

Molecular typing of *Y. pestis* strains: practical application

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***Y. pestis*: very young bacterium (< 5,000 y)**

Phenotypic polymorphism very low

4 biovars: Antiqua, Medievalis, Orientalis, Pestoides



Molecular tools

- Ribotyping
- Pulsed field gel electrophoresis (PFGE)
- IS fingerprinting (IS-RFLP)

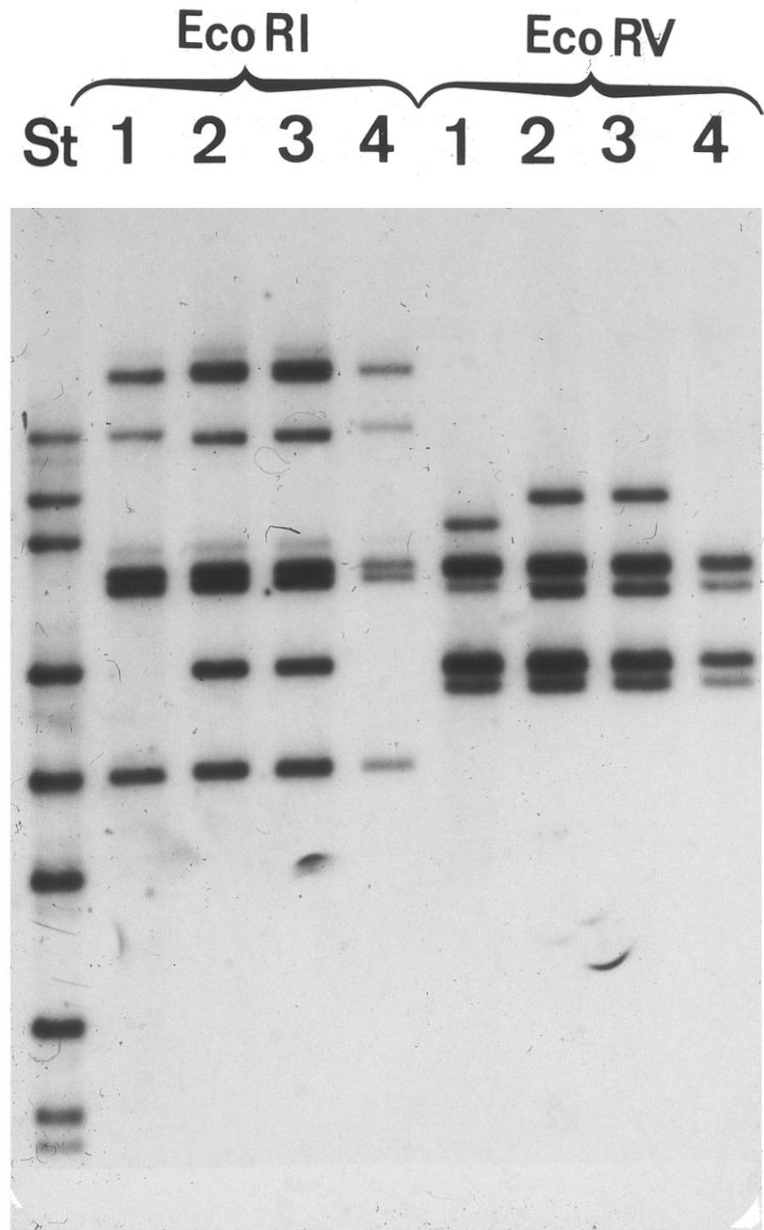
MADAGASCAR

- Endemic foci
- Outbreaks
- Re-emergence in some 'plague-free' areas

Ribotyping



Ribotype B
(Orientalis)

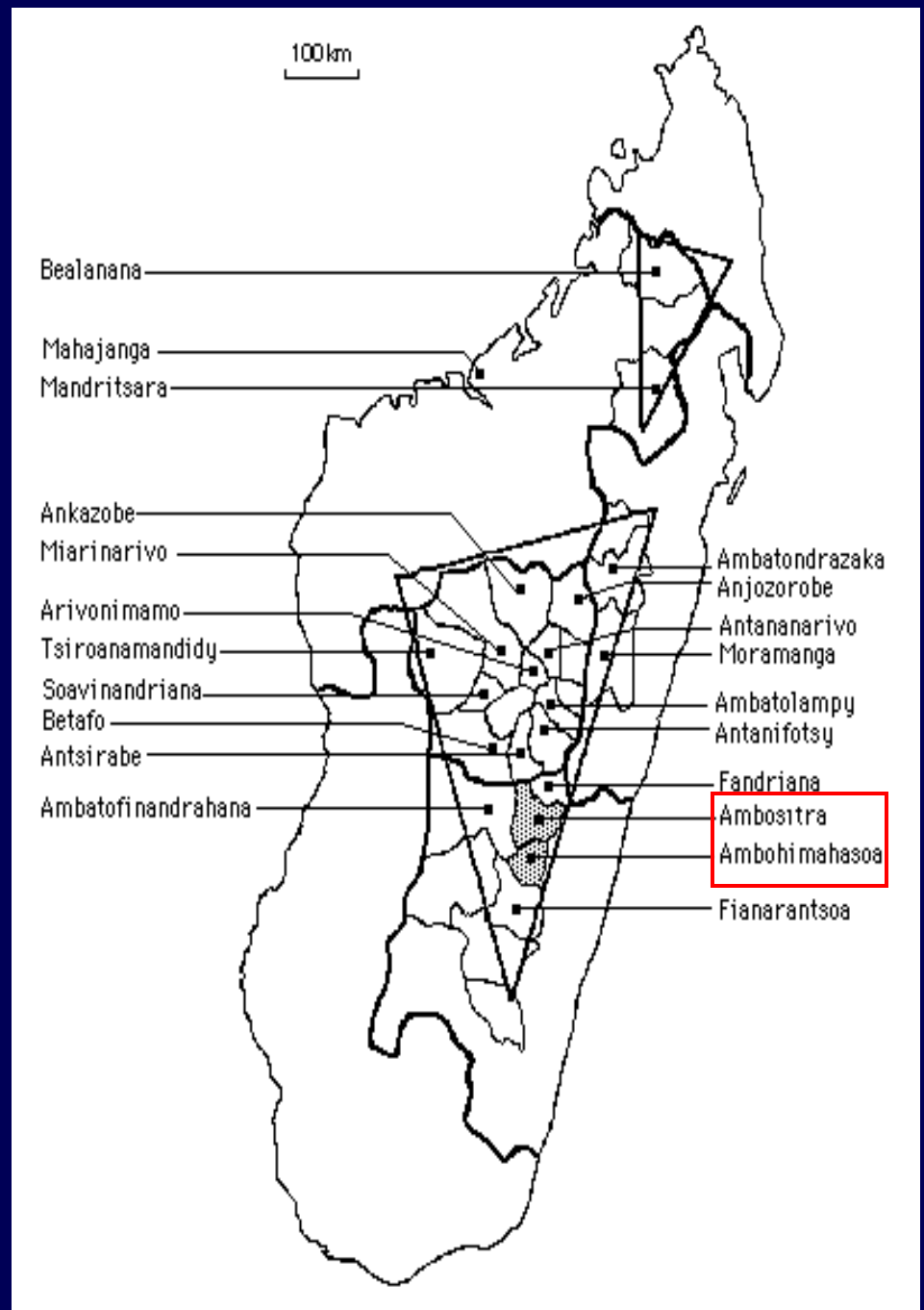


Orientalis

Ribotype B

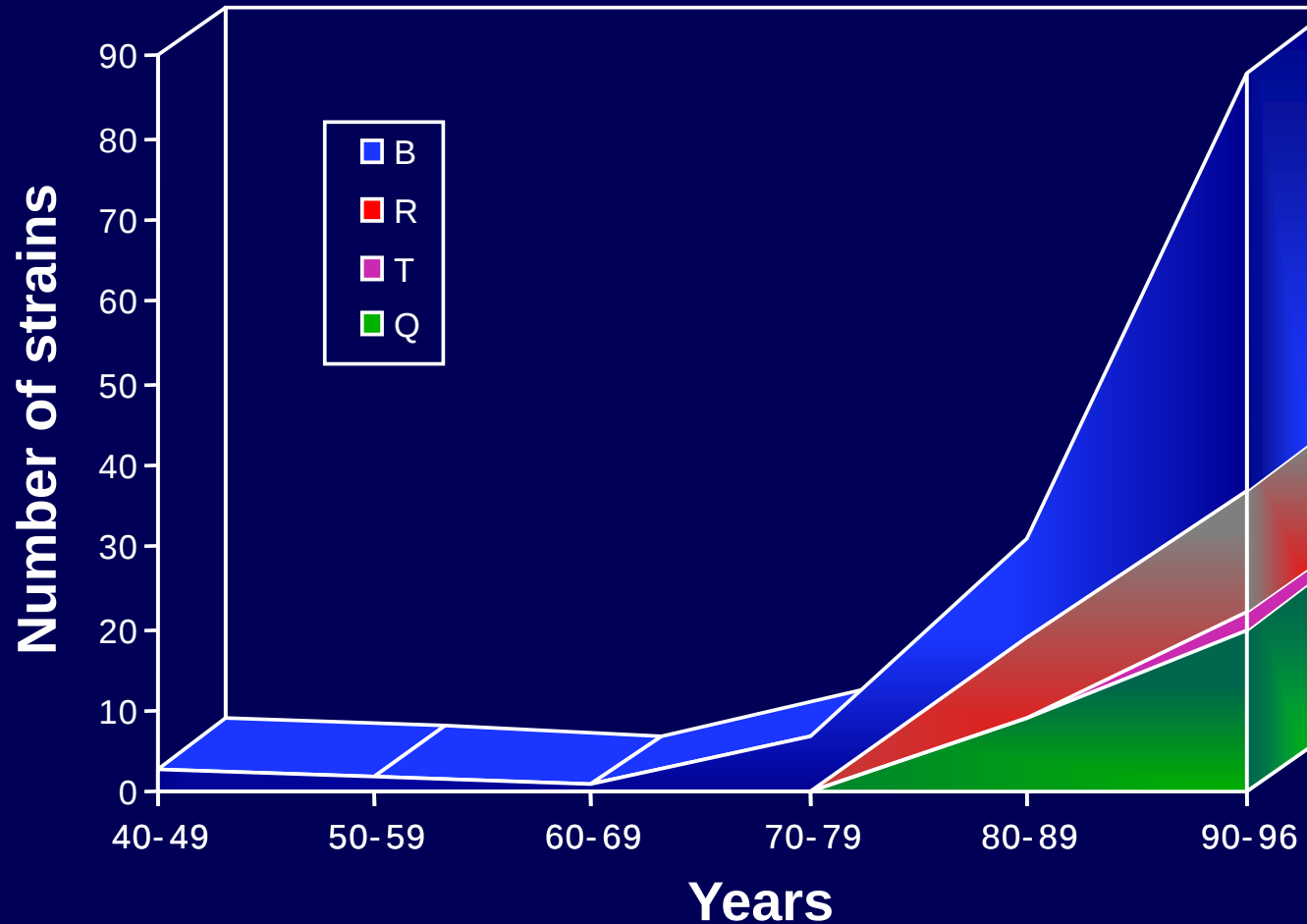
Emergence of new
ribotypes:

Q, R, T



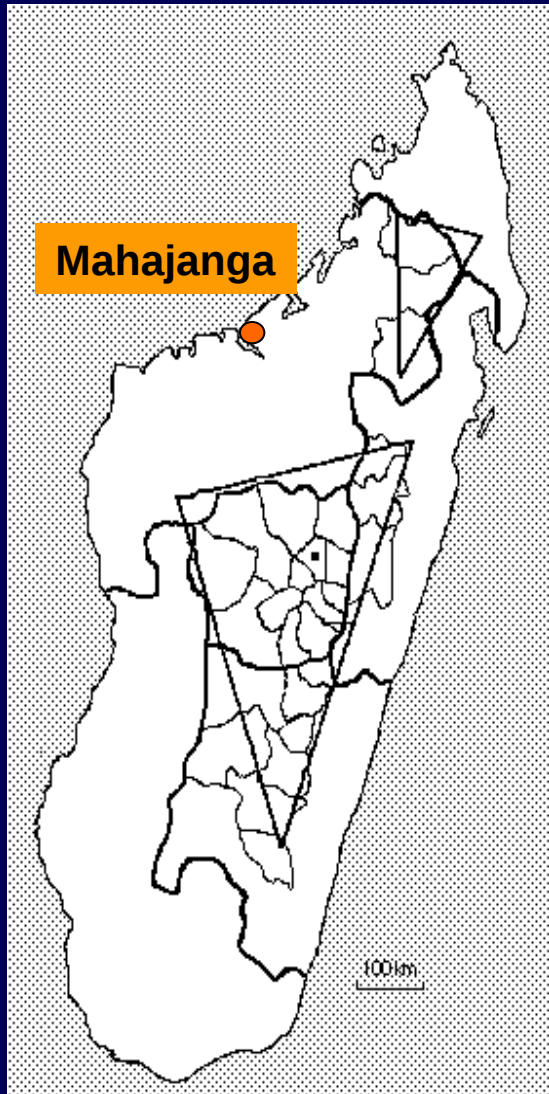


Evolution of the new variants

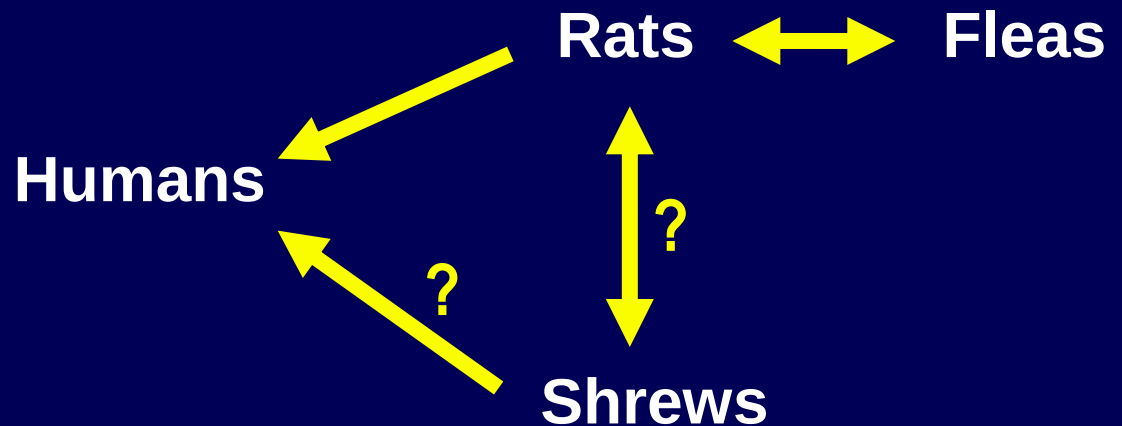


Mahajanga outbreak

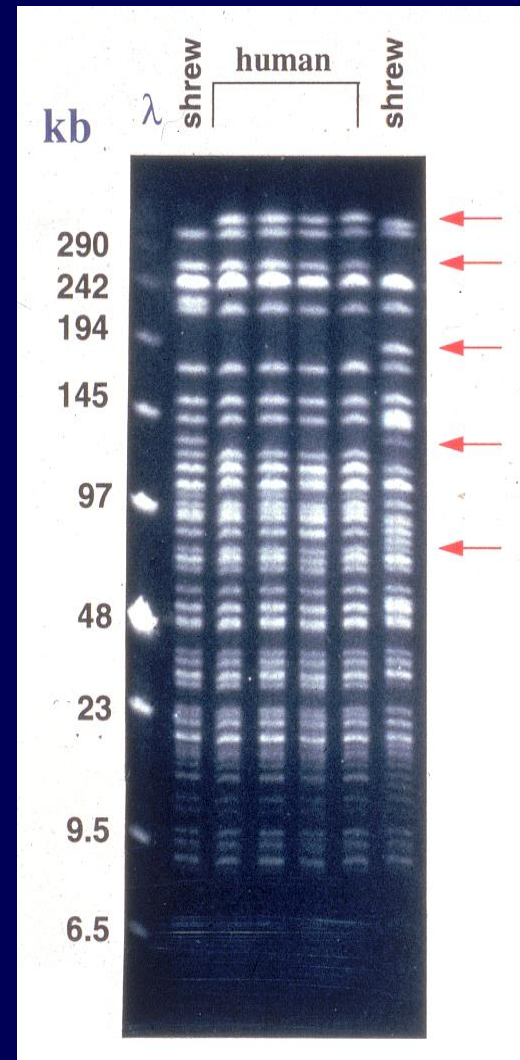
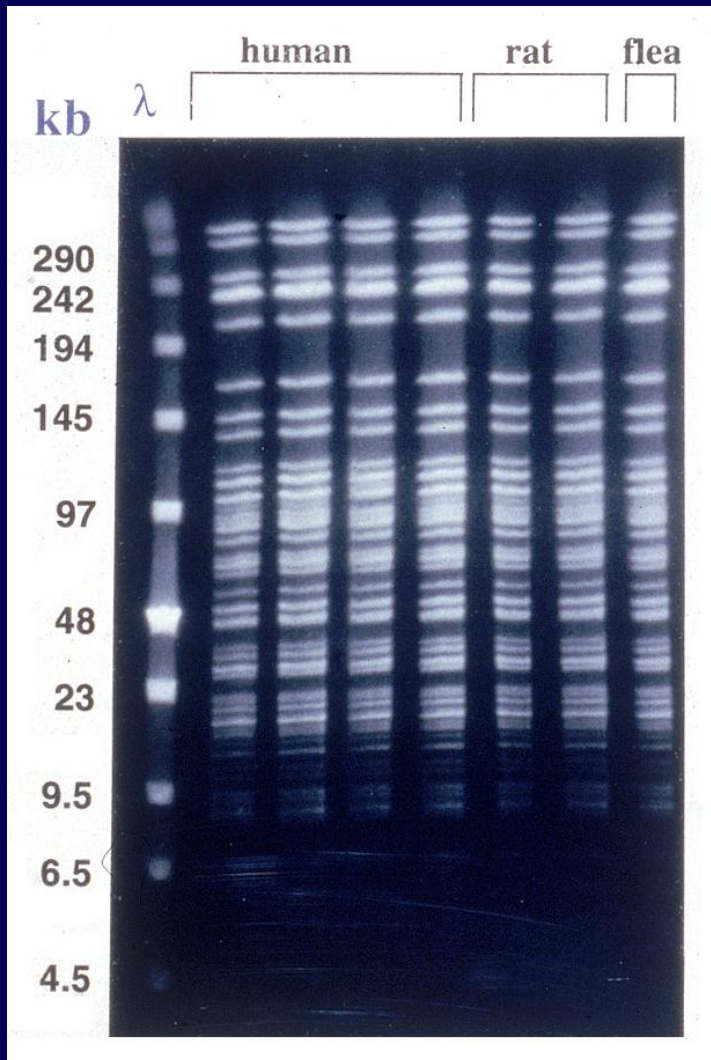
(Resurgence in 1995)



Reservoir?



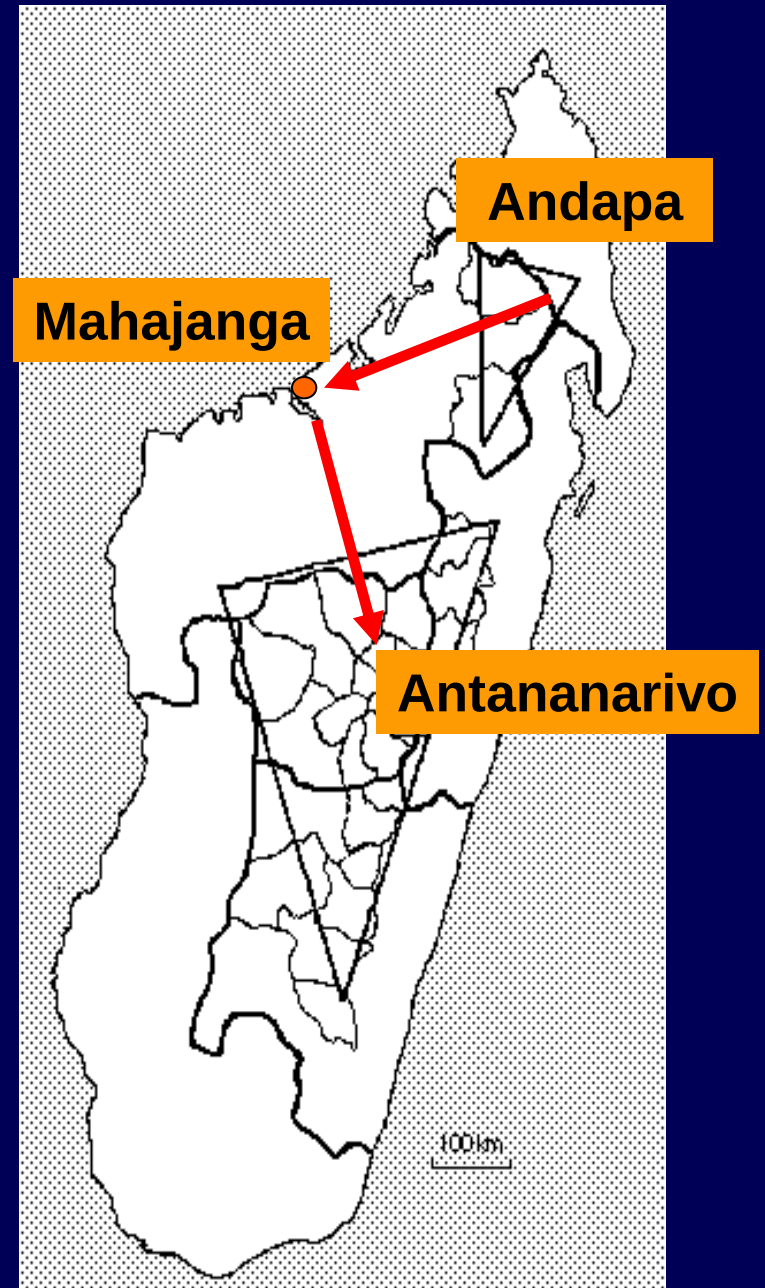
PFGE Mahajanga



Geographical origin:

- From a Malagasy focus?
- Imported ?

PFGE



Algeria

- Oran, June 2003
- No plague cases for 50 years
- Cases: First on June 2 in Kehailia
11 year old boy who died on June 4



Epidémie de peste dans la région d'Oran, Algérie
Juin - Juillet 2003 / répartition des cas

Mer Méditerranée

- Cas suspect
- Cas confirmé

Zones urbaines

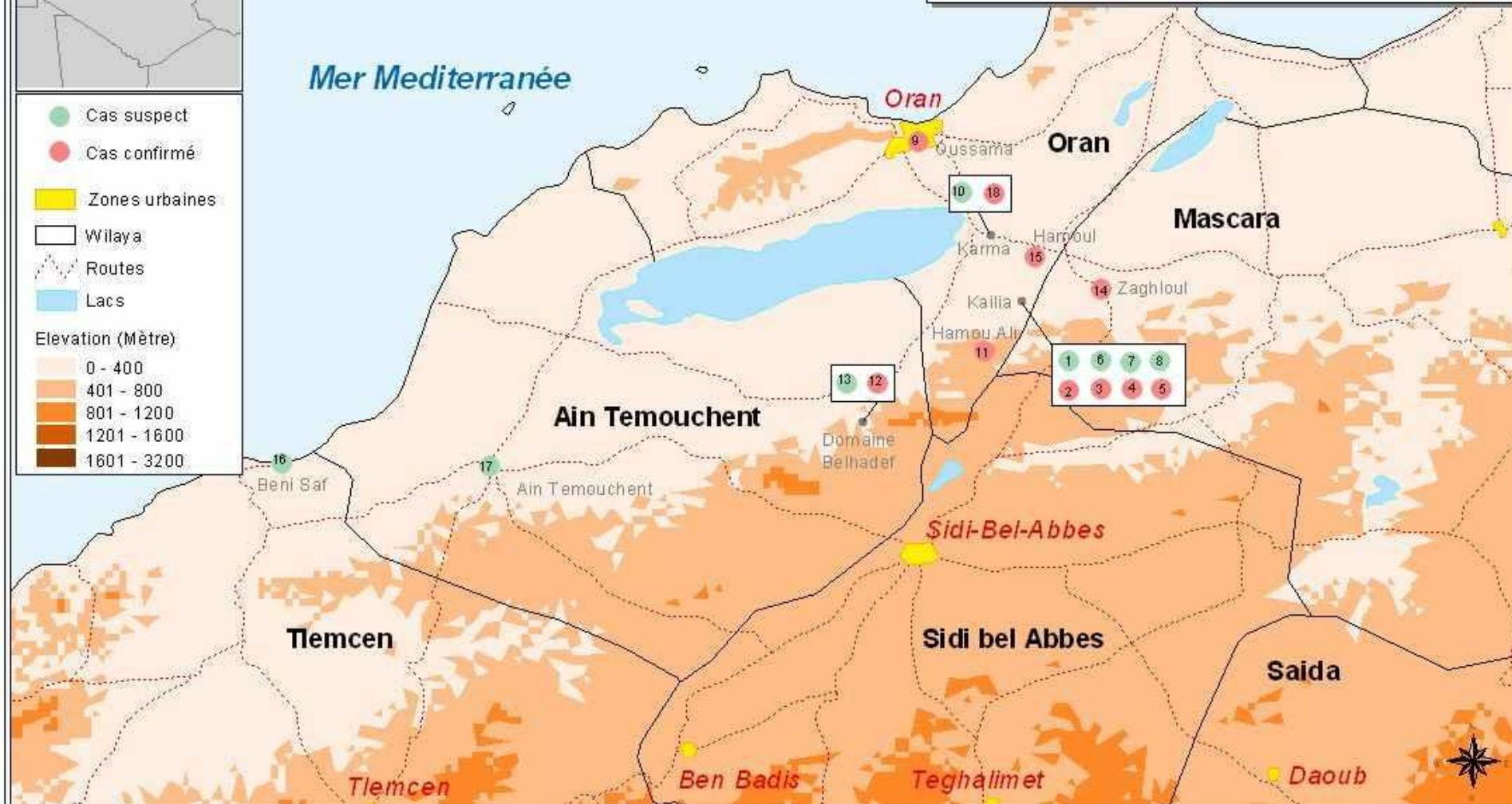
Wilaya

Routes

Lacs

Elevation (Mètre)

- 0 - 400
- 401 - 800
- 801 - 1200
- 1201 - 1600
- 1601 - 3200



The presentation of material on the maps contained herein does 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 areas or of its authorities, or concerning the delineation of its frontiers or boundaries.

Data source: Ministère de la Santé/Algérie
Map Production: Public Health Mapping Group
Communicable Diseases (CDS)
World Health Organization
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Ain Temouchent: June 28
50 km from Kehailia



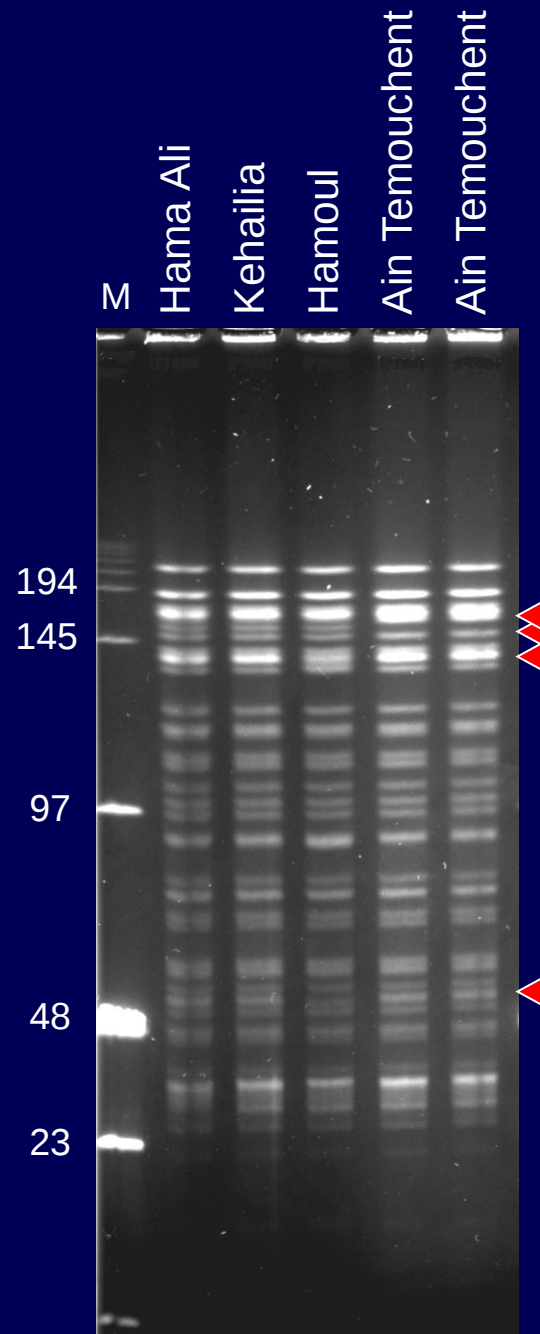
Are the human cases in Kehailia and Ain Temouchent related?

Five strains isolated: 3 around Kehailia
 2 from Ain Temouchent

- **Phenotyping** → Typical Orientalis strains
- **Ribotyping** → Typical ribotype B
- **PFGE**

PFGE

(NotI)



3 pulsotypes

Different strains
Closely related

Origin of this outbreak?

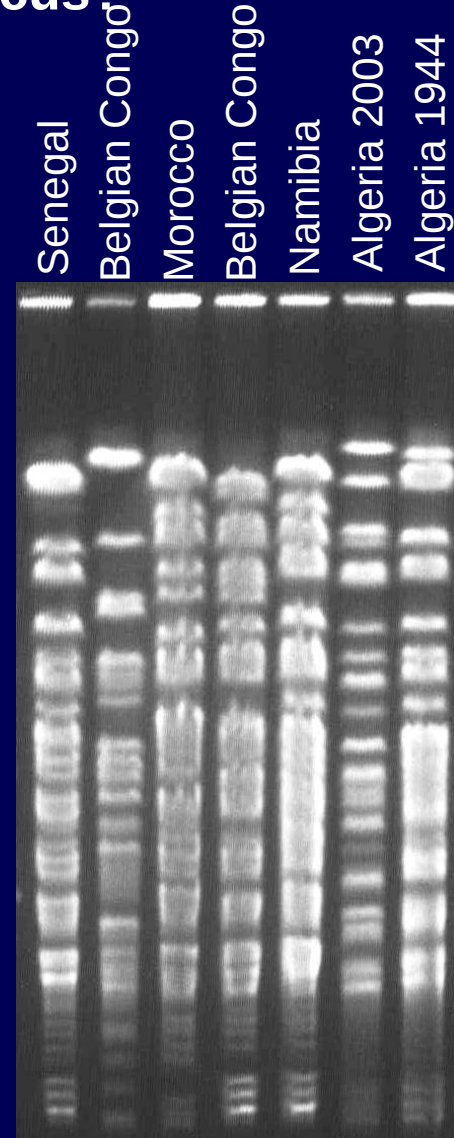
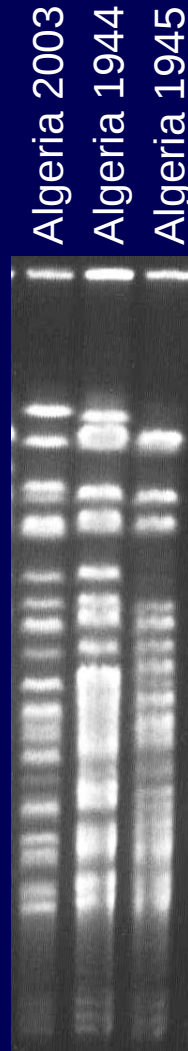
- Re-emergence of a quiescent plague focus?
- Imported?

2 human *Y. pestis* isolates:

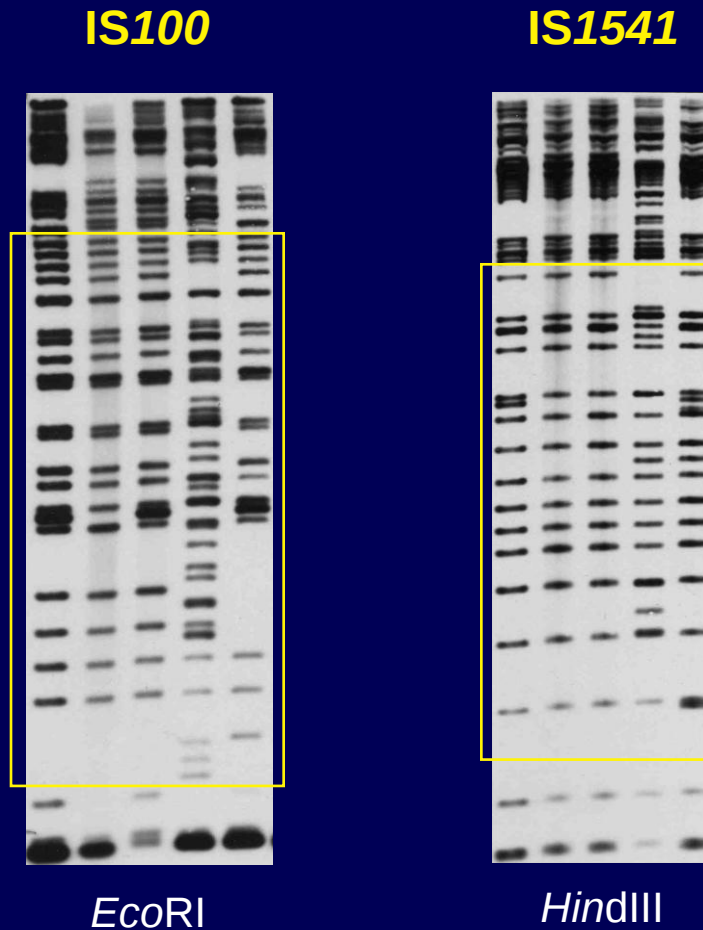
Oran 1944

Oran 1945

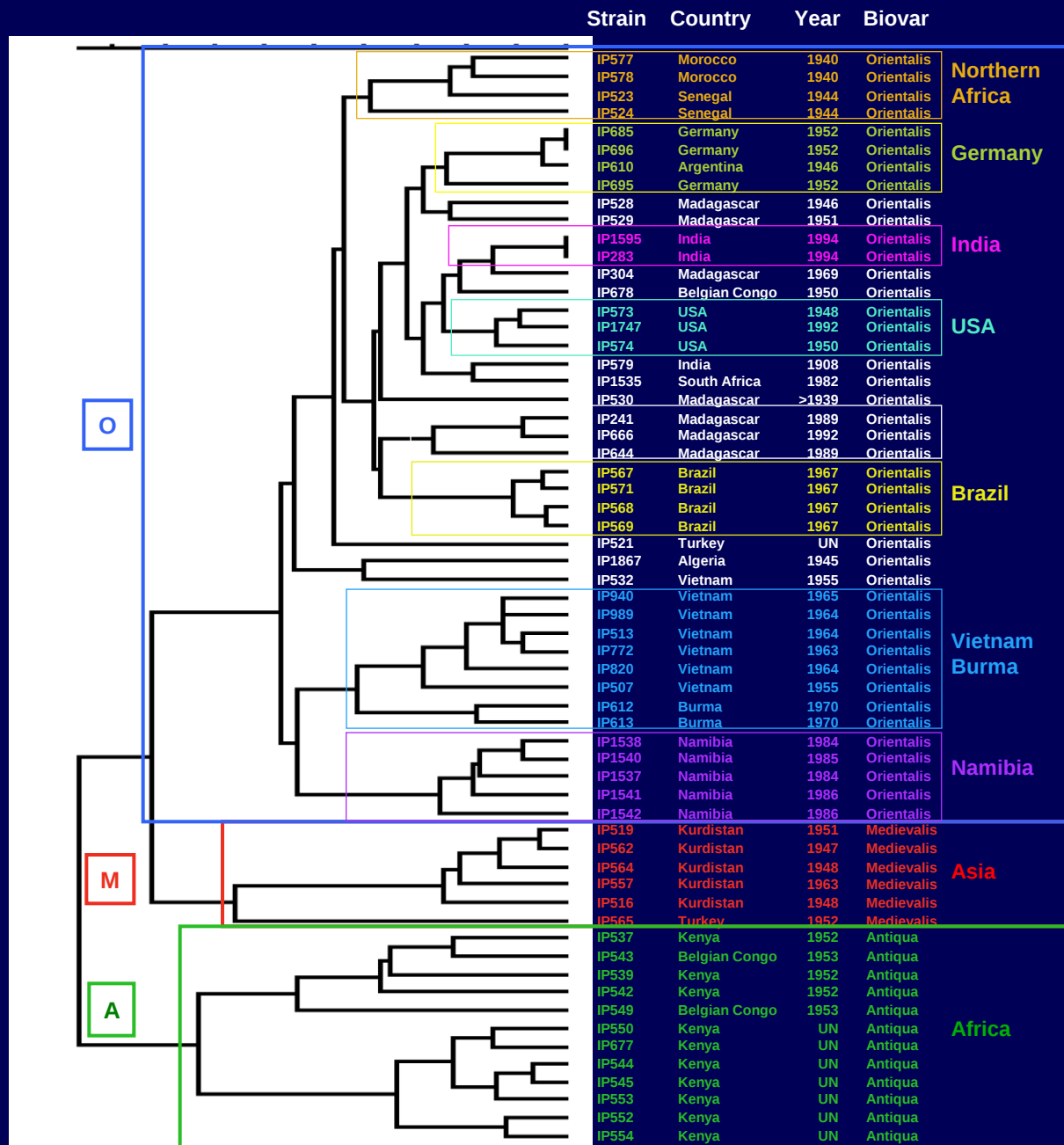
PFGE
(*SpeI*)



IS Fingerprinting (IS-RFLP)



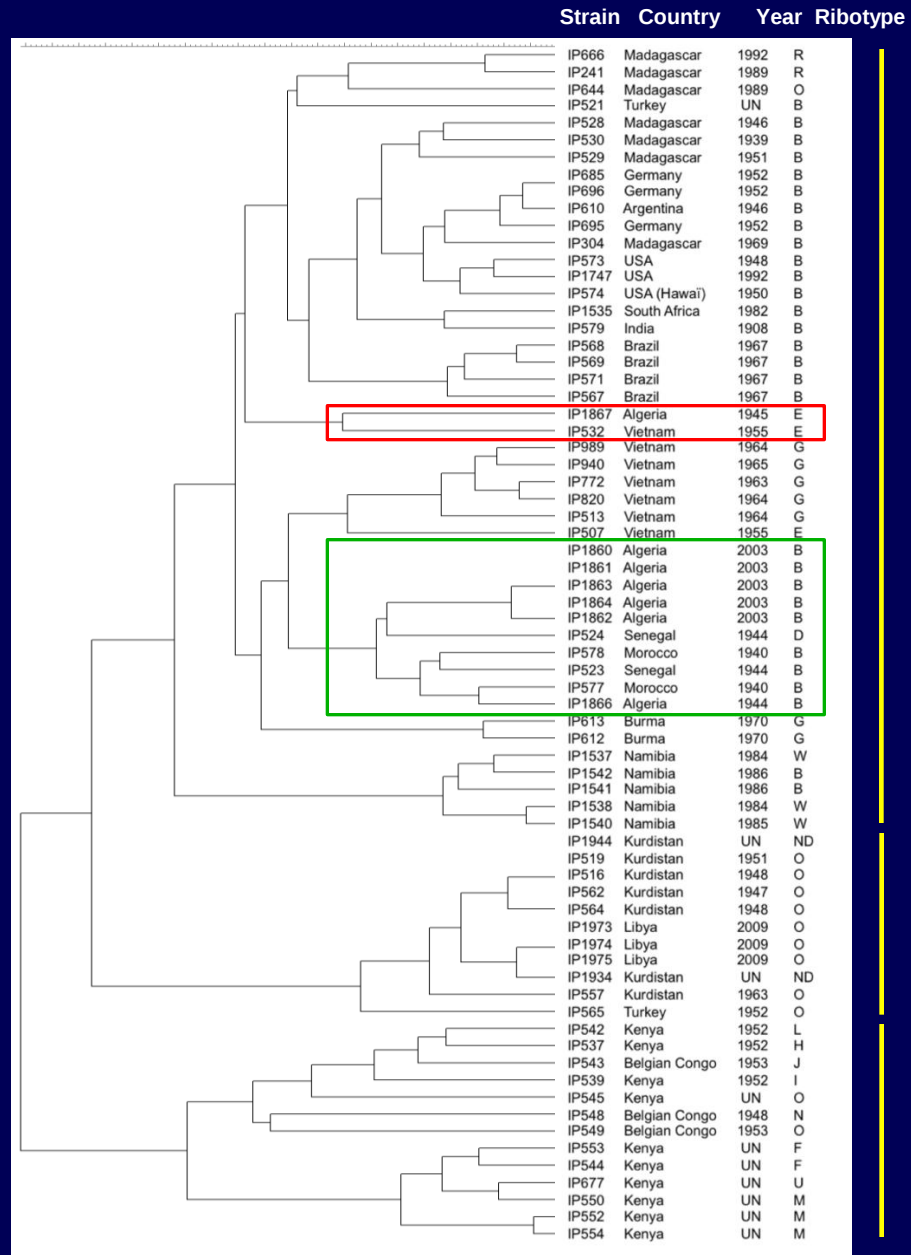
IS-RFLP



IS-RFLP

Algerian strains

→ Origin from Northern Africa



Orientalis

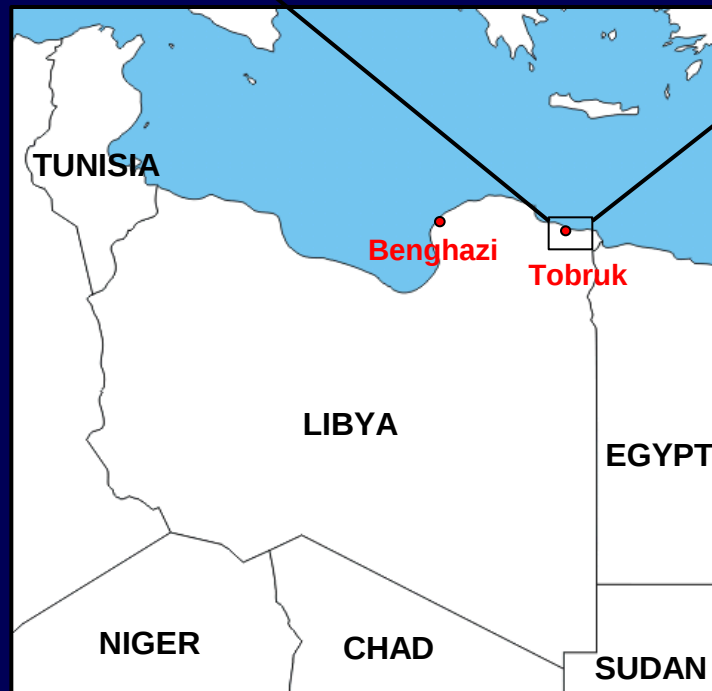
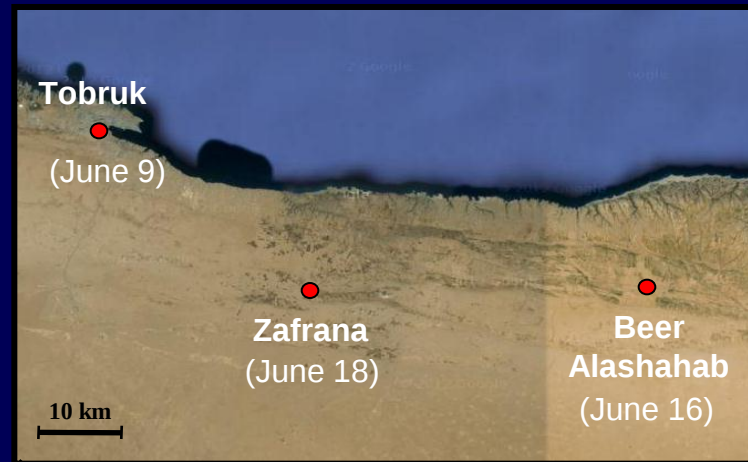
Medievalis

Antiqua

Libya

- Tobruk, June 2009
- No plague cases for 25 years
- Cases: First on June 9 in Eltarsha
13 year old boy who died on June 11

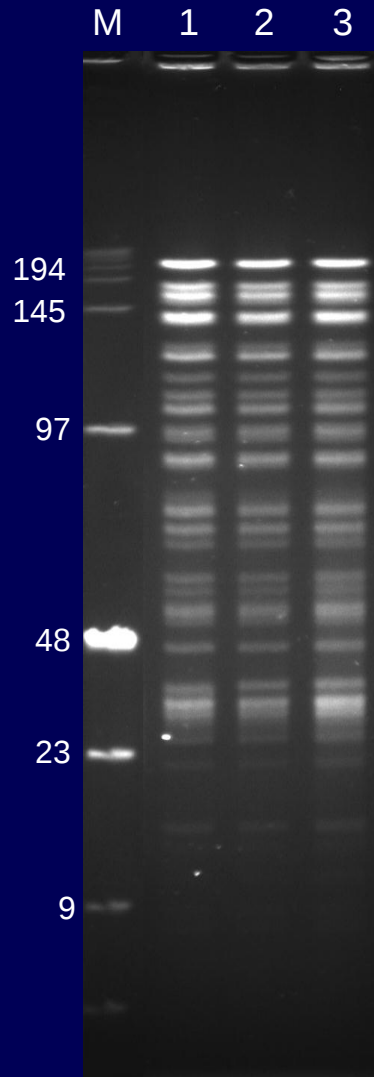
3 strains isolated
(by IP Madagascar)



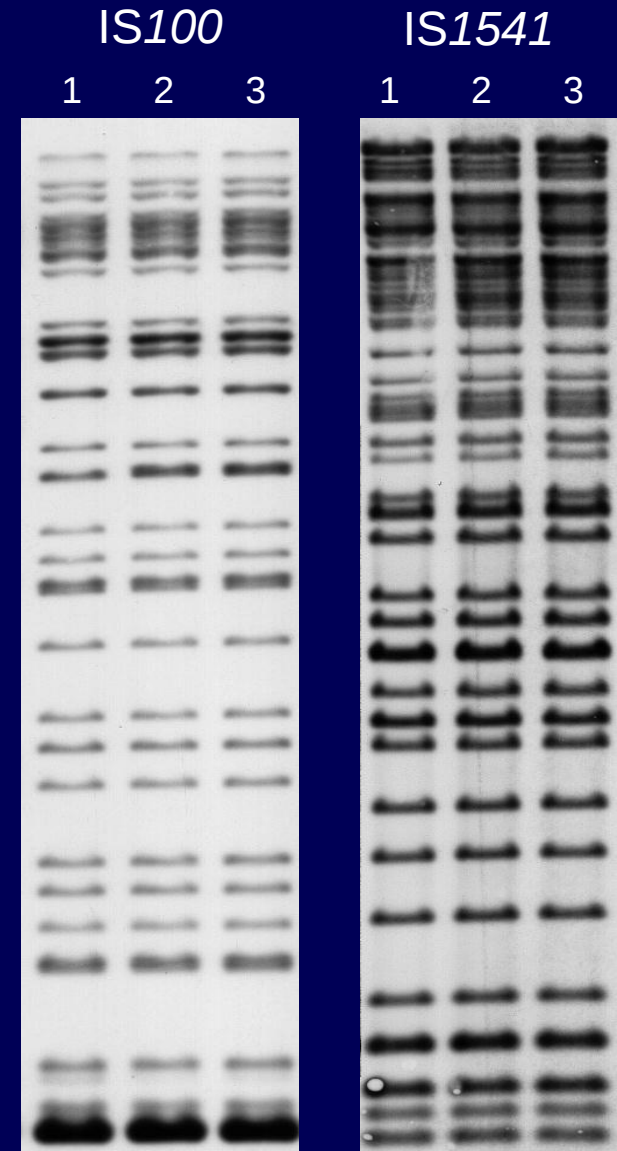
Cases related?

→ Yes

PFGE



IS-RFLP

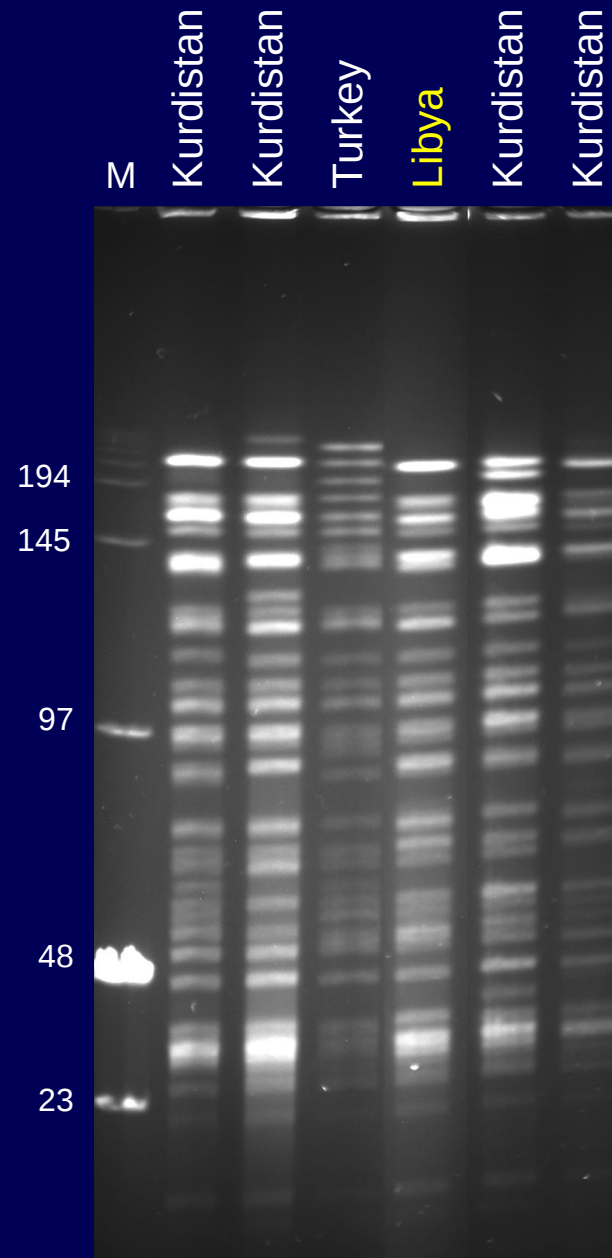


Origin?

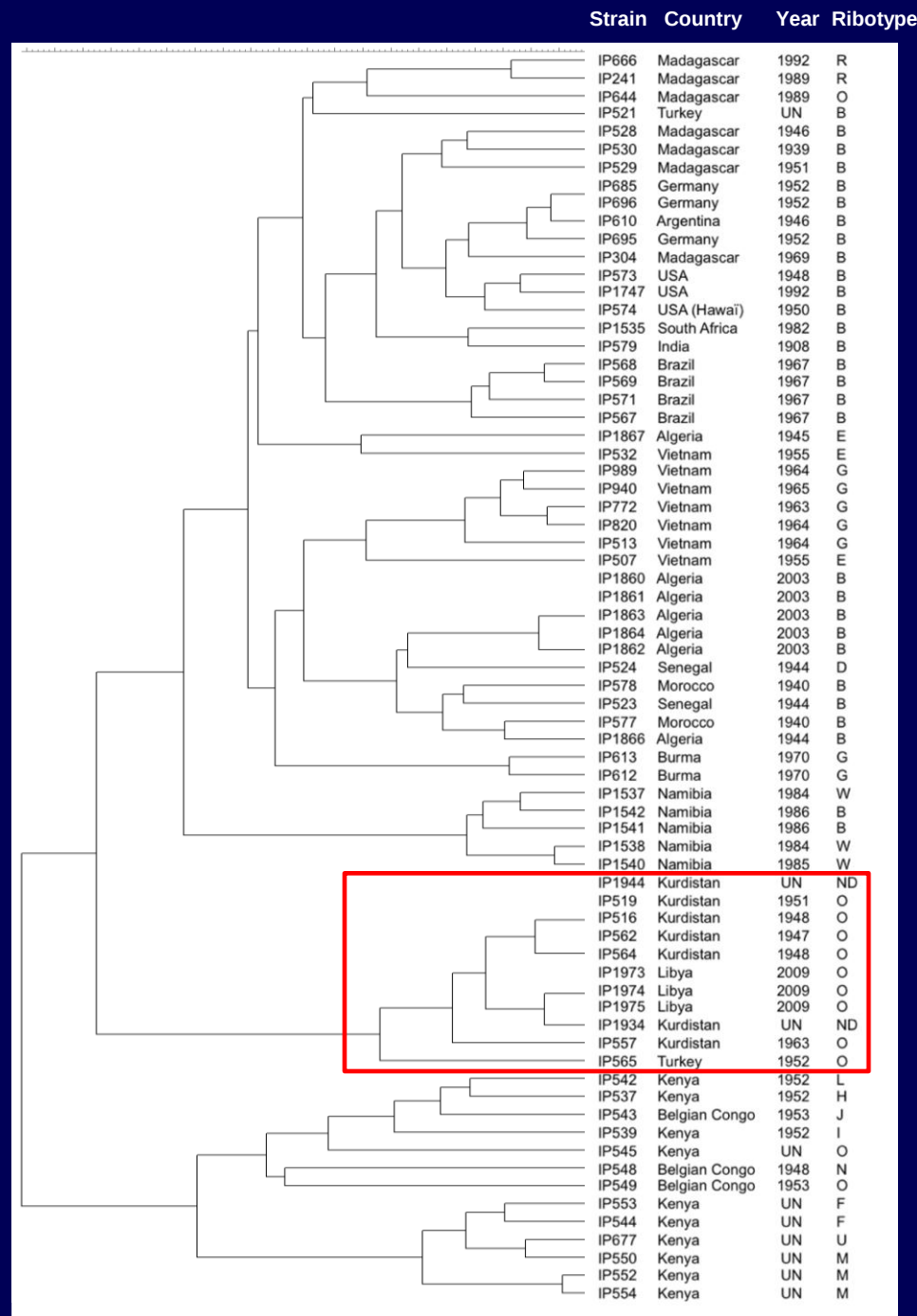
Biovar → Medievalis

Ribotype → O

PFGE



IS-RFLP



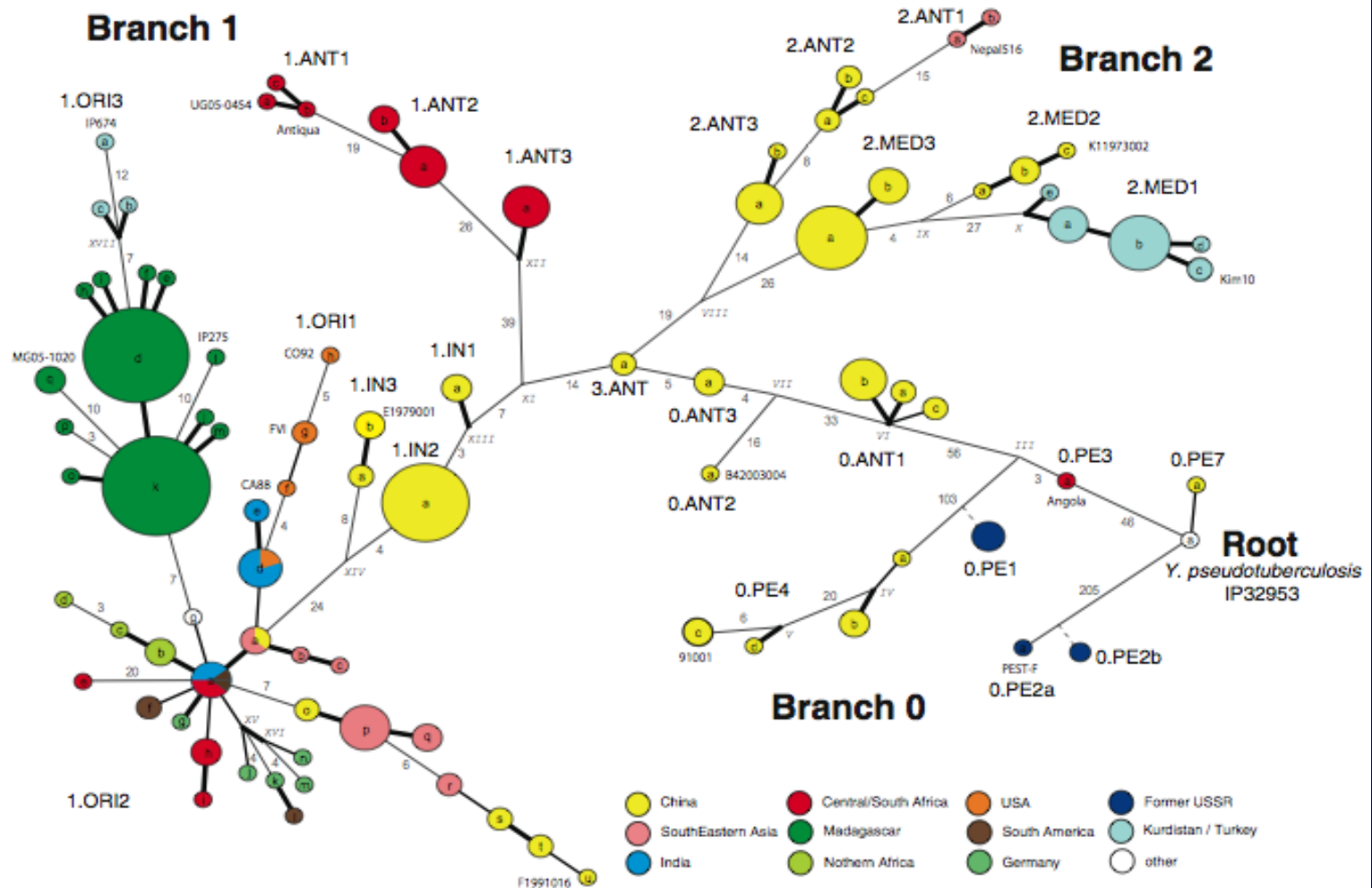
Orientalis

Medievalis

Antiqua



- No Link between the Algerian and Libyan plague outbreaks
- Algeria: Northern Africa focus
- Libya: Central Asia origin



Collaborators

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