Chikungunya Situation in Asia –

Including Exports Resulting in Outbreaks Far Away

Robert Steffen

Prof. (em), Division of Epidemiology and Prevention of Communicable Diseases

Institute for Social- and Preventive Medicine, University of Zurich

WHO Collaborating Centre for Travellers‘ Health

Adjunct Professor, Epidemiology and Disease Prevention Division

University of Texas School of Public Health, Houston, TX, U.S.A.

Hon. FFTM/ACTM (Australasia)

Santanu Chatterjee

M.D., Wellesley Medicentre, Kolkata, India

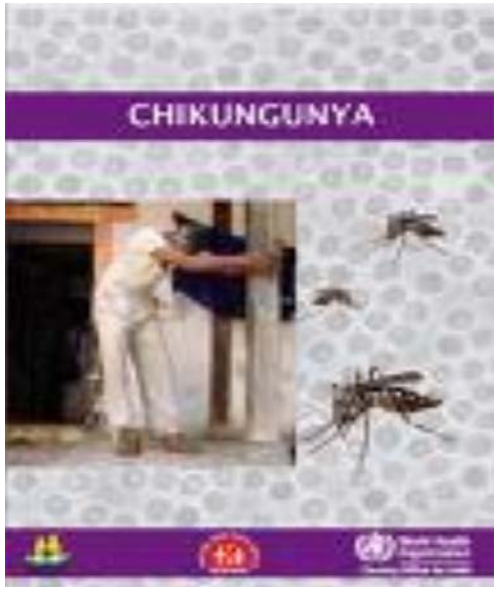
Chikungunya Situation in Asia –
Including Exports Resulting in Outbreaks Far Away

- Historical lessons — essentials on clinical picture, outcome
- Re-emergence of Chikungunya in Asia — and elsewhere
- Import / Export — relevance in travel medicine
- Basics on the Chikungunya Virus and Vectors
- Preventive options: public health vs. individual
- Outlook on further evolution

- NO discussion of diagnostics and treatment

History of Chikungunya

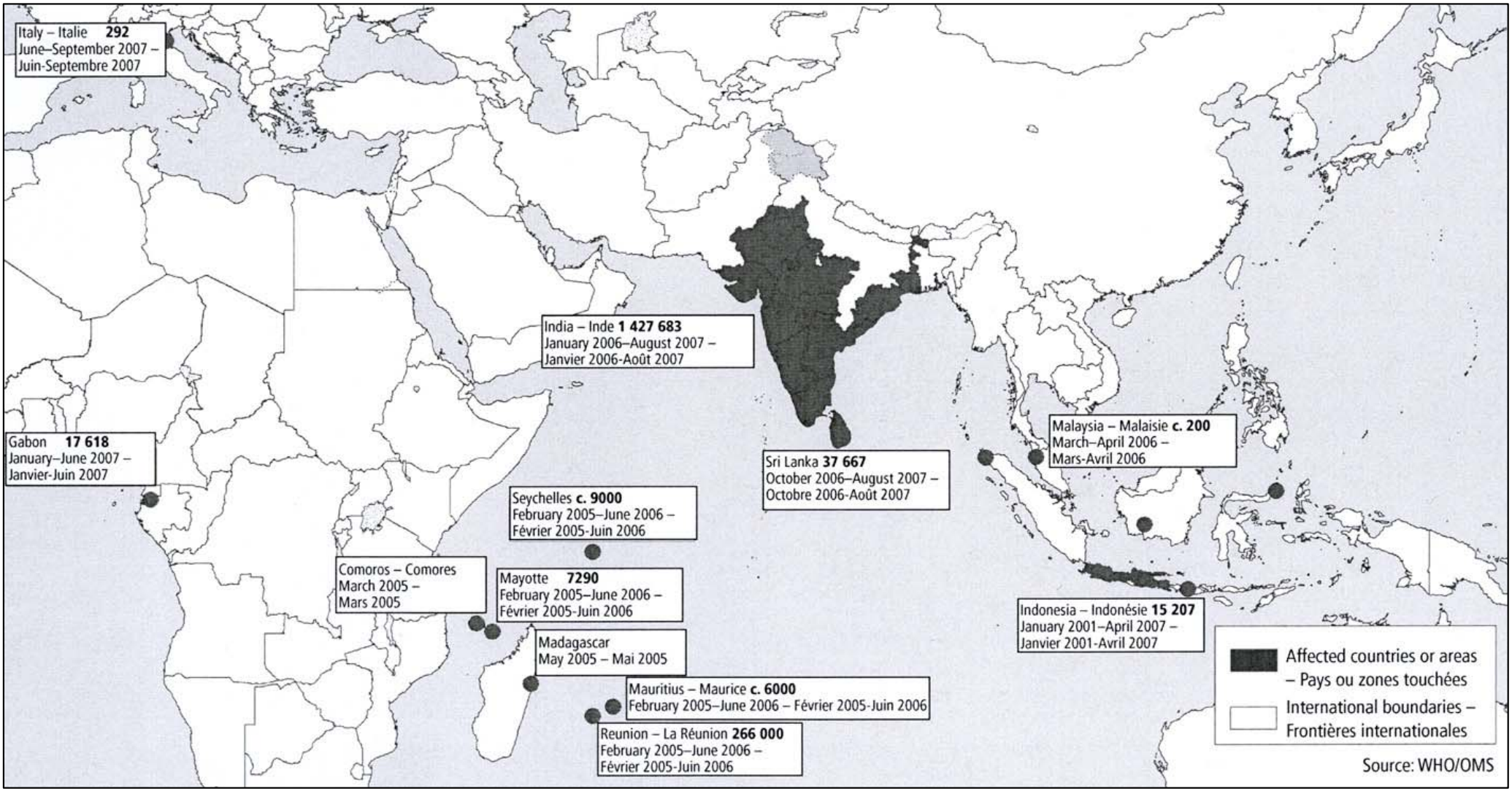
- 1824 India: Epidemics: fever + rash + arthritis (?)
- 1952 Makonde Plateau, S of Tanganyika, N Mozambique
  - disease described by Robinson, virus isolated
  - Makonde: ‘kungunyala’ = ‘which bends up’
- 1960s Bangkok
- 1964 India, from Kolkata
- 1969 Sri Lanka
- 1975 Vietnam, Myanmar
- 1982 Indonesia
- 20+ y Interval !!! (circulated at low levels in Africa)



The New Epidemic

- 2004 Kenya
- 2005 Réunion: 266'000 patients (population 777,000 = 34%)
  - also Comoros, Madagascar, Mayotte, Mauritius, Seychelles
- 2006 India: 1.39 million reported cases (areas with 45% affected)
  - also Malaysia, Sri Lanka, Maldives
  - and Indonesia (2001-2007, peak 2003)
- 2007 Gabon / India: 96% decrease of reported cases

Geographical Distribution of Chikungunya 2001 - 2007



WER 2007;47(82):409–416

Chikungunya in Australasia – 2008

- Early Indonesia — no details published
- January Maldives — ongoing
- January Melbourne, 8(+) cases — concerns of spread
- January Singapore, local outbreak: 10 cases
- May South Kanara (Karnataka, India) 200,000 cases (?)
- July Western Australia: low activity in past 2 years

www.searo.who.int/en/Section10/Section2246_13975.htm and other

Chikungunya: Clinical picture

Symptom	%
Fever > 38.5°C, 2-5 days	99.6
Arthralgia	99.2
- persisting over 18-36 months: **12%**	
Myalgia	97.7
Headache	68.4 – 84.1
Vomiting	59.4
Rash, maculopaular, 2-3 days	40.0
Abdominal pain	31.6
Lymphadenopathy	30.8
Hemorrhagic symptoms	23.0

Chikungunya

Chikungunya: 'new' complications

Symptom	per 1000
Meningoencephalitis	1.7 (fatal in high age)
Myocarditis	N/A
Fulminant hepatitis	N/A
Disseminated intravascular coagulopathy	N/A

Elevated Case Fatality Rate in

- elderly, particularly with co-morbidity
- atypical cases (CFR 10%)

Neonatal infection: encephalopathy (vertical transmission)

Fetal loss before week 22 due to infection, not quantified

Cordel H et al. Euro Surveill 2006;11: E060202.3 + E060302.3
Economopolou A et al. Epidemiol Infect 2008;11:1-8
Touret Y et al. Presse Med 2006;35:1656-8

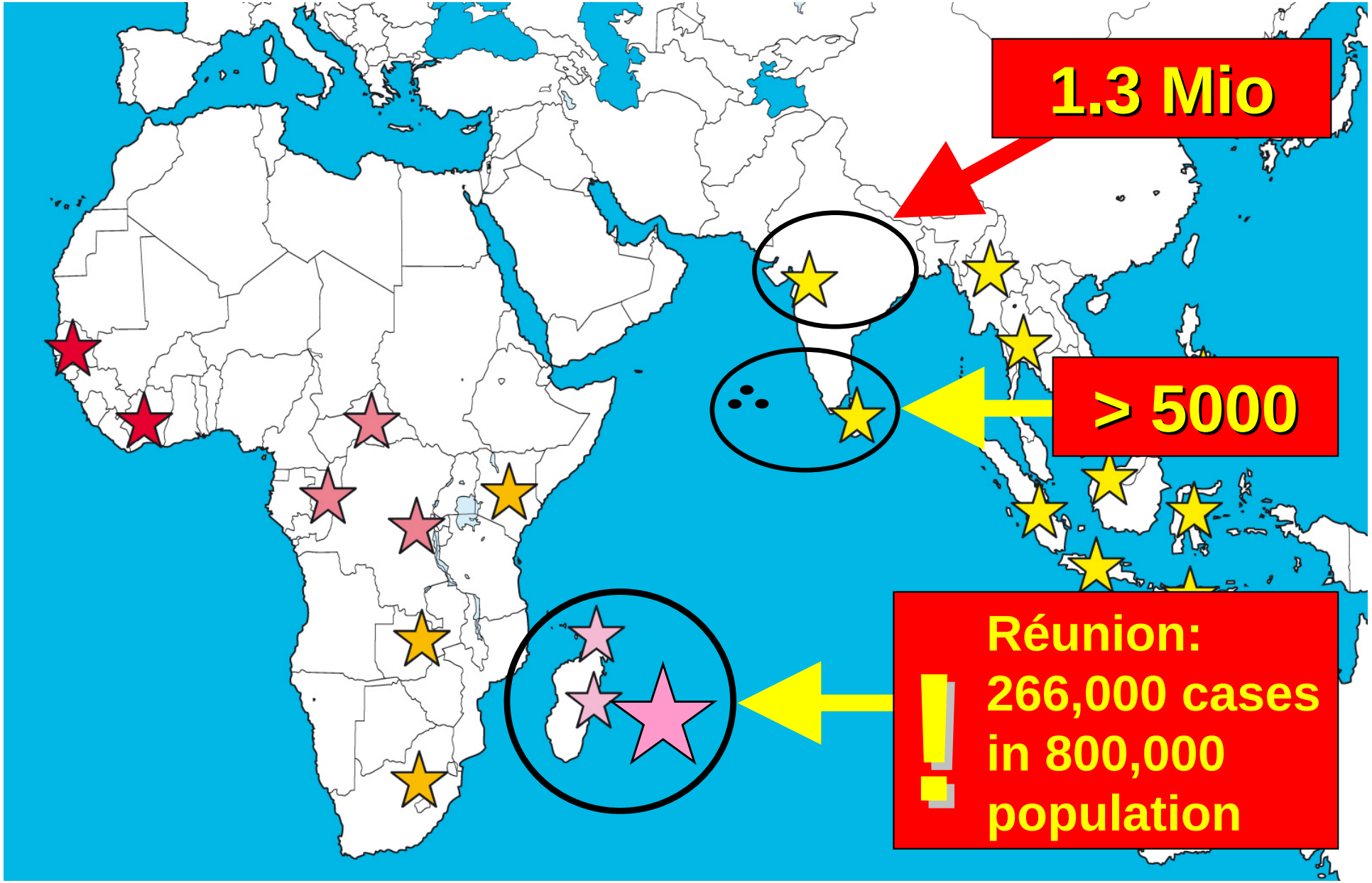
Differential diagnosis: Chikungunya vs. Dengue

Criteria (n =)	Dengue	Chikungunya	Sign (p)
Arthralgia	0	**22 (all!)**	< 0.001
Myalgia	8 (50%)	7 (32%)	NS
Cephalgia	**11 (69%)**	9 (41%)	0.087
Macular exanthema	13 (81%)	16 (73%)	NS
Thrombocytopenia	**14 (88%)**	7 (35%)	0.002
Leucopenia	**12 (75%)**	8 (40%)	0.033
Neutropenia	**13 (81%)**	2 (10%)	< 0.001
Lymphopenia	9 (56%)	**18 (90%)**	0.049

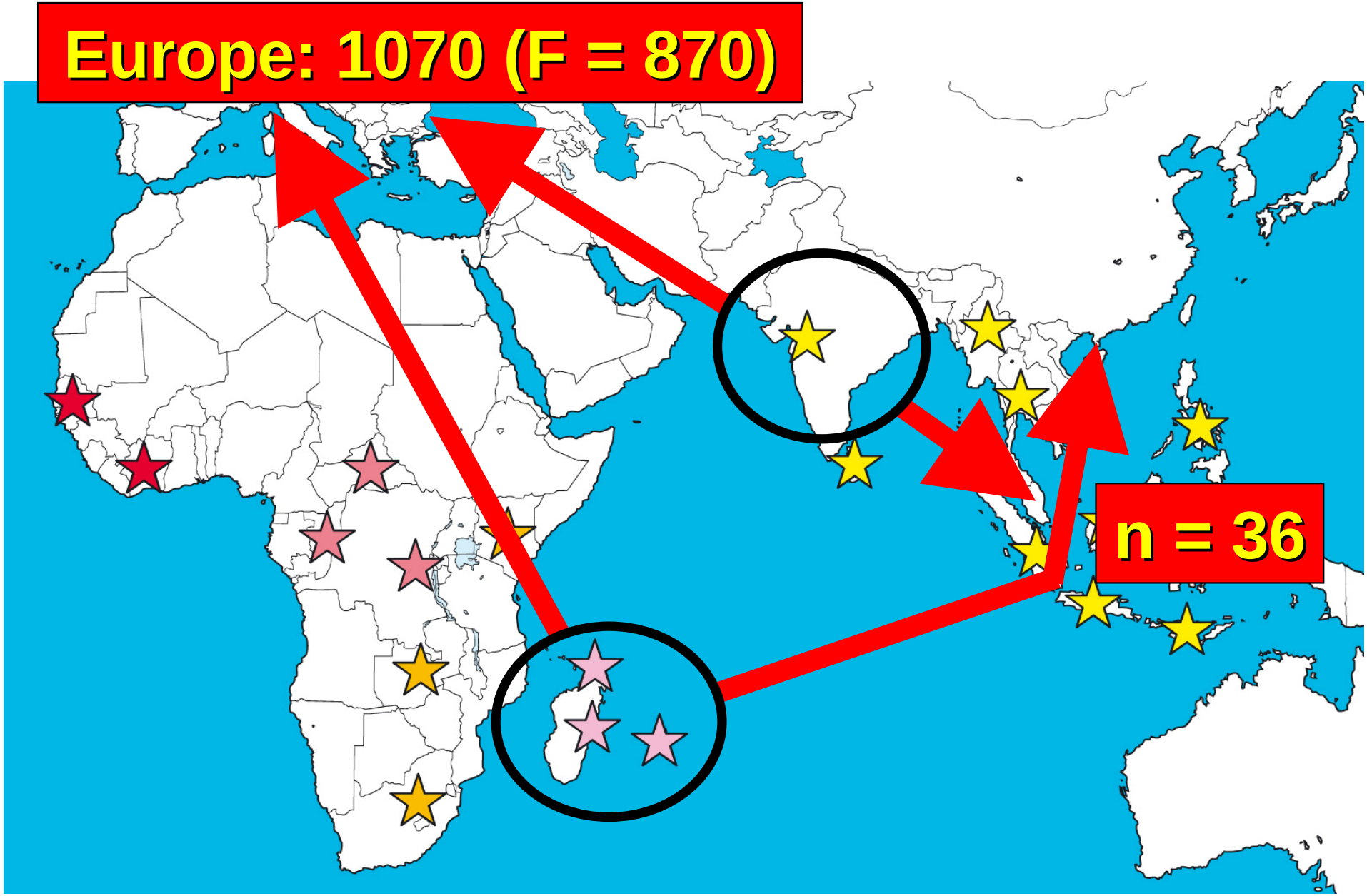
N = 62: Dengue 16, Chikungunya 22, 60% male

Hochedez P et al. Am J Trop Med Hyg. 2008;78(5),710-13

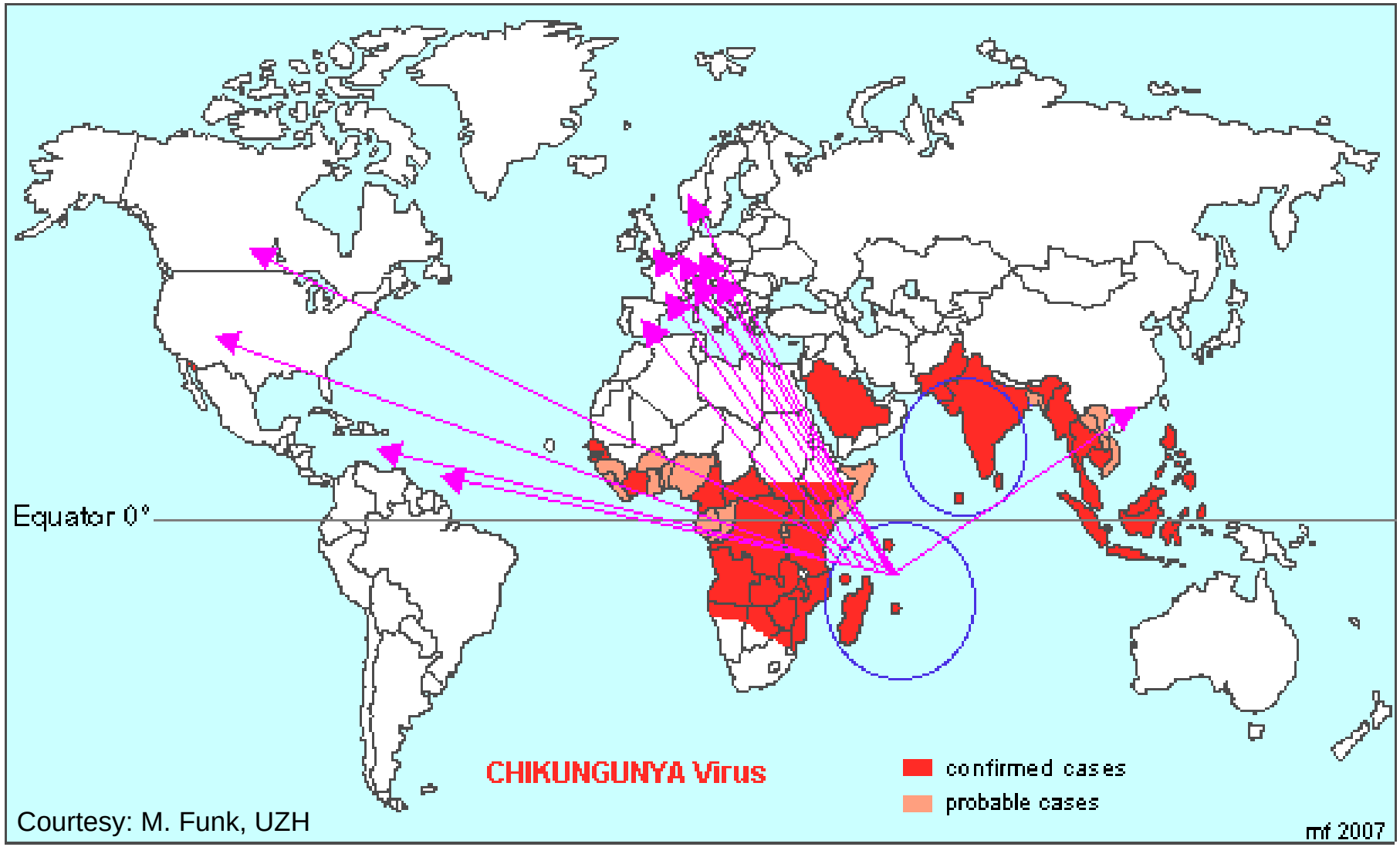
Chikungunya - Epidemic 2006/7



Chikungunya „Export / Import”



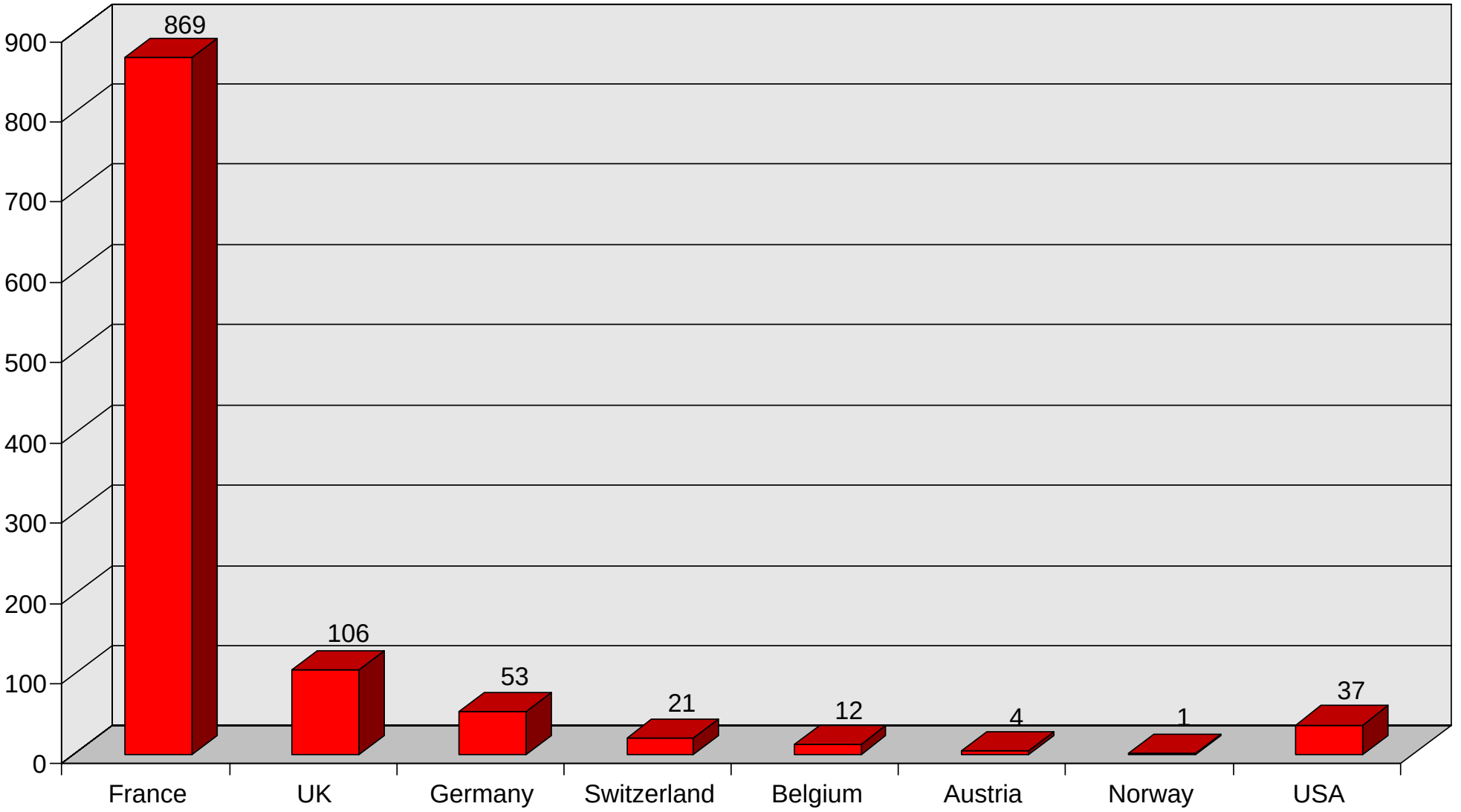
Exportation of ChickV Infections by Travelers



Epidemics: 2005/6

Exports from Indian Ocean

Export / Import of ChikV Infections by Travelers



Courtesy: M. Funk, UZH

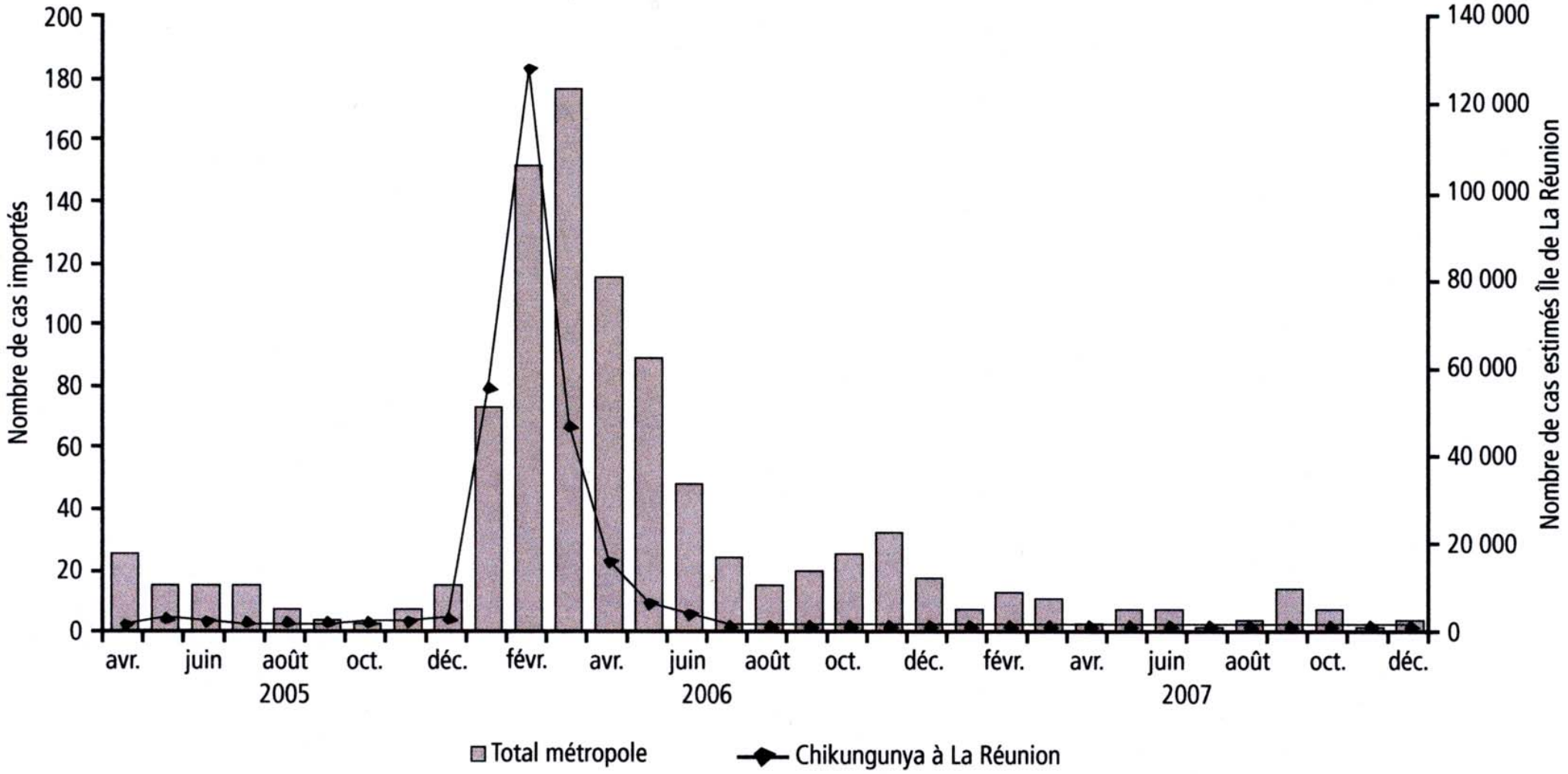
Export / Import of ChikV Infections by Travelers

- 2005/06 India (n=7), Malaysia (n=1) → Singapore
  Personal communication

- 11/2006 NW India → Israel
  Tanay A et al. J Travel Med 2008;15:410-2

- 2/2008 1st indigenous transmission Surinam → Holland
  Hassing RJ et al. J Travel Med 2009 (in print)

Surveillance as mirror of an epidemic elsewhere



Source : Cire Réunion Mayotte pour les données concernant l'épidémie réunionnaise

VIRUS CHIKUNGUNYA

Vous revenez de la réunion

de Mayotte, Maurice, des Comores ou des Seychelles...

Appelez le 051103

(heures ouvrables) pour une

démoustication

autour de votre domicile.

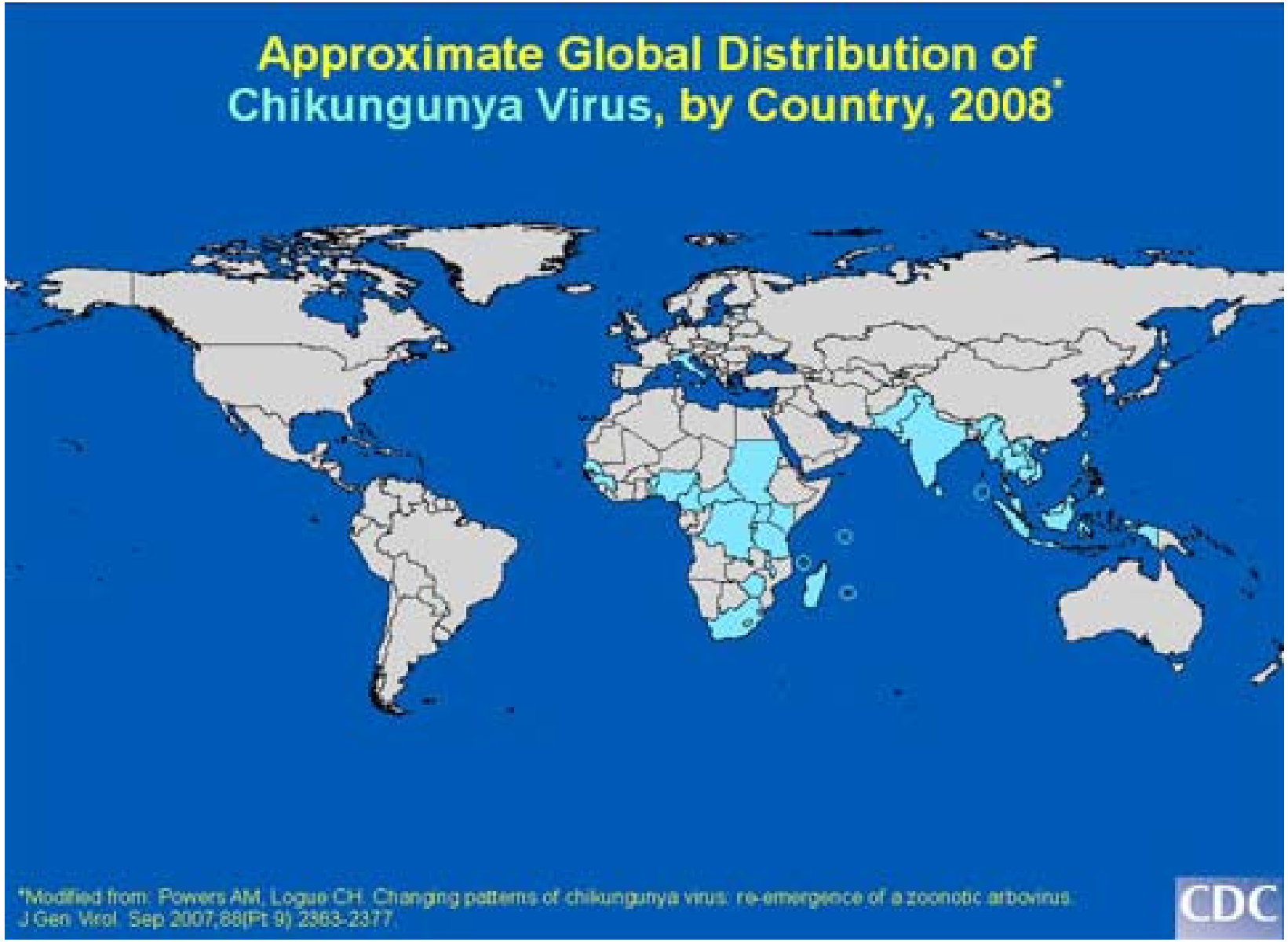
Et si vous avez de la **fièvre**, des **douleurs**

(maux de tête, douleurs articulaires,...)

Consultez rapidement votre médecin

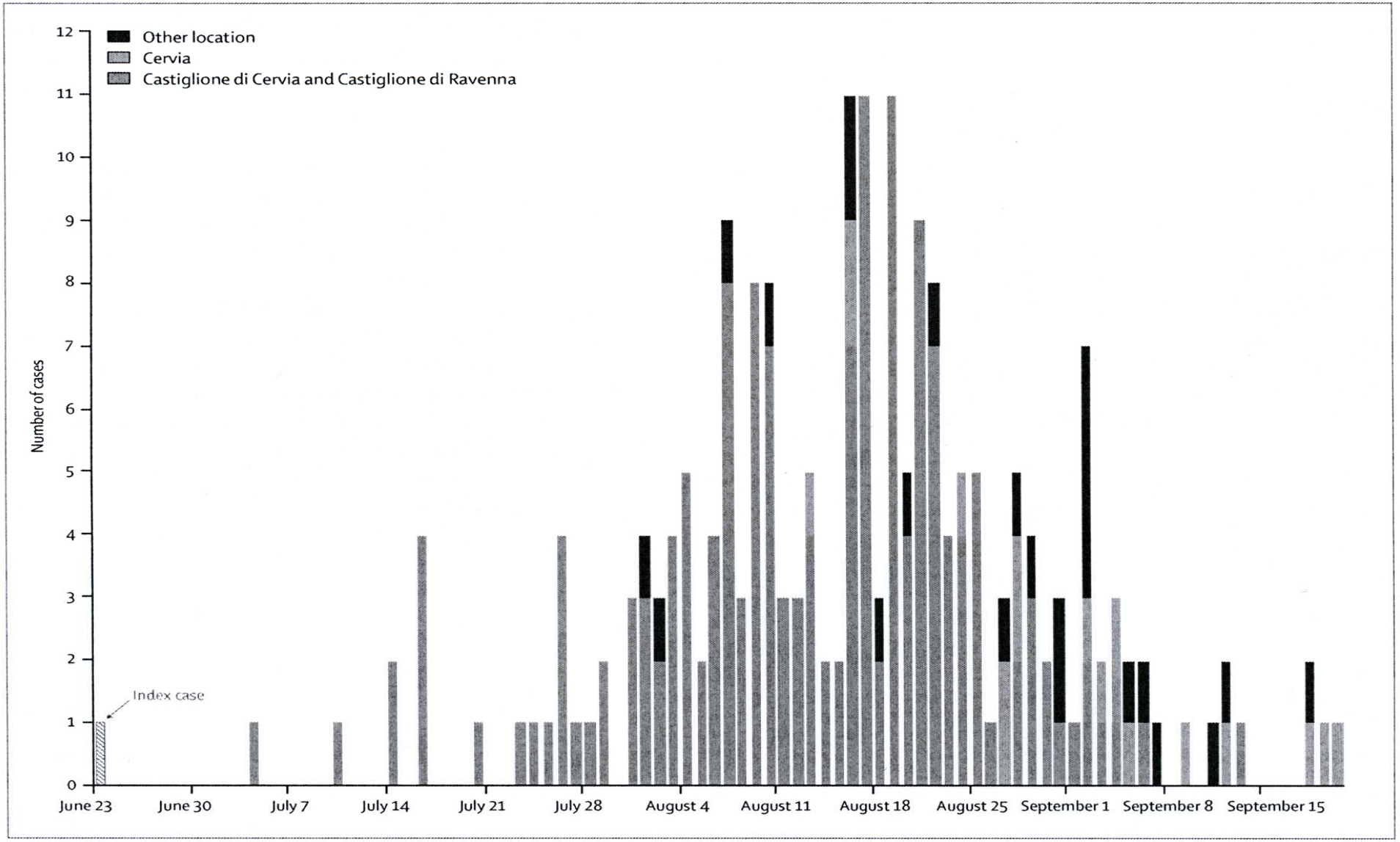
en lui précisant les dates et lieux de votre séjour.

Chikungunya 2008



CDC 2008

Epidemic curve – ChikV cases in Italy
2007 (n=205)



Rezza G. et al. Lancet 2007;370:1840-6

Origin of the ChikV outbreak in Castiglione di Cervia

- Index case: Man of Indian origin — no travels
- Visiting relative from Kerala, India in June
  - Fever on June 23
  - Antibody titre against ChikV >1:1280

- 11/205 admitted to hospital (5.4%)
- 1 died: 83 y/o man with multiple chronic diseases
- Attack rate in Castiglione di Cervia 5.4%

Rezza G. et al. Lancet 2007;370:1840-6

Preventive options against ChikV

Travellers: measures against mosquito bites (DAYtime)

- Clothing to cover skin
- Coils, repellents, electric vapour mats
- Mosquito nets for those who rest at daytime

Other:

- Laboratory: S.O.P.s
- Public Health (e.g. Italy):
  - Surveillance: GPs, hospitals
  - Insecticides 100 m around confirmed/suspected cases
  - General health education
  - Communication about vector control
  - Obtain evidence on efficacy of control measures

www.eurosurveillance.org
www.searo.who.int/en/Section10/Section2246.htm

Chikungunya vaccine research

- Military formalin-killed vaccine

  Harrison VR et al. J Immunol 1971;107:643-7 and
  Am J Trop Med Hyg 1967;16:786-91

- Military attenuated vaccine, project abandoned 1990

  Levitt NH et al. Vaccine 1986;4:157-62

- Plaque purified live vaccine, Phase II trial, 'promising'

  Edelman R et al. Am J Trop Med Hyg 2000, 62:681-5

- Chimeric alphavirus vaccine candidates, from
  - VEE TC-83 (Venezuelan equine encephalitis)
  - EEE (Eastern equine encephalitis)
  - Sindbis

- DNA vaccine

  Wang E et al. Vaccine 2008;(Epub ahead of print)
  Muthumani K et al. Vaccine 2008;(Epub ahead of print)

Chikungunya arbovirosis: Basics on Virus and Vector

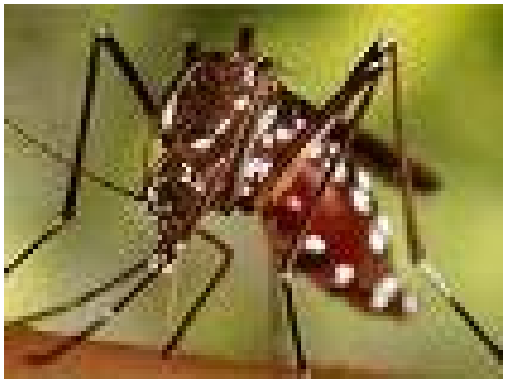
VIRUS: Genus Alphavirus / Family Togaviridae

VECTOR: Aedes (Stegomyia)

- Kenya: Ae. aegypti tropics, subtropics — urban
- Réunion, Italy: Ae. albopictus temperate — rural, periurban
- India: Ae. albopictus, (Ae. Aegypti, Culex, etc.)

RESERVOIR

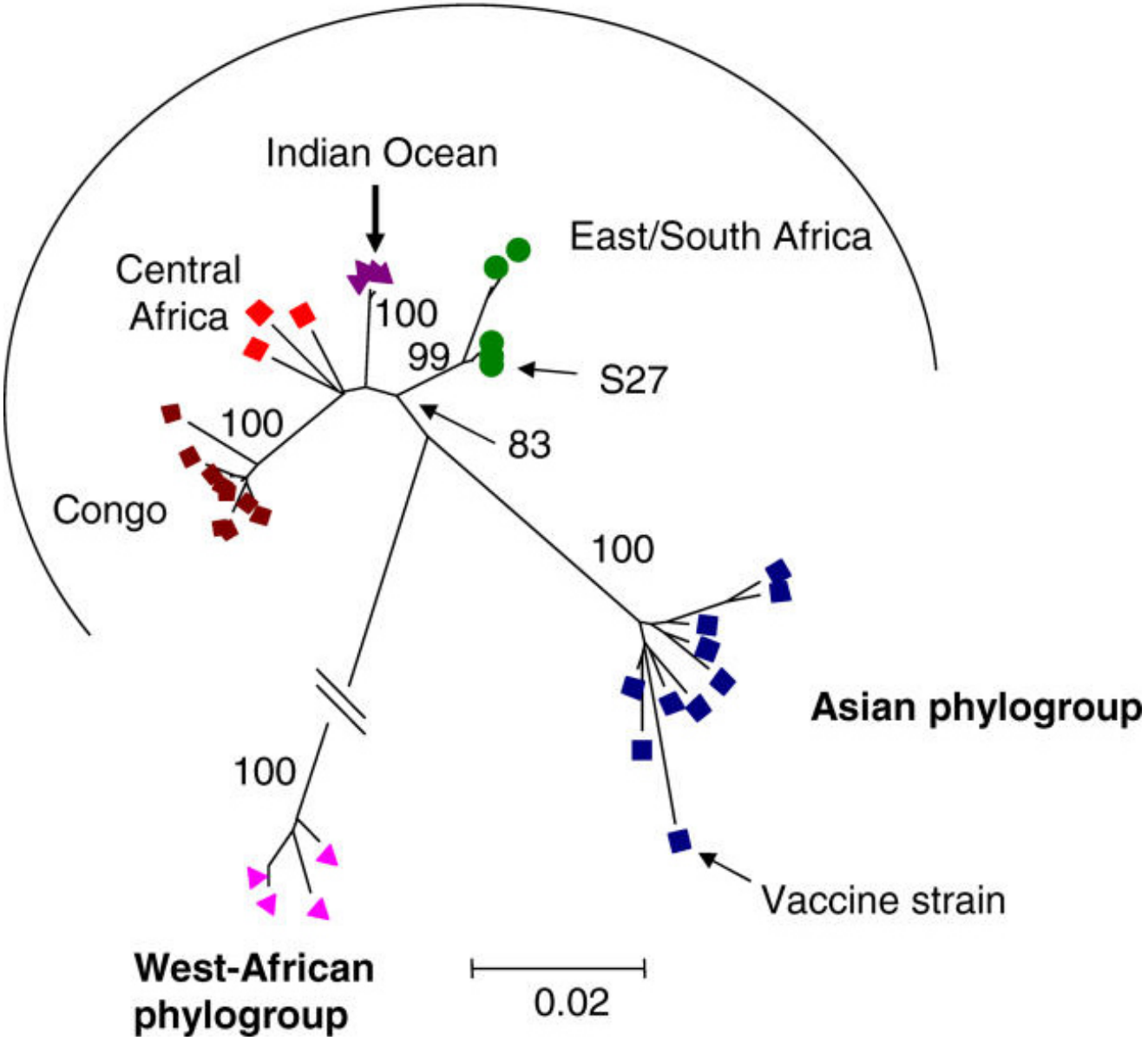
- Human
- Primates (high virus load, asymptomatic)
- Other mammals, birds



CYCLE

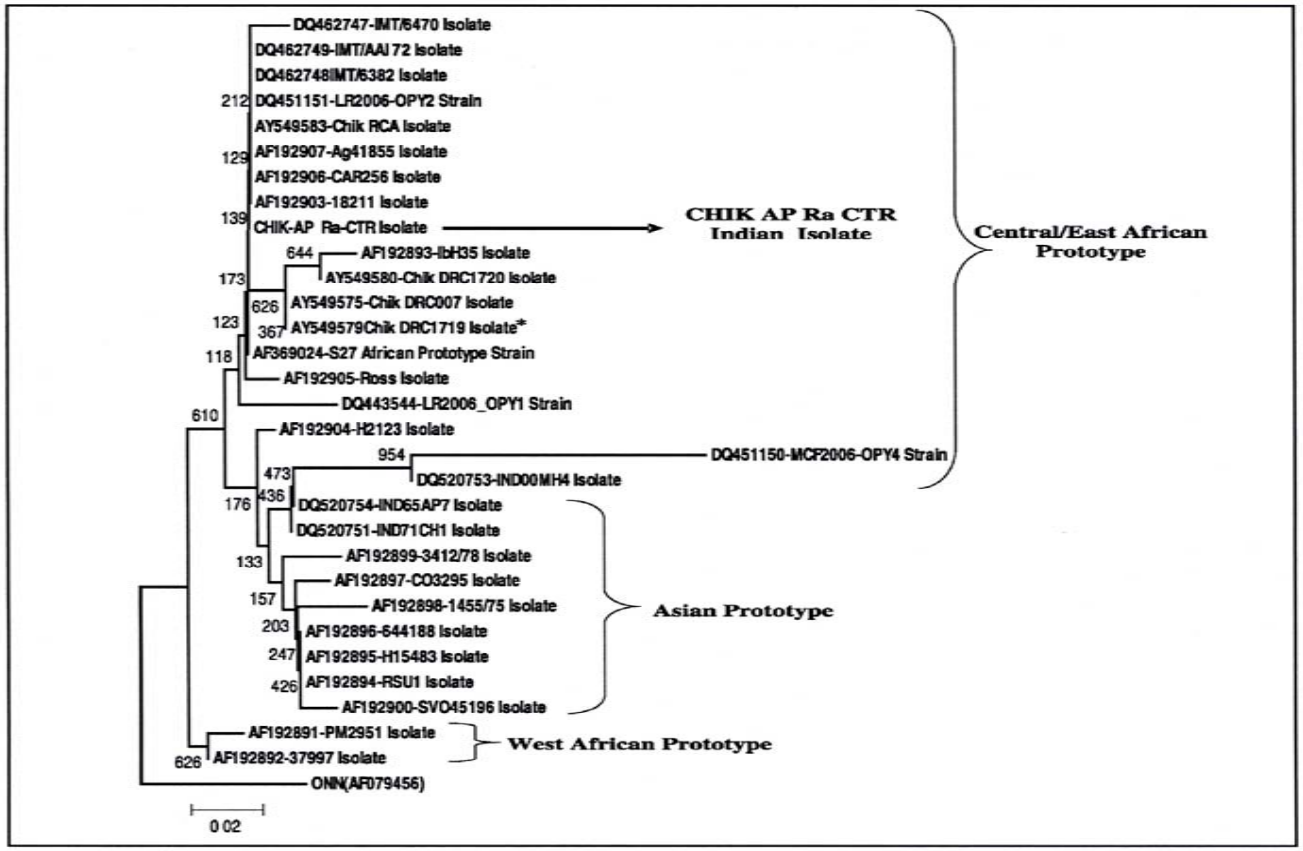
- Africa: sylvatic
- Asia: urban

Genome microevolution of ChikV



Schuffeneker I et al, PLOS Med 2006;3:e263

Characterization of ChikV: India vs. Central Africa



- IND-06 isolates shared 99.9% nucleotide identity with RU isolates
- RU isolates with mutation (226 on E1 glycoprotein)

Kumar NCVM et al. Indian J Med Res 2007;126:534-40

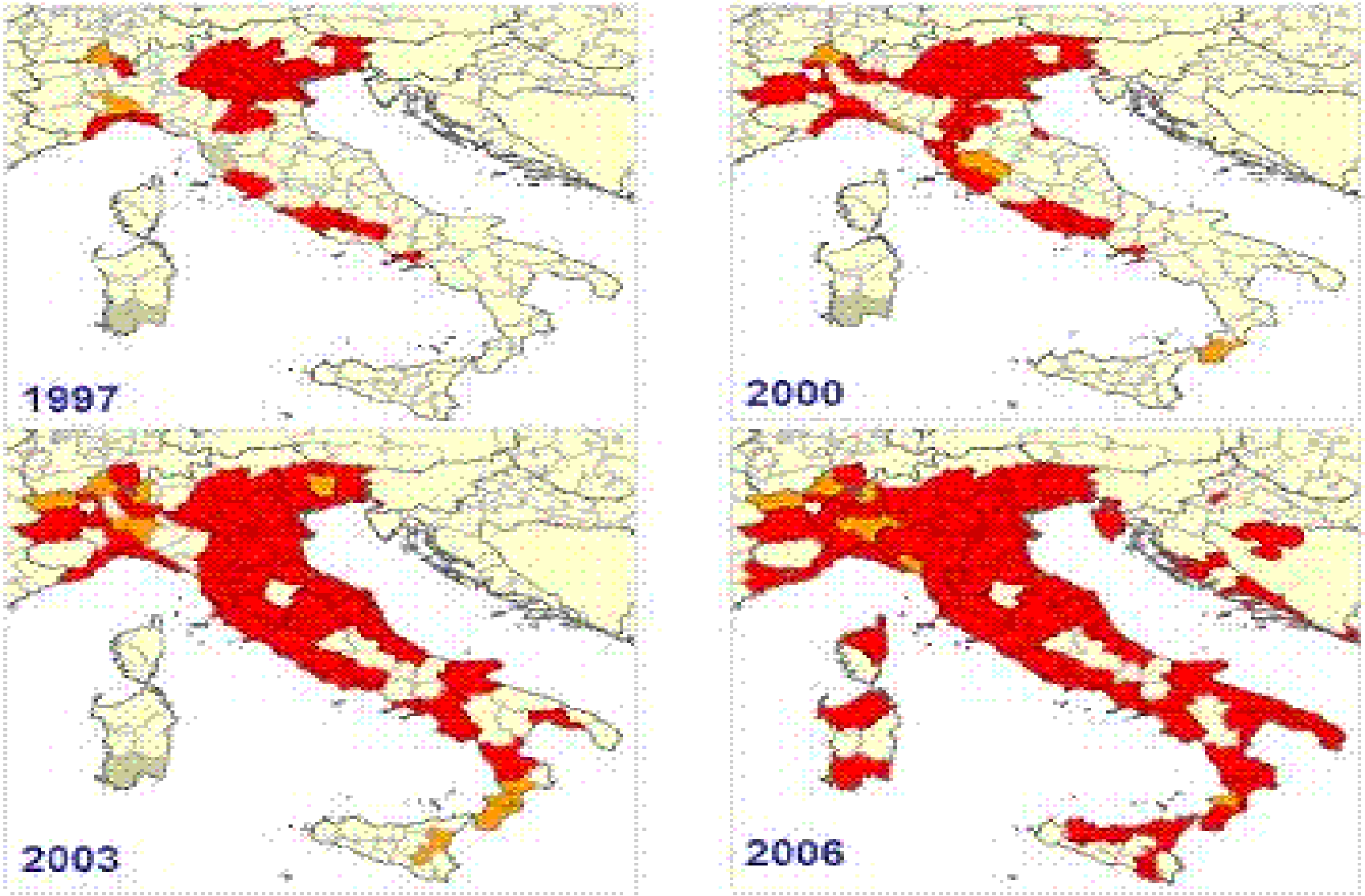
Outlook: Continued EXPLOSIVE epidemics (?)

- Virus polymorphism: faster evolution in mosquitoes
- No herd immunity
- Spread of vector(s) in different parts of the world
- Globalization of trade and travel

- Consequences: Major impact on
  - public health
  - economy, tourism

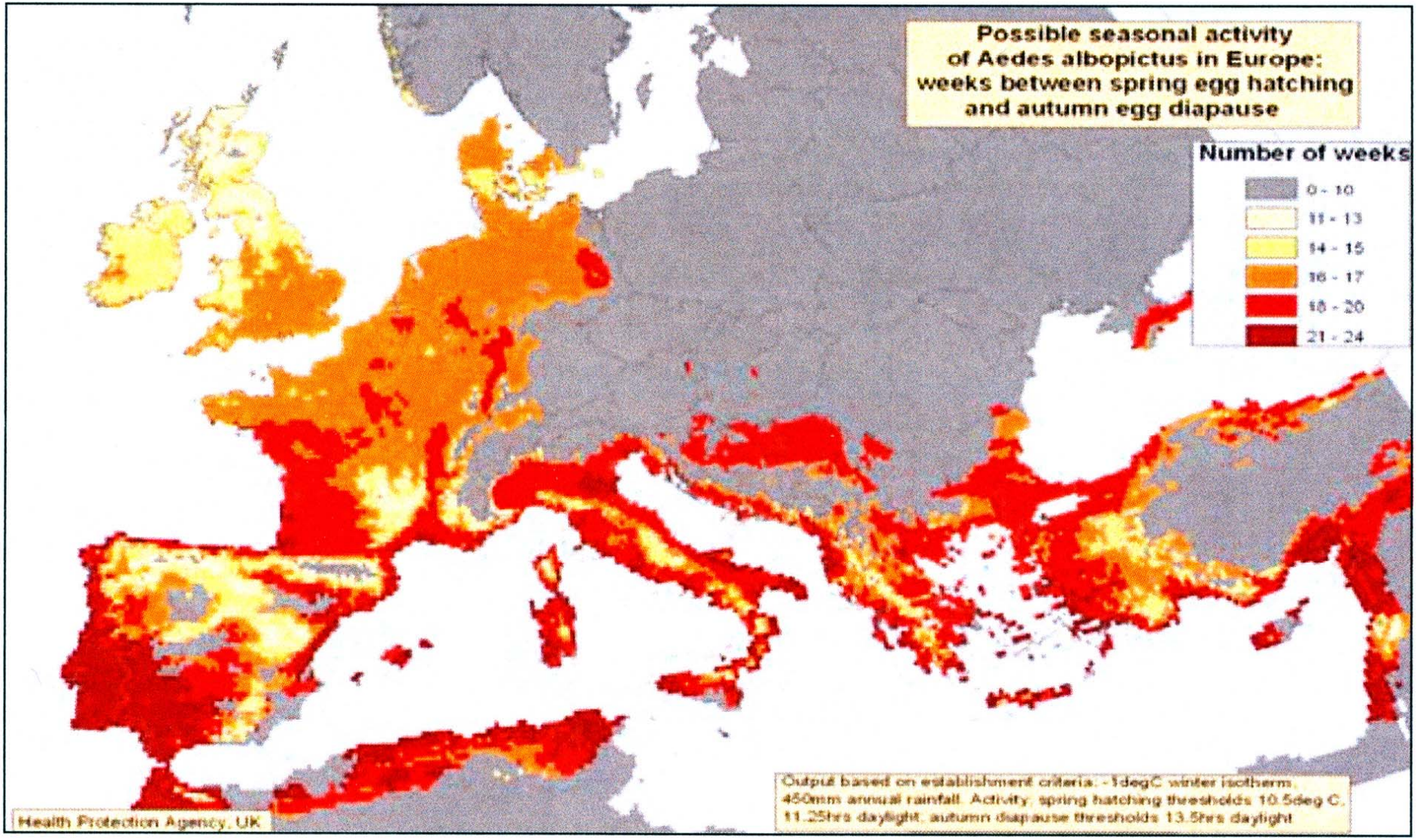
- Increased monitoring, surveillance paramount

Distribution of *Aedes albopictus*, Italy



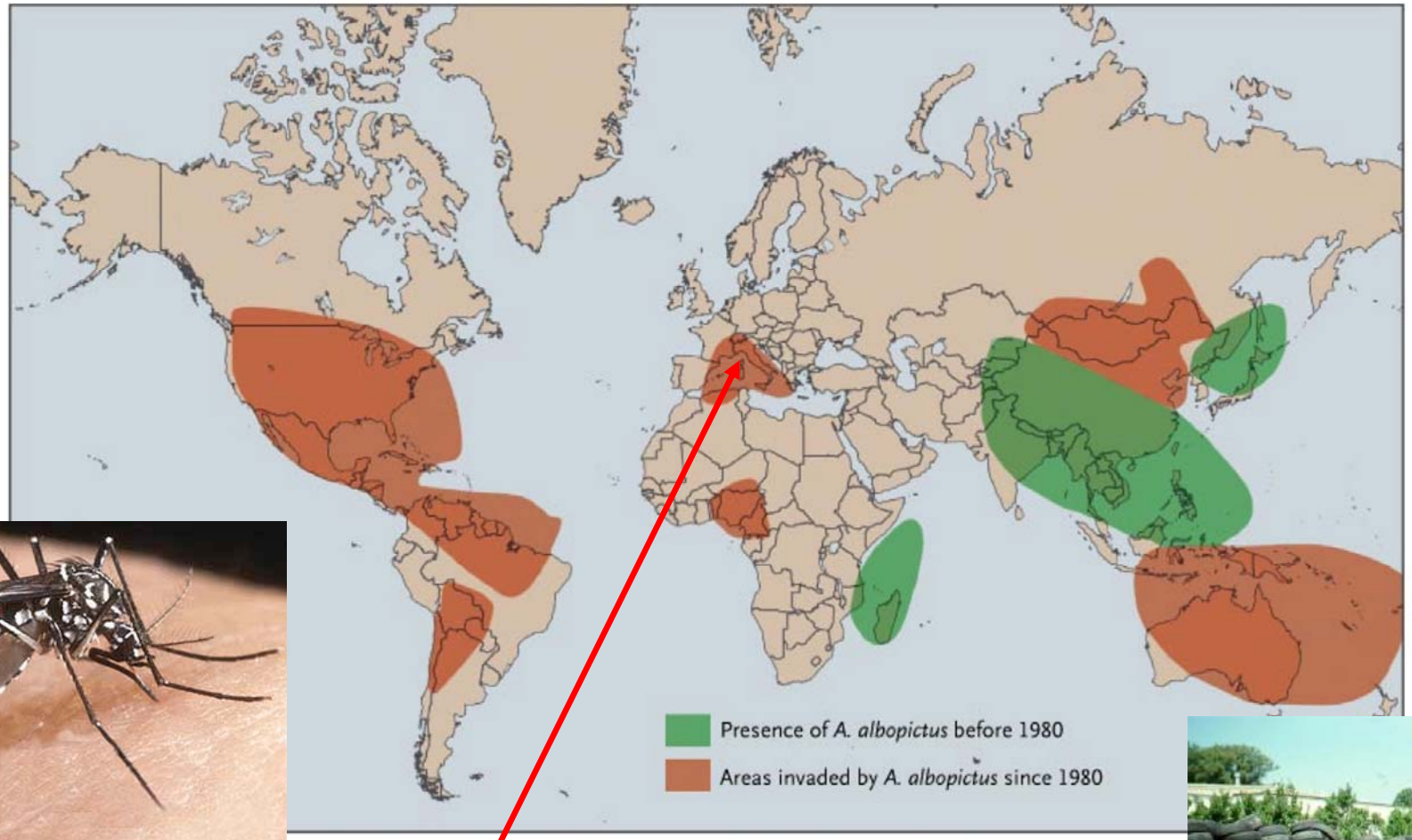
Courtesy: Dr. Alberto Matteelli

Duration of seasonal activity of *Aedes albopictus* – Mathmatical modeling of weeks between spring egg hatching and autumn egg diapause



Ecdc. Meeting report, Paris (22 October 2007)

.... and the future?



Aedes (Steg.) albopictus

NEJM 2007;356(8):769-771

Summary and Conclusions

- New epidemic 'wave' – ongoing
- Mutation → possibly faster evolution
- ChikV established endemicity in Asia, Africa
  - Persisting socio-economic factors
  - Persisting public health inadequacies that facilitate the spread of this infection
- Travellers at risk
- Modest options for prevention
- Vaccine far away