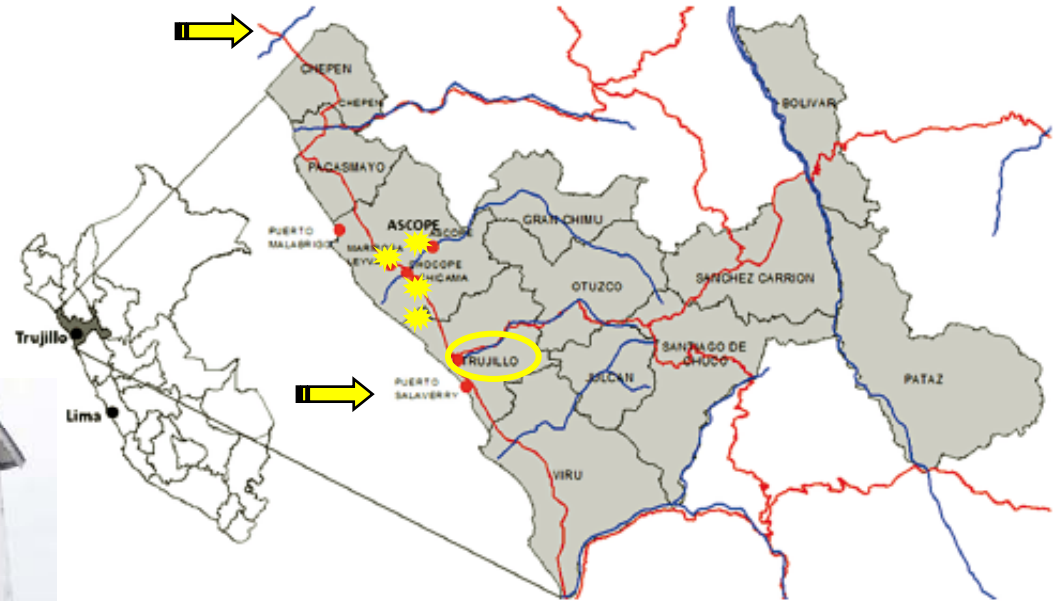


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Potential for an international spread

La Libertad, Peru, 2010

After 13 yrs of silence,
bubonic plague upsurge:
28 cases / 4 deaths



From *Donaires LF et al.* PESTE NEUMÓNICA PRIMARIA CON TRANSMISIÓN INTRAHOSPITALARIA EN LA LIBERTAD, PERÚ 2010 Rev Peru Med Exp Salud Publica. 2010; 27(3): 326-36

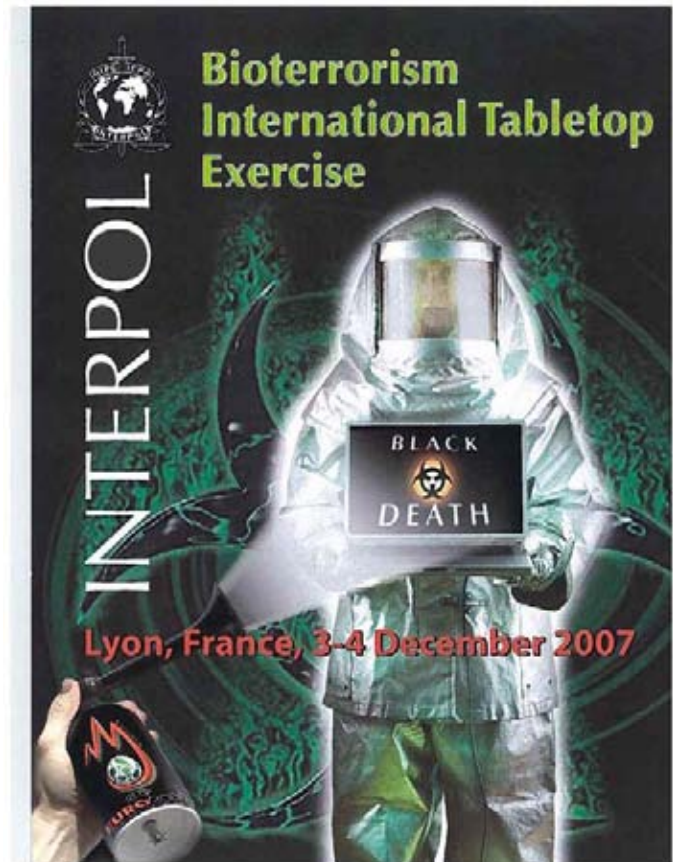
- Panamerican road
- International port

Bioterrorism

WHO, 1970:

50 kg of aerosolized
Yersinia pestis in a city
of 5 million people,

- would infect 150,000
and kill 36,000
- would spread over 10
km in a 1 hour period



1721



2006



Thank
you