

Mosquito-borne viruses

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Mosquito-borne infections

Flaviviruses

WNV

Culex

DENV

Aedes

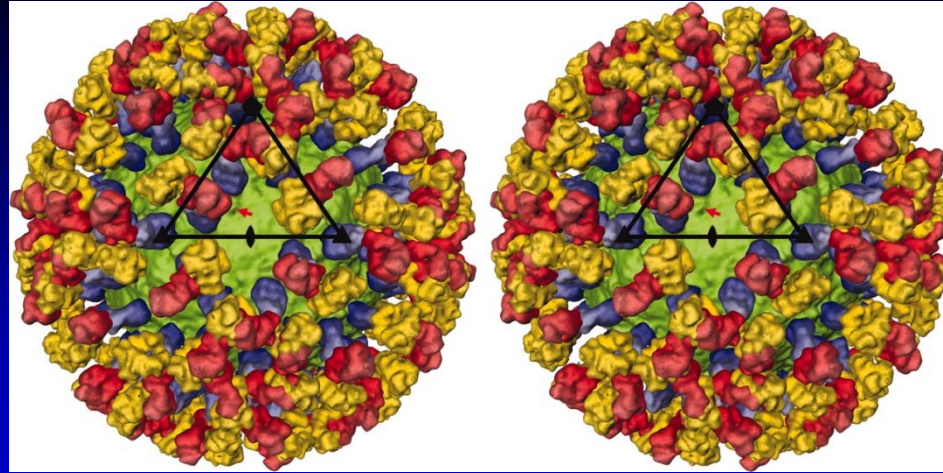
ZIKV

Aedes

Alphaviruses

CHIKV

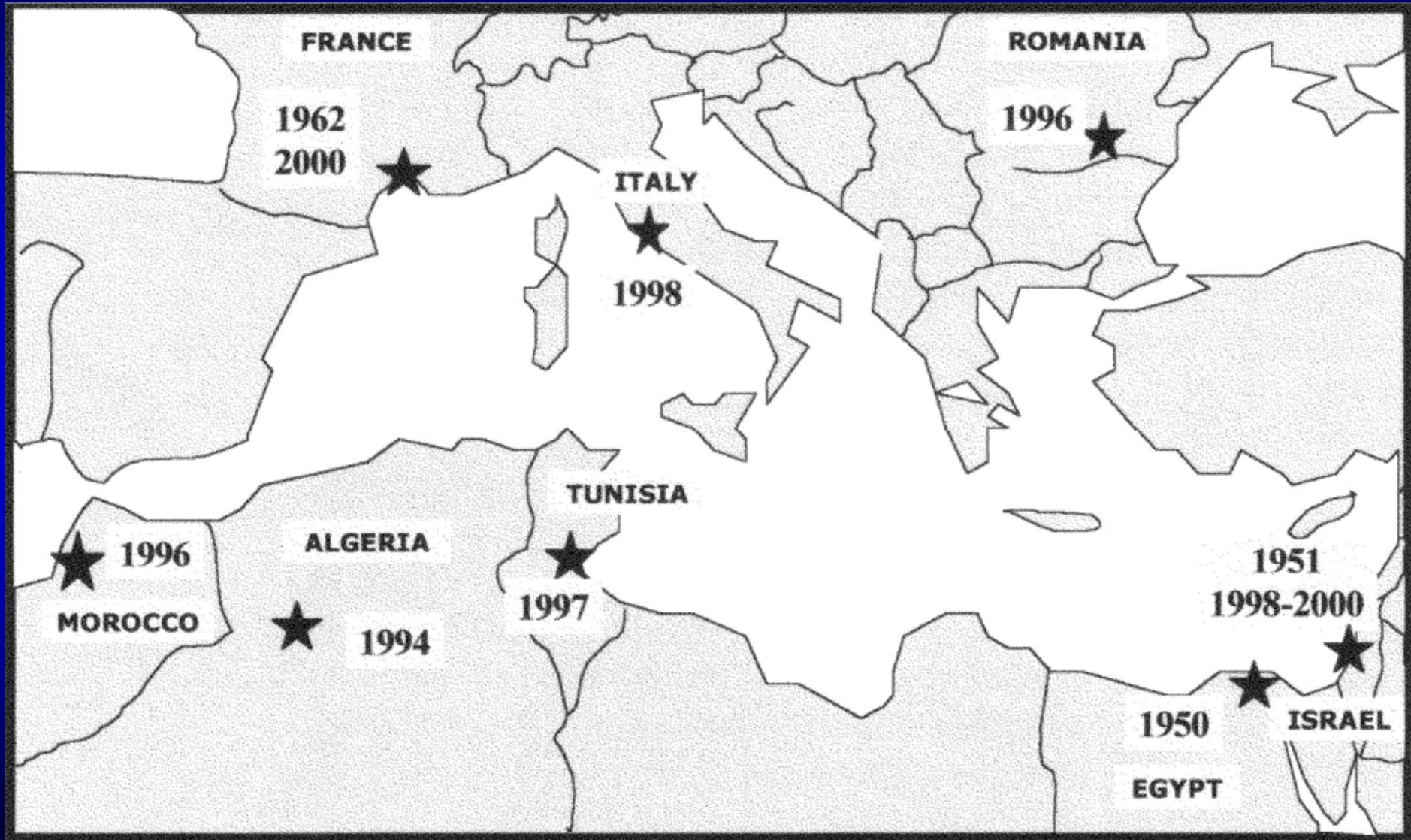
Aedes



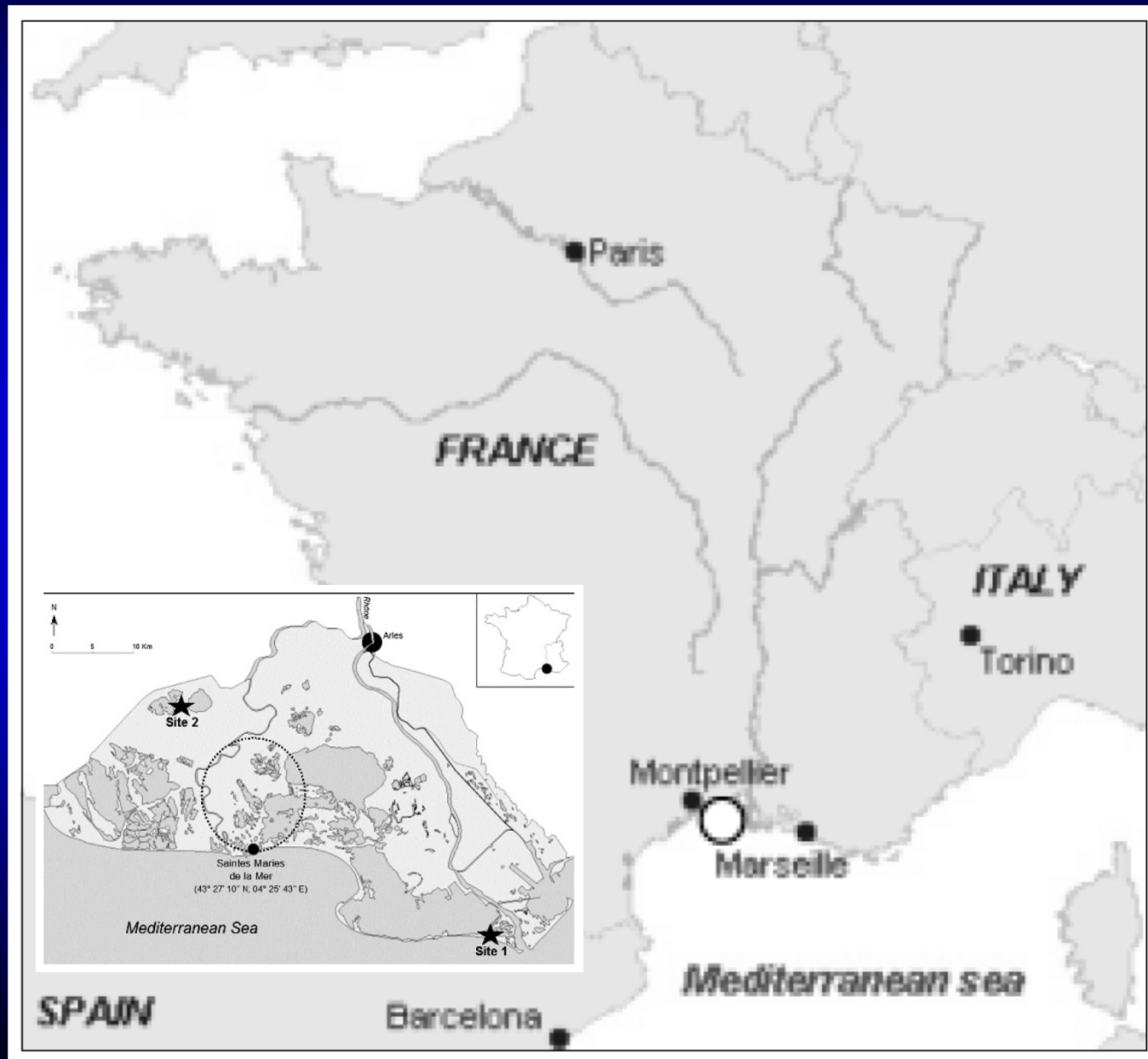
WEST NILE VIRUS



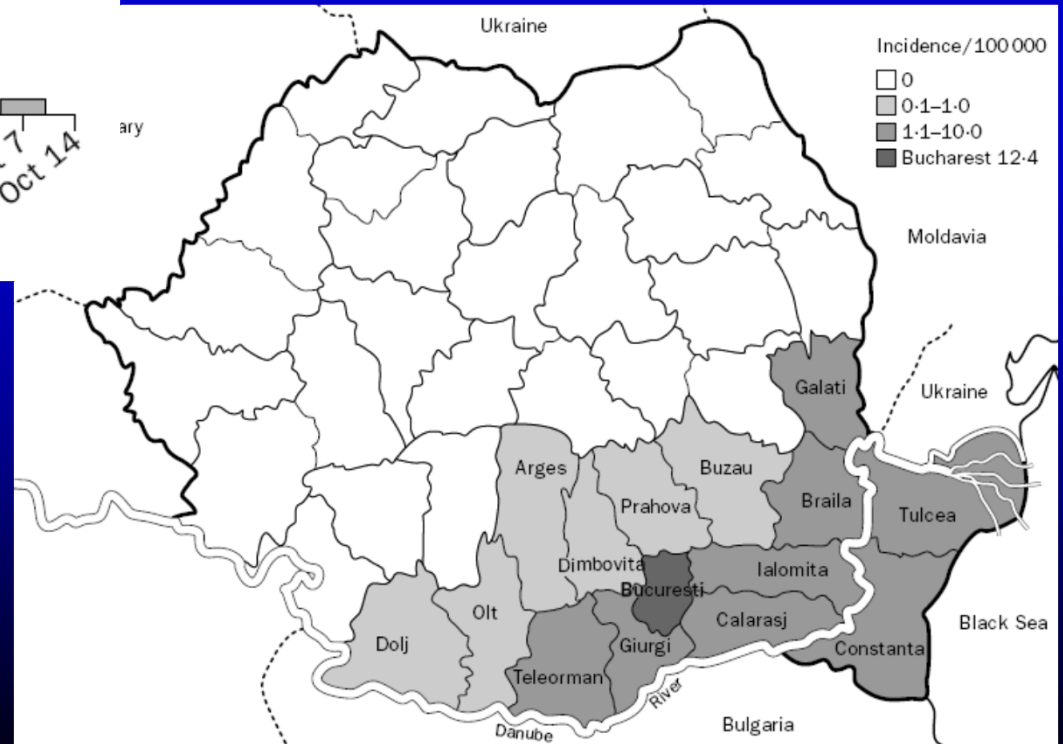
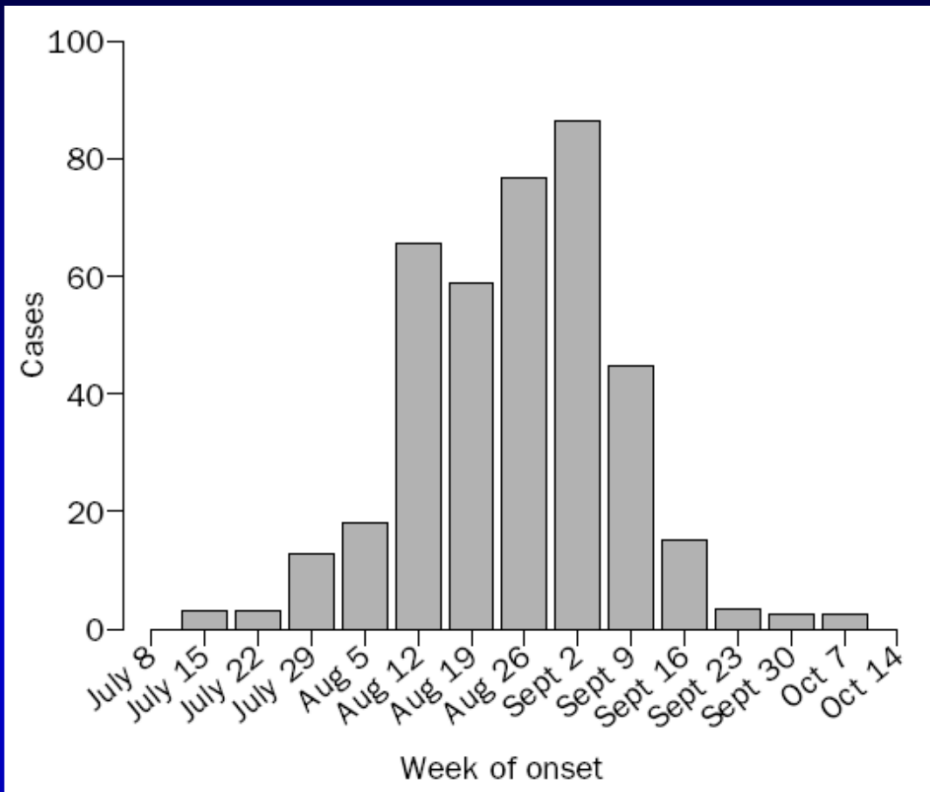
WNV in the Mediterranean basin



**WNV in Camargue, France: 1962-65 (cases in horses,
13 human cases) - 2000 (no cases in humans)**



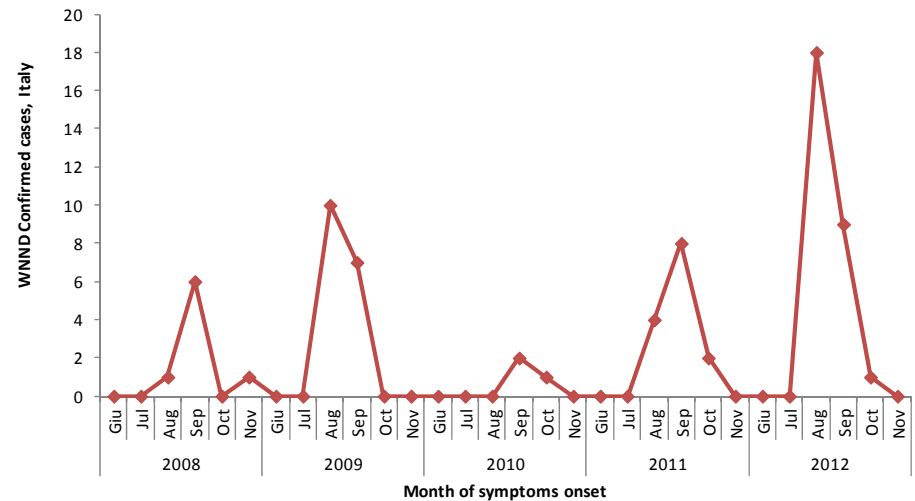
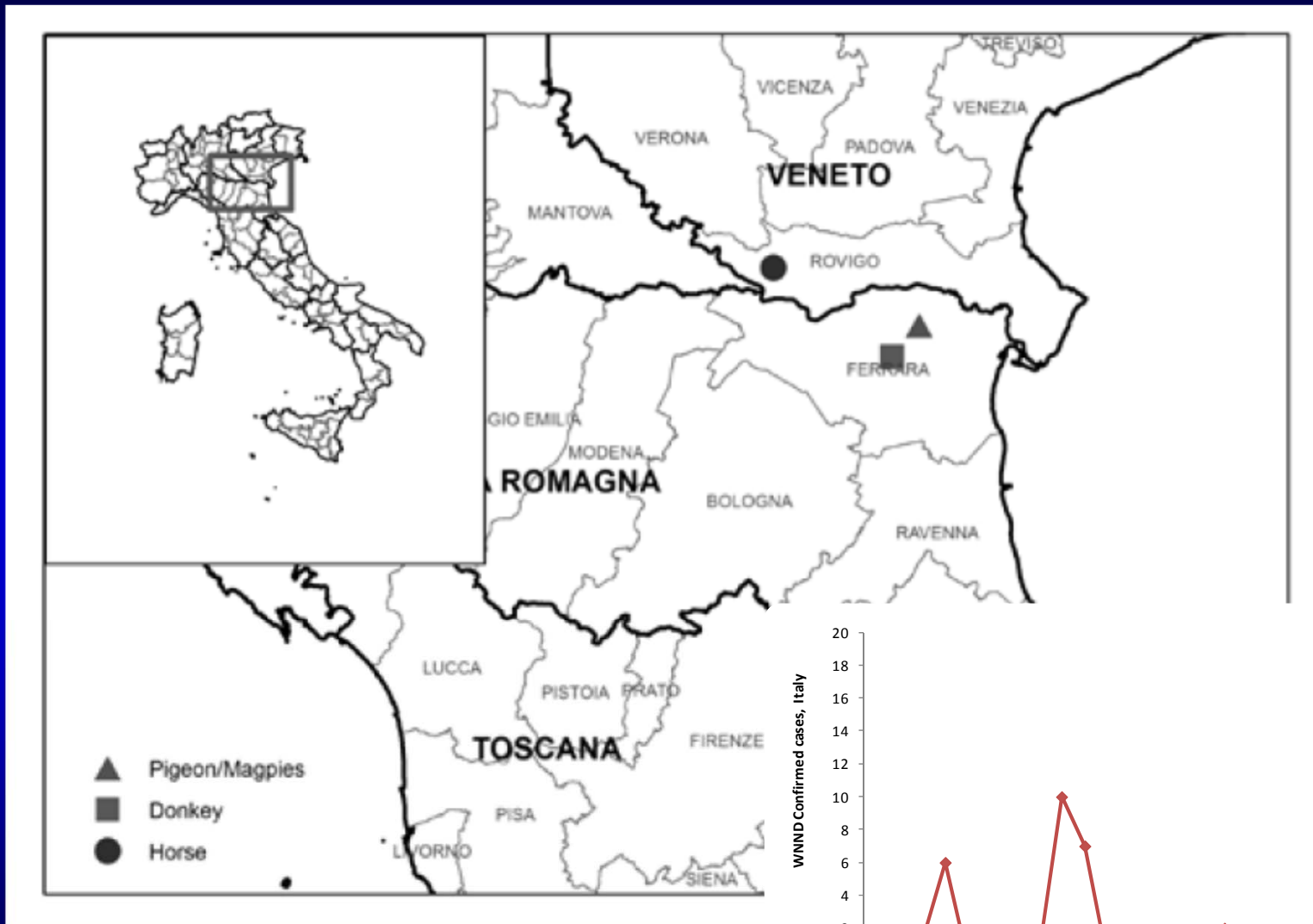
Romania, 1996



West Nile virus in Italy, 1998

- Between August and October 1998 an outbreak of equine encephalomyelitis occurred in Tuscany Region. 14 cases were registered, with 6 deaths.
- A strain of West Nile virus was isolated from the brain of a horse.
- Four asymptomatic infections were identified in asymptomatic humans at risk

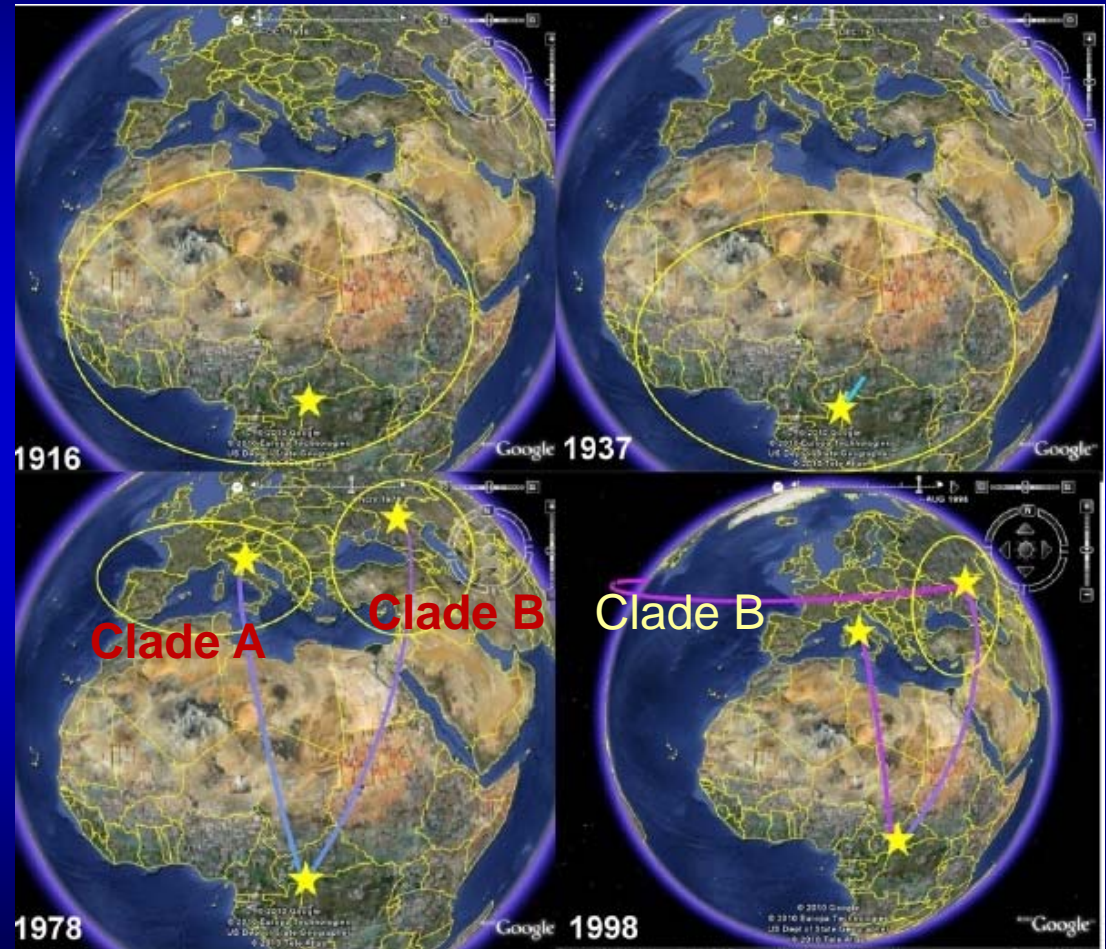
2008: WNV is back!



Phylogeographic analysis of WNV- 1 spread

Significant links

- between Africa and Western Europe
- between Africa and Eastern EuroAsia
- between Eastern EuroAsia and America



Key to Aedes

Scutum with lyre-shaped white markings----- *Aedes aegypti*

Scutum with a long median longitudinal white stripe extending from anterior margin to about level of wing root----- *Aedes albopictus*

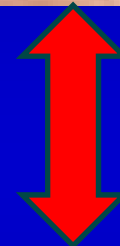
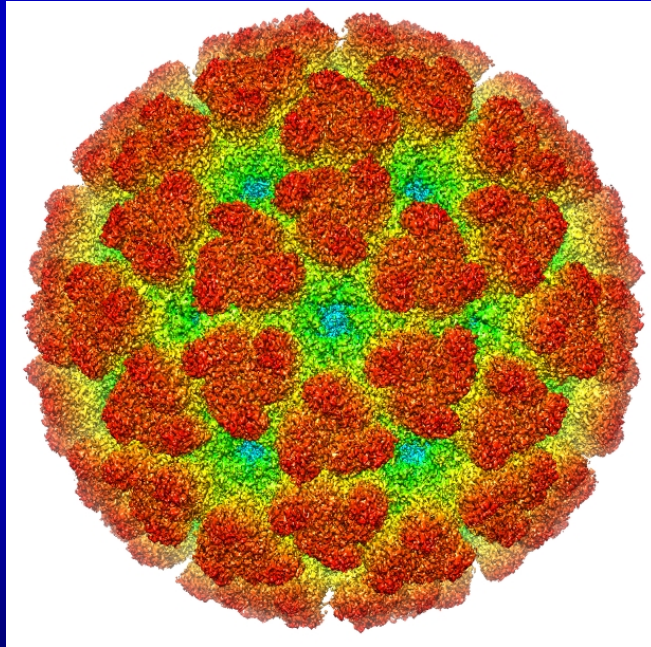


Lyre

Aedes aegypti

Aedes albopictus

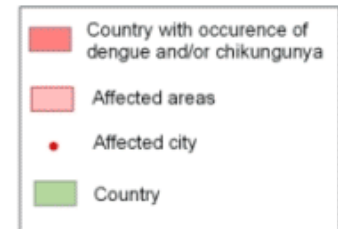
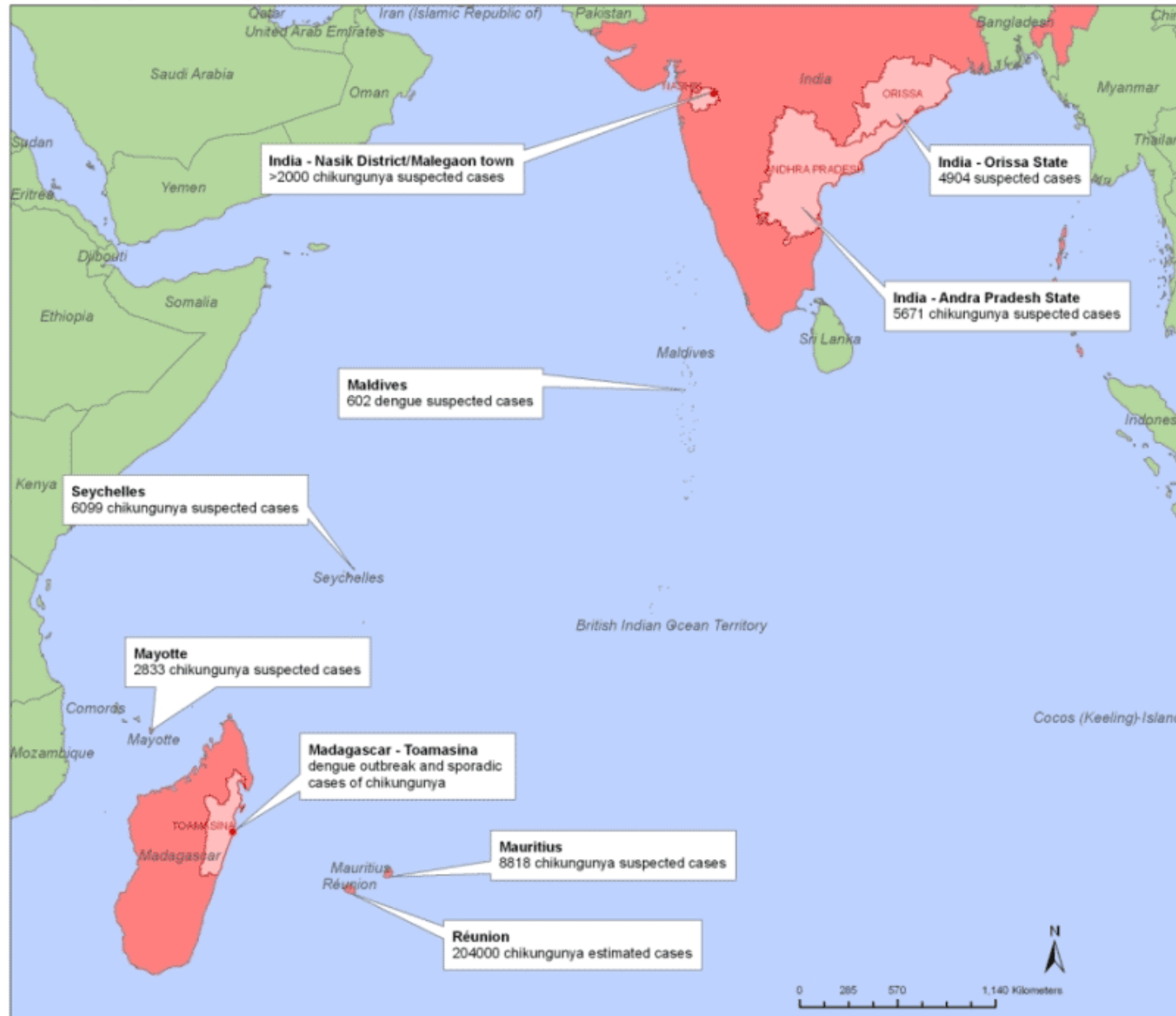
Chikungunya



Chikungunya Symptoms



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



Data Source: WHO/EPR
 Map Production: Public Health Mapping and GIS
 Communicable Diseases (CDS),
 World Health Organization.

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.



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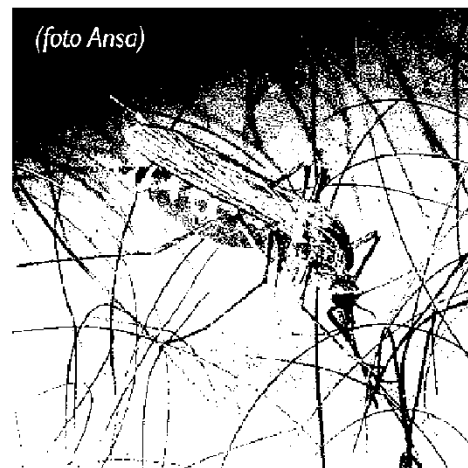
RAVENNA: 50 COLPITI DALL'INSETTO, QUATTRO RICOVERI

Febbre alta e dolori forti Scatta l'allarme pappatacio

- RAVENNA -

SCATTA l'allarme pappataci nel Ravennate. Sono circa 50 le persone che, dai primi di luglio a oggi, sono state colpite da febbre alta e forti dolori articolari, provocati da un virus veicolato da questi piccoli insetti. Si tratta di residenti nella zona di Castiglione di Cervia (una frazione a pochi chilometri da Ravenna): quattro di loro sono stati ricoverati nell'ospedale ravennate, perché — ha precisato il direttore del dipartimento di Sanità Pubblica dell'Ausl, Raffaella Angelini — avevano altre patologie per cui i medici del Pronto Soccorso hanno ritenuto prudente tenerli sotto stretta osservazione. «E' una sintomatologia febbrile con forti dolori articolari — ha precisato la dottoressa — Ma è assolutamente benigna».

SECONDO le prime ipotesi, la febbre da pappataci sarebbe provocata da un 'arbovirus' (veicolato da insetti) con temperature di 39-40 gradi, cefalea, dolori articolari e un forte senso di spossatezza che può restare anche un mese dopo la febbre: l'altera-



zione scompare però in pochi giorni dopo una cura a base di antipiretici (in alcuni casi anche cortisone).

«SIAMO a conoscenza di casi sporadici ma non di un focolaio», ha spiegato ancora la dottoressa Angelini annunciando che, nella zona interessata, sono state sistemate delle trappole per insetti con cui saranno catturati alcuni esemplari di pappataci. Questi verranno poi esaminati dall'Istituto zooprofilattico di Reggio Emilia, con un'indagine che ha lo scopo di individuare con precisione il tipo di virus.

Rezza et al. Lancet 2007



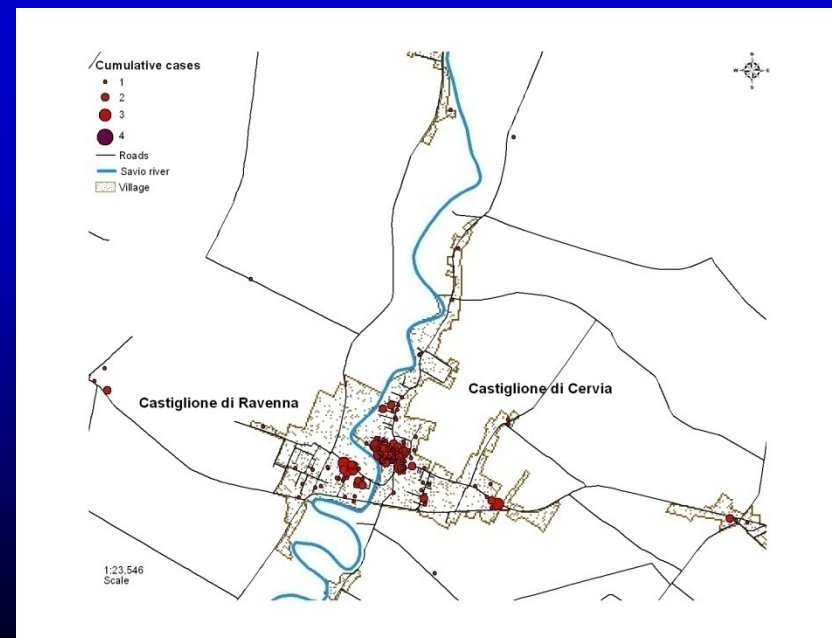
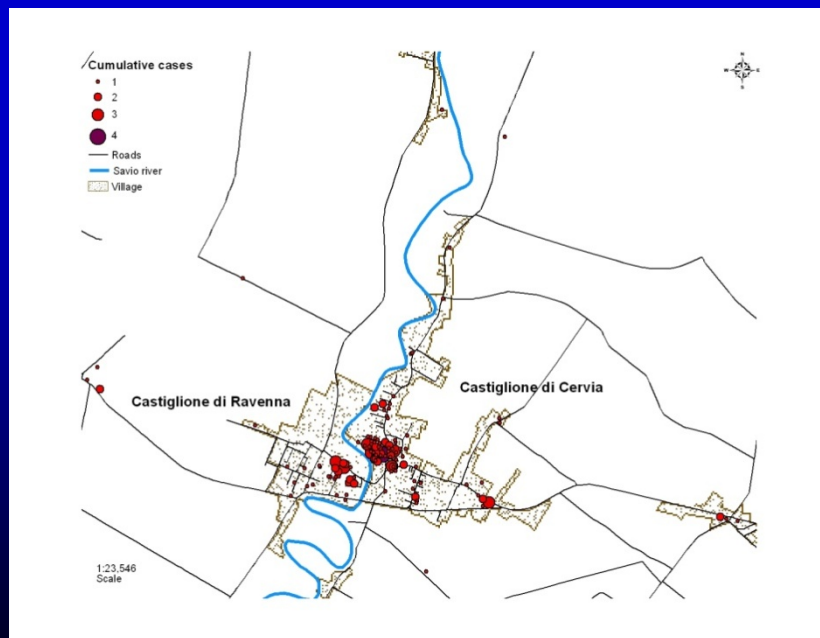
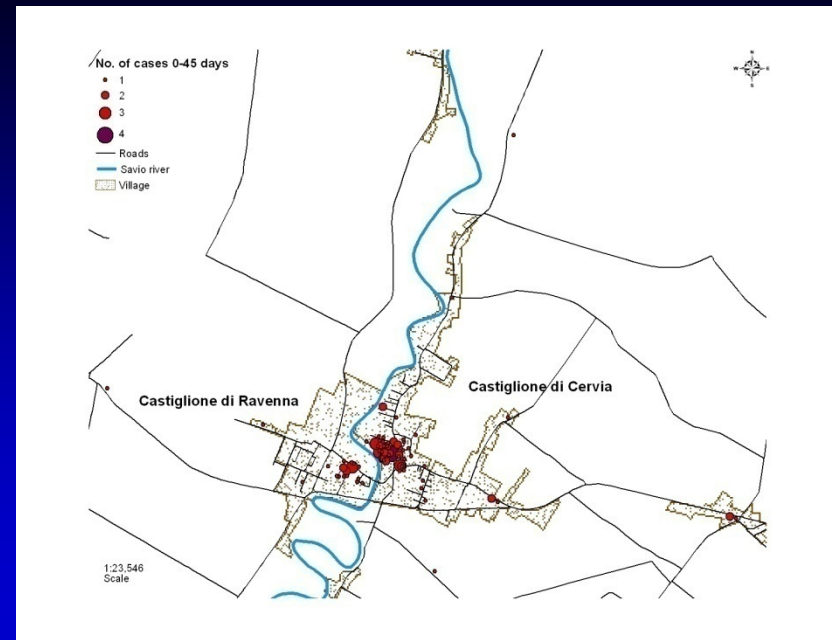
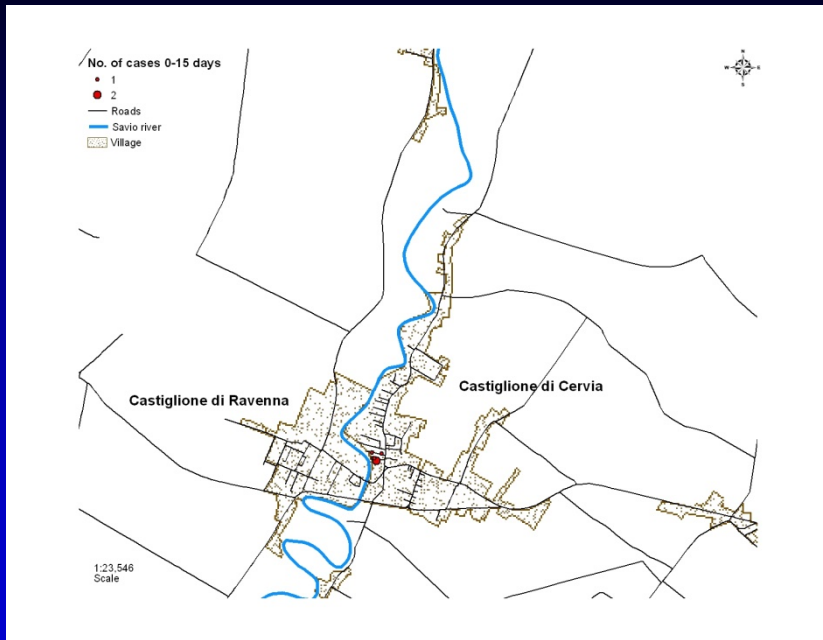
Castiglione di Cervia



Castiglione di Ravenna







Secondary clusters of CHIKV and distance from primarily affected areas



Cervia (9 Km) 19 cases

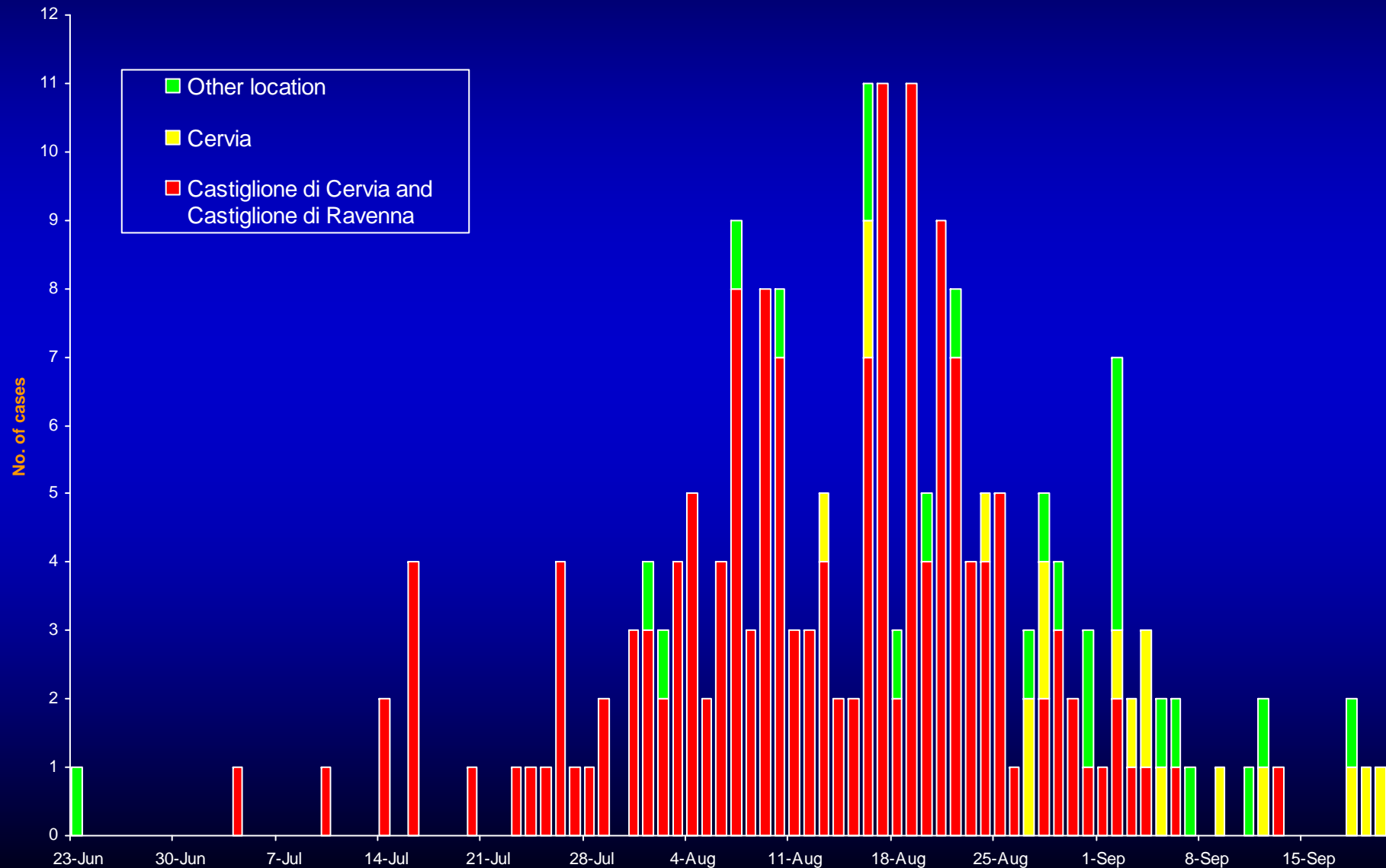
Ravenna (23 Km) 9 cases

Cesena (19 Km) 15 cases

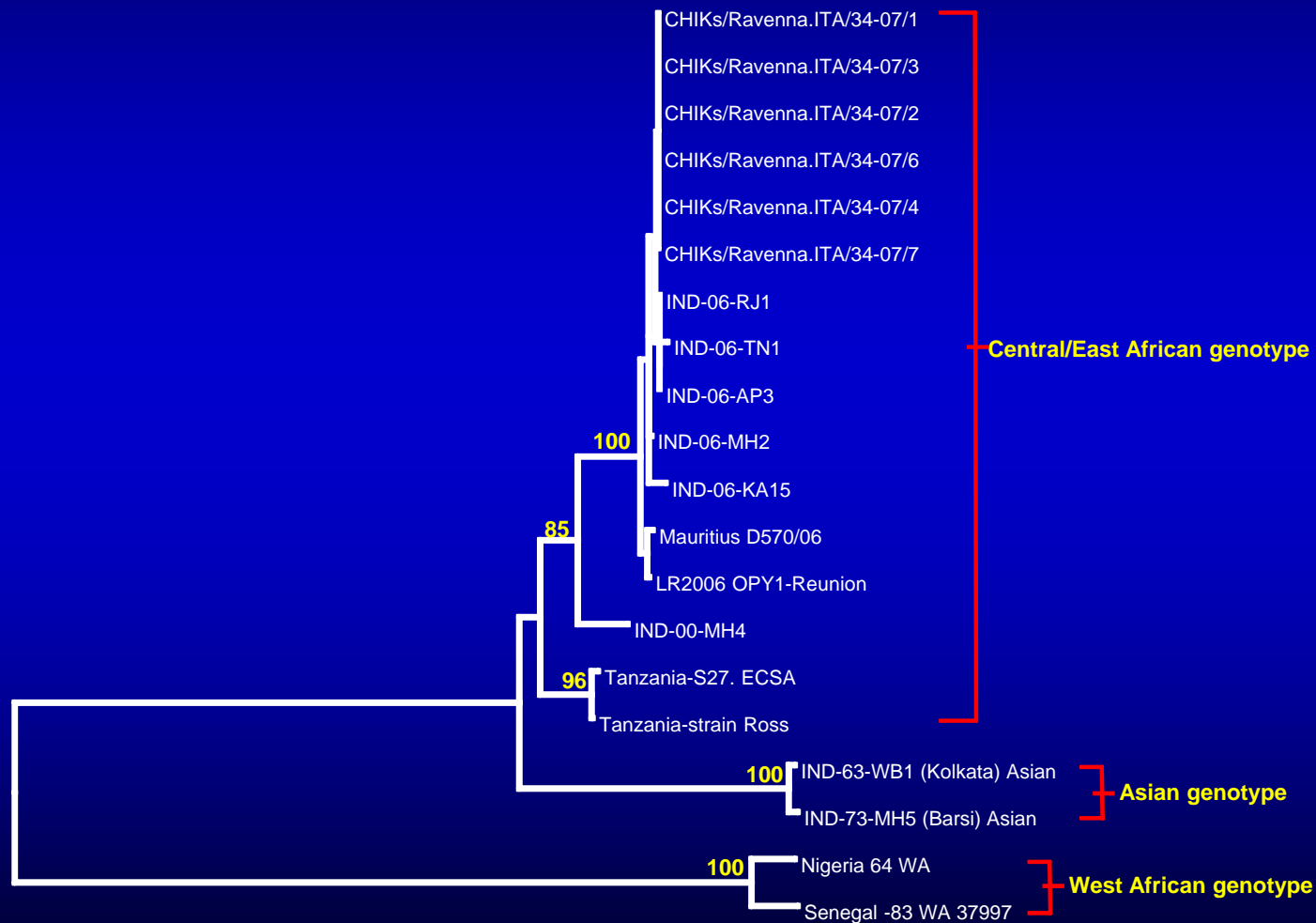
Bologna (90 Km) 5 cases

Rimini (49 Km) 6 cases

Epidemic Curve by Presumed Place of Infection



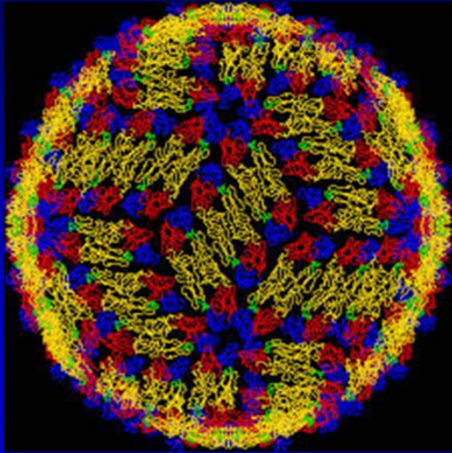
Phylogenetic analysis of the partial nucleotide sequence (1011 nucleotides) of the E1 gene of CHIKV strains identified in Italy and in different parts of the world



0.005

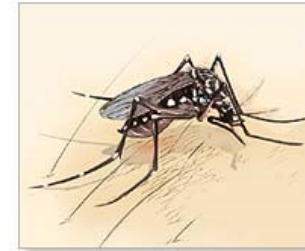


Dengue: geographic distribution and symptoms



Dengue fever is characterized by:

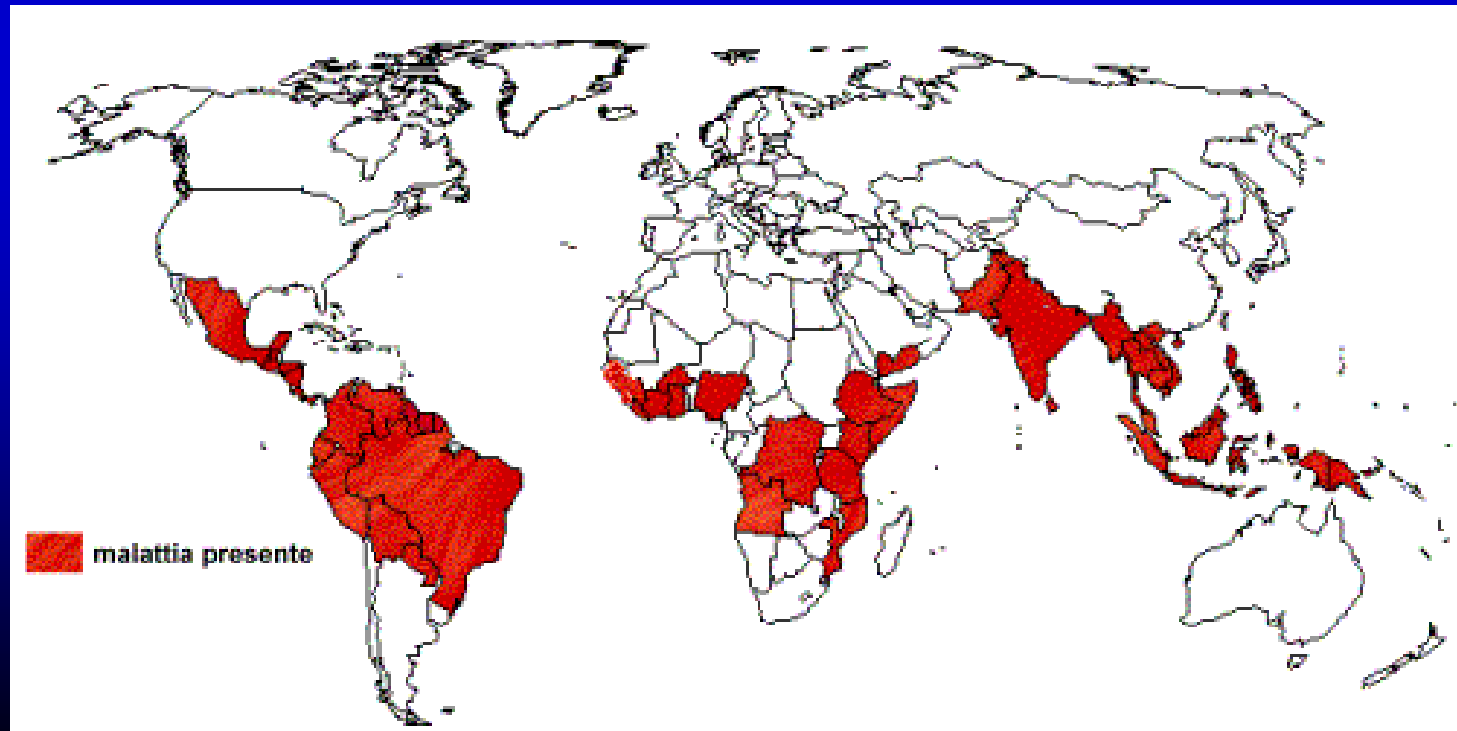
- Fever
- Rash
- Muscle and joint pains



Aedes aegypti mosquito



ADAM.



Dengue in Latin America: historical spread

AVANCE PROGRESIVO DEL DENGUE EN AMÉRICA LATINA



Década del '70

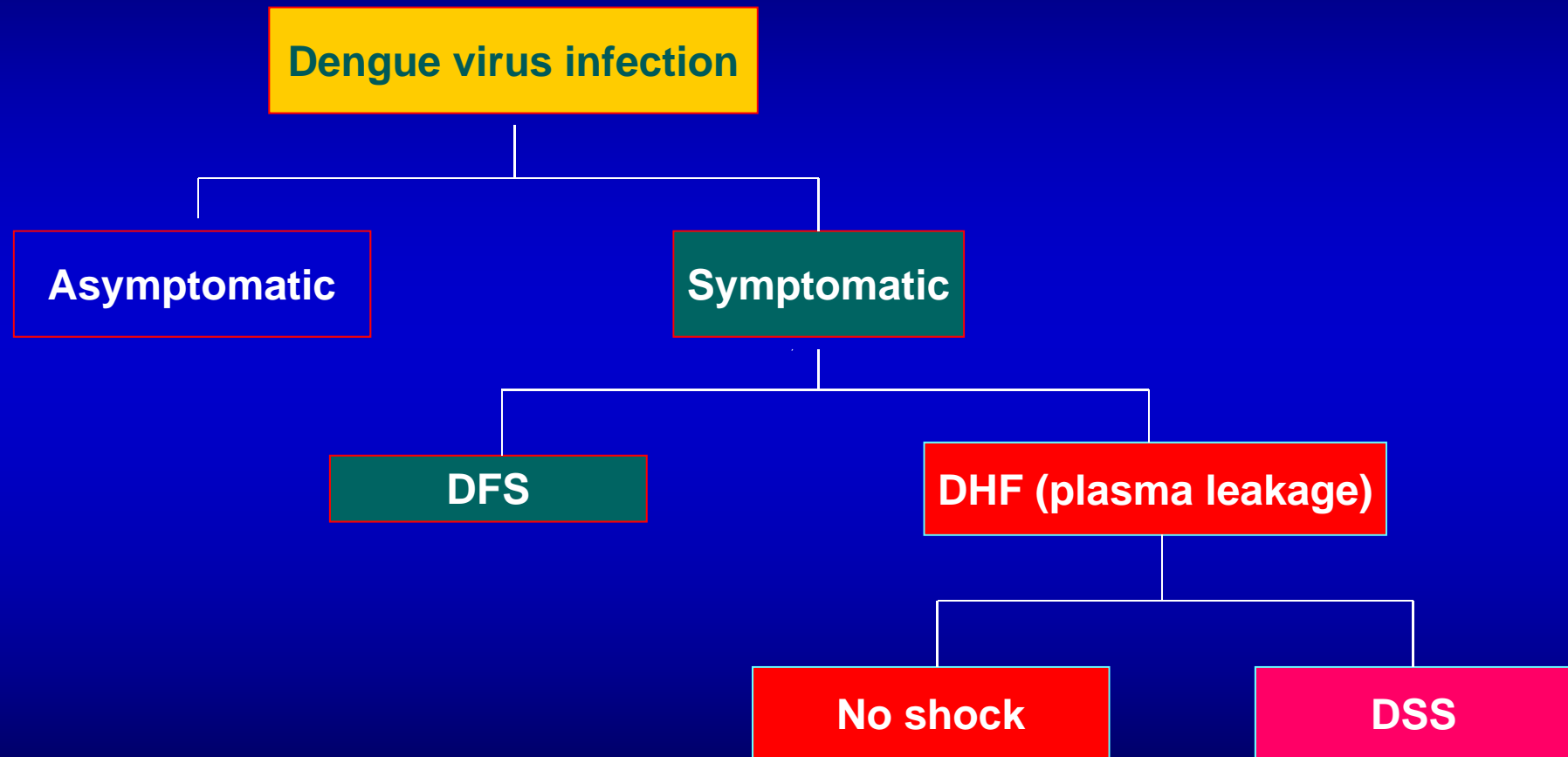
Década del '80

Década del '90
hasta 2008

■ Evolución histórica de la situación del dengue y la fiebre hemorrágica del dengue | 1980-2008.

Fuente: Organización Panamericana de la Salud

Manifestations of Dengue virus fever

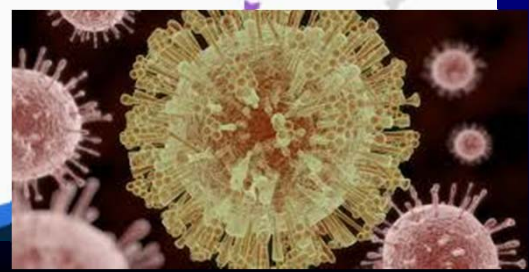
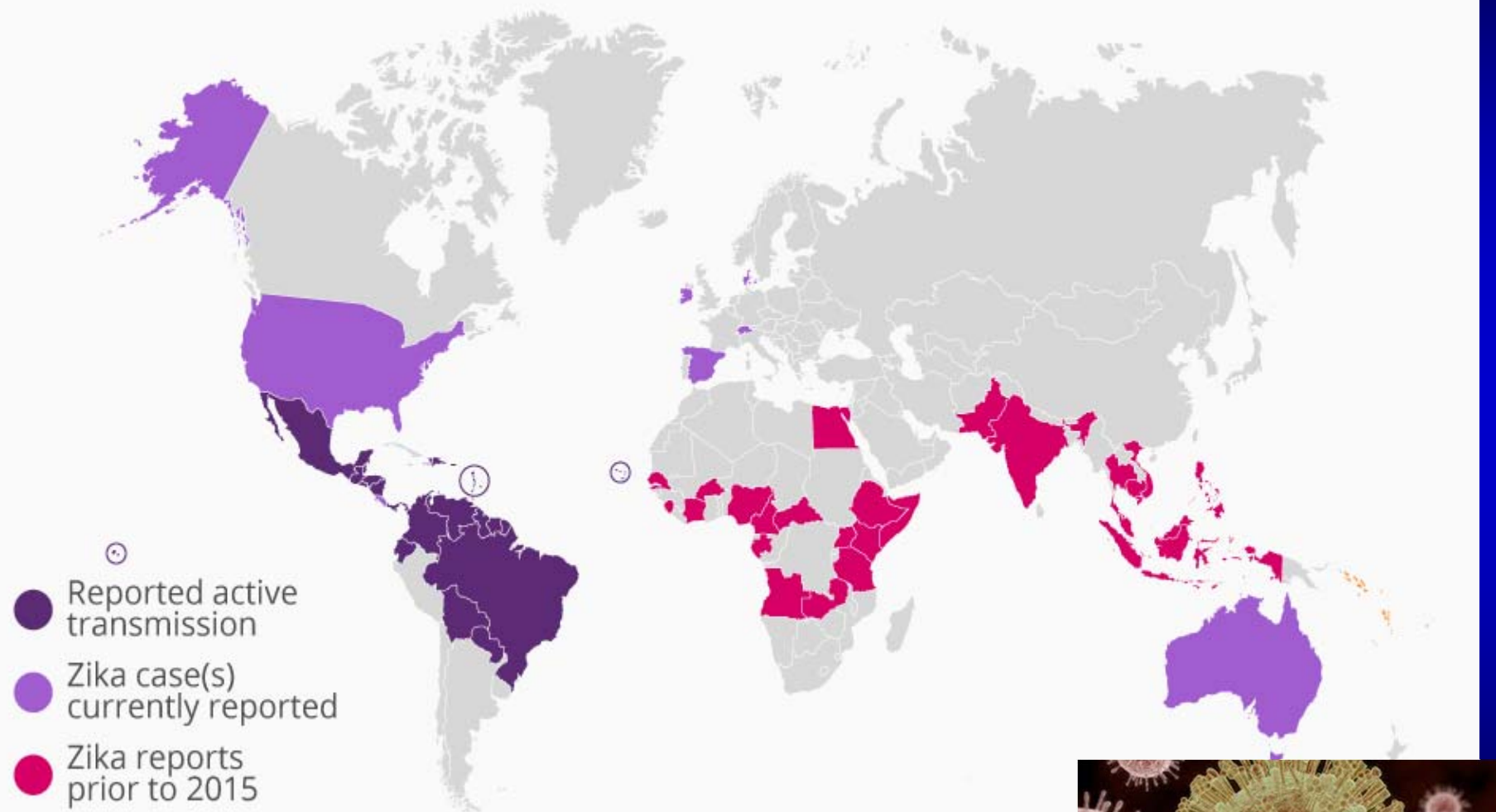


Frequency of selected symptoms in Chikungunya e Dengue

	Chikungunya	Dengue
Fever	100	93
Joint pain	100	N/A
Muscle pain	N/A	50
Skin rash	75	53
Itching	25	21
Vomit	3	13
Diarrhea	2	25
Hemorrhagic symptoms	0,5	26

The Spread Of The Zika Virus

Countries and territories with active Zika virus transmission* and reported cases



The epicenter of the Zika outbreak in Brazil



Zika conjunctivitis and skin rash



Zika related mycrocephaly and brain malformations



***Aedes*-borne viruses**

Vaccines and other interventions

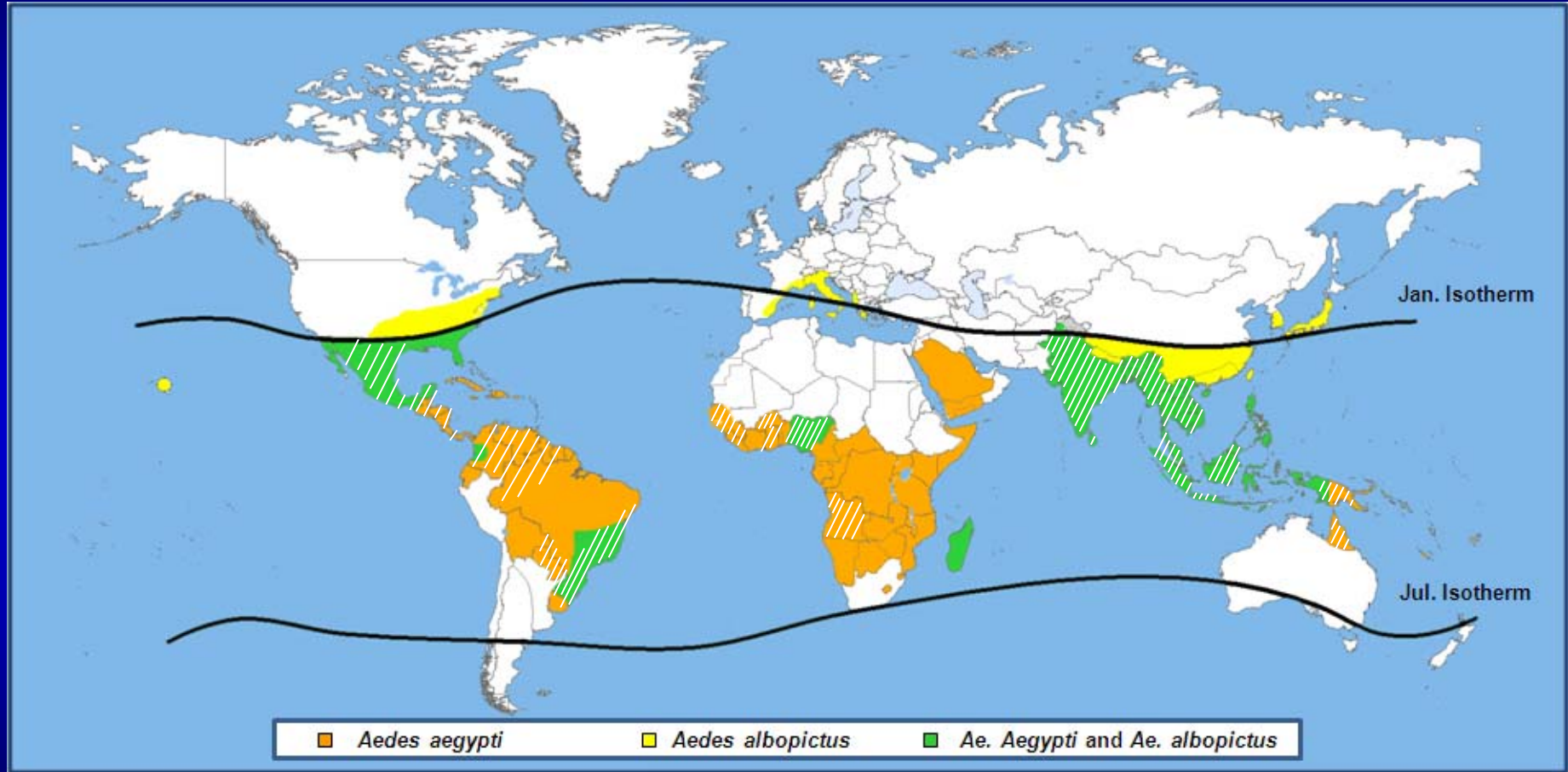
- Vaccines

Yellow fever	Yes
Japanese encephalitis	Yes
Dengue	Licensed
Chikungunya	Phase 1/2
Zika	Pre-clinical

- Genetically modified mosquitoes

- Mosquito control measures

Global distribution of *Aedes spp* (*Ae. aegypti* and *Ae. Albopictus*) mosquitoes



Autochthonous cases of dengue and chikungunya in Europe

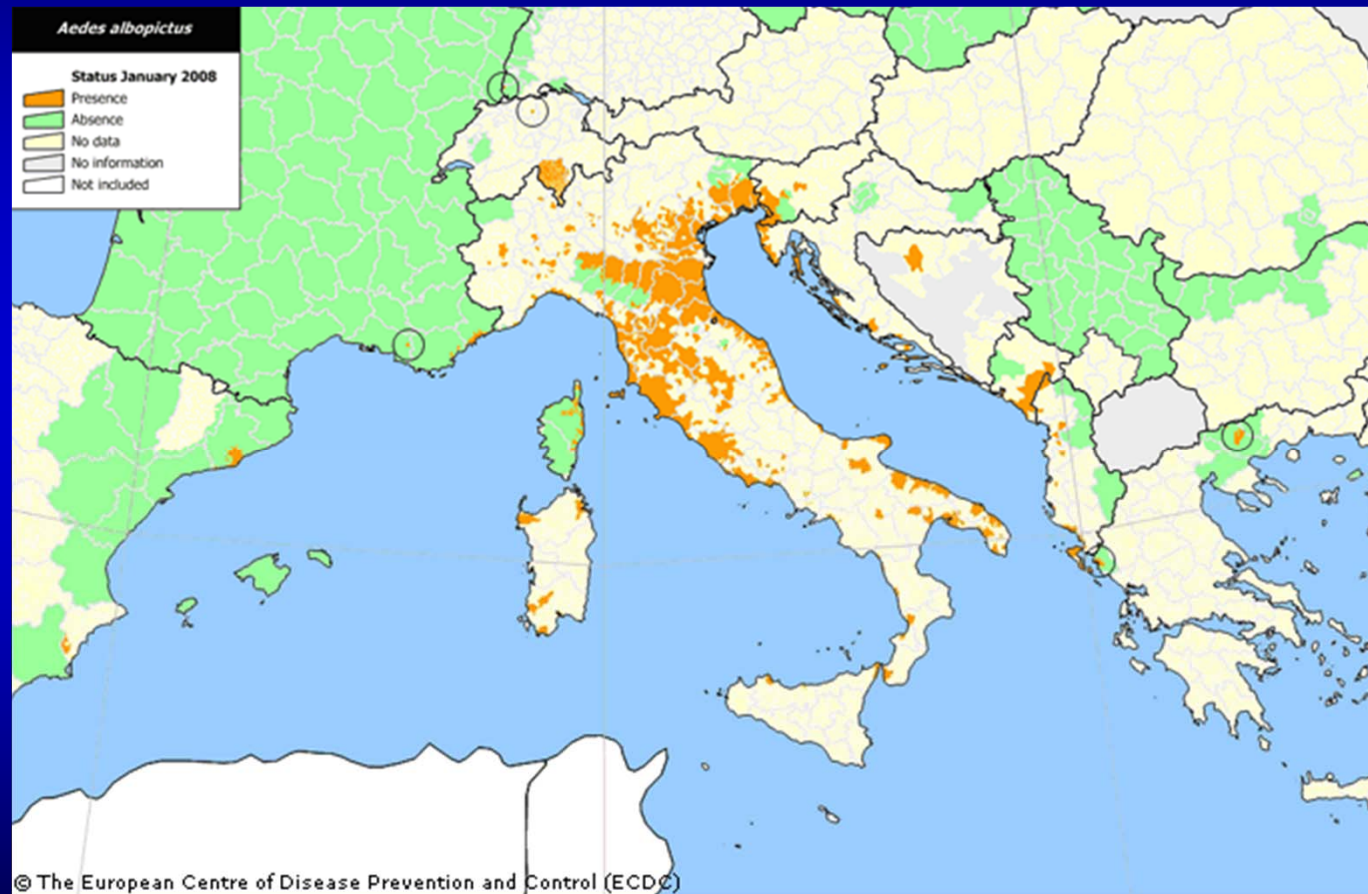
Dengue

- Summer 2007
Italy (>250 cases)
- Summer 2010
Southern France (2 cases)
Croatia (>10 cases)
- 2012
Madeira (>2100 cases)
- October 2013
Southern France (one case)
- Summer 2015
Southern France (6 cases)

Chikungunya

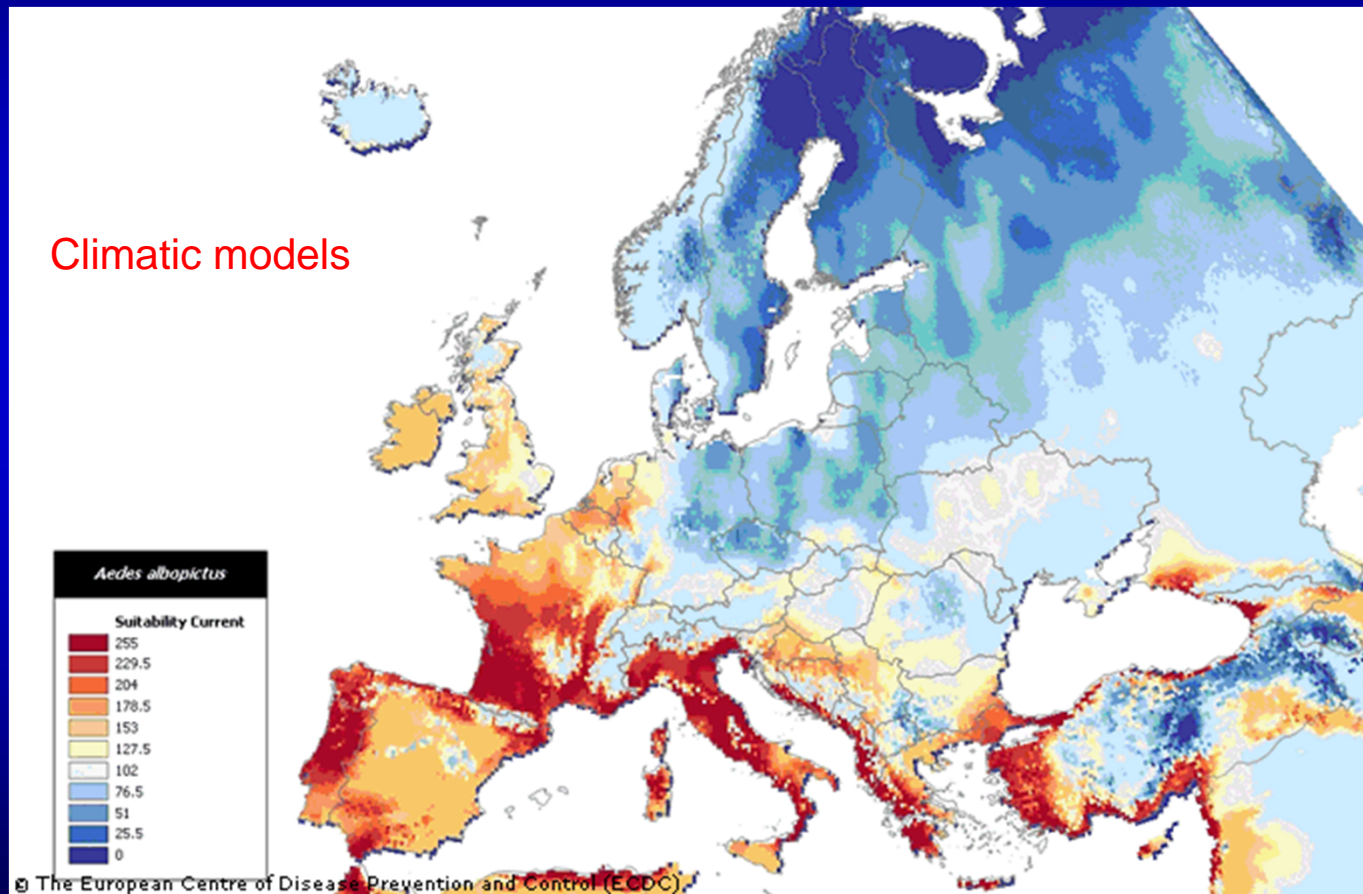
- Summer 2007
Italy (>250 cases)
- Southern France (3 cases)

Distribution of *Ae. Albopictus* in Europe



Risk map for *Ae. Albopictus* in Europe

Climatic models





*There is no where in the world from which we
are remote and no one from whom we are
disconnected*



PNAS, 2004