Overview of Zoonotic Infections

Pet-related and Emerging Zoonotic Infections
Hong Kong 23 Oct 2025

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University of Liverpool, UK

Liverpool


THE BEATLES

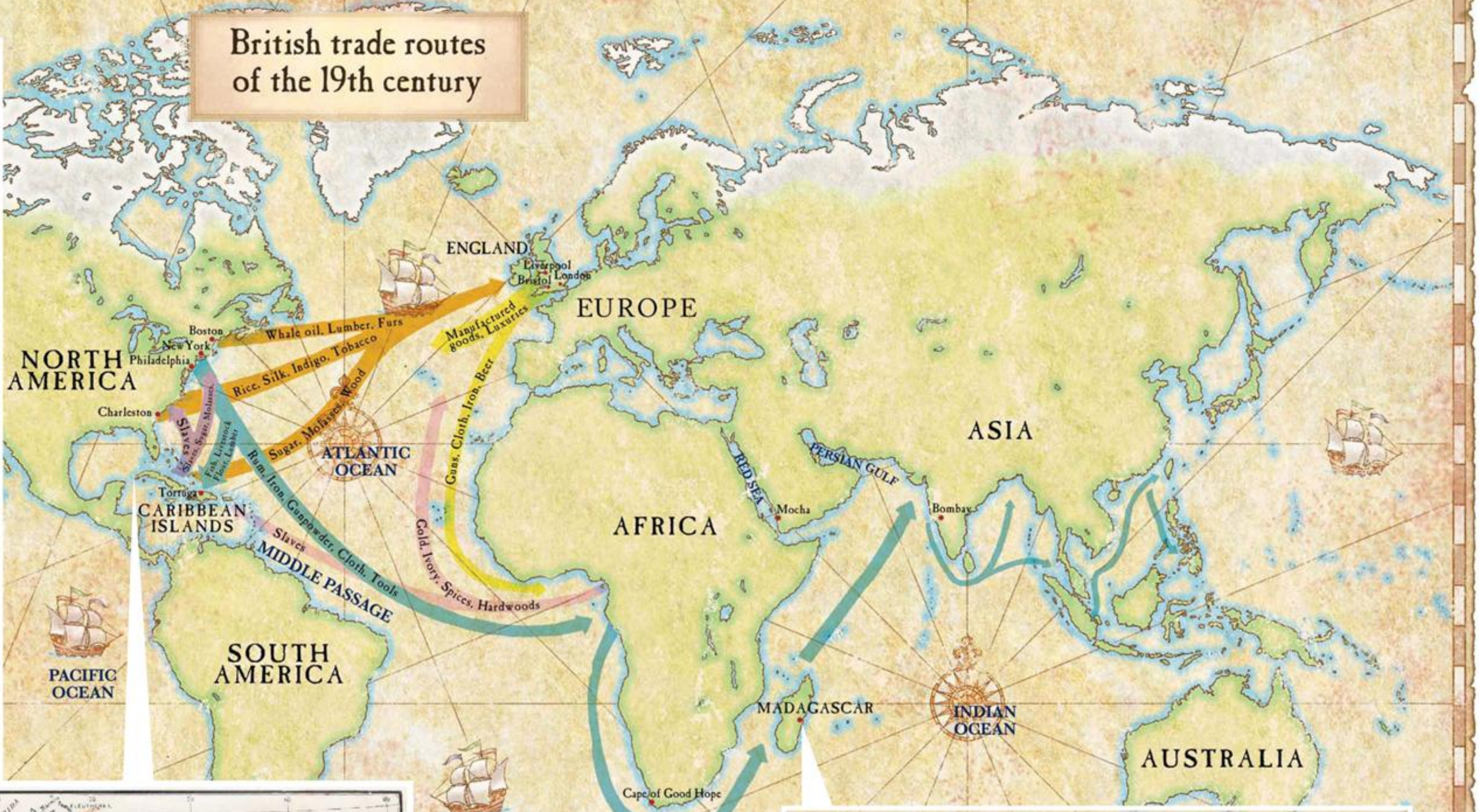

Premier League
Expedia

University of Liverpool – est 1881

Liverpool School of Tropical Medicine – est 1898

Why Liverpool?

British trade routes of the 19th century



HAUNTS OF THE BRETHREN OF THE COAST

While there was never such thing as an organised 'pirate government', there did exist a loose coalition of buccaneers active during the 17th and 18th centuries. It was made up of captains who regulated the activity of privateering within the community and with their external benefactors.

Mainly stationed on the island of Tortuga and in the city of Port Royal, the original Brethren were mostly French Huguenot and British Protestants, although a number of Spaniards and African sailors also counted themselves among their ranks. Their loyalties and codes of conduct were akin to those of modern-day Mafia families; their command was hierarchical and they promoted equitable division of revenue.

This map, created at the time and reproduced in *Buccaneers and Pirates of Our Coasts* (1897), details the most densely populated pirate haunts in the Caribbean during the so-called 'Golden Age of piracy'. Although popular culture depicts these haunts as lawless, debauched shanty towns, they were more used as places where privateers could feel safe from the threat of authority for a short while before once again setting out to sea.

Following the demographic changes of the mid-18th century, many members of the Brethren left the Caribbean to take up residence in colonies of the future United States. A few remained, upholding the name of the Brethren of the Coast as a purely criminal organisation until they were finally broken at the turn of the century.

PIRATE HAVEN OF MADAGASCAR

There could have been few spots anywhere along the British trade routes more dangerous than Madagascar. It was a safe port for pirates between 1680 and 1725, the inhabitants of which would prey on merchant ships in the Indian Ocean, the Red Sea, and the Persian Gulf.

The island had an abundance of sheltered coves, vast supplies of fresh water and food – including limes and oranges needed to prevent scurvy – and large beaches ideal for scraping barnacles from ships' hulls. On top of that, the island

Hong Kong Port end 18th Century

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NIHR | Health Protection Research Unit in Emerging and Zoonotic Infections at University of Liverpool

UK Health Security Agency

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LSTM LIVERPOOL SCHOOL OF TROPICAL MEDICINE

NIHR Health Protection Research Unit (HPRU) in Emerging and Zoonotic Infections (EZI)

Founding Director (since 2014)

(£10M from NIHR, £160M external funding)

Ebola

Zika

Covid-19

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NIHR | National Institute for Health Research

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Tackling emerging infections And pandemic threats

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Infections at University of Liverpool

Wellcome Fellowship, Vietnam 1995-8


OLD
HONGKONG
Volume two 1901–1945
FormAsia

Pet-related and Emerging Zoonotic Infections

Hong Kong 23 Oct 2025

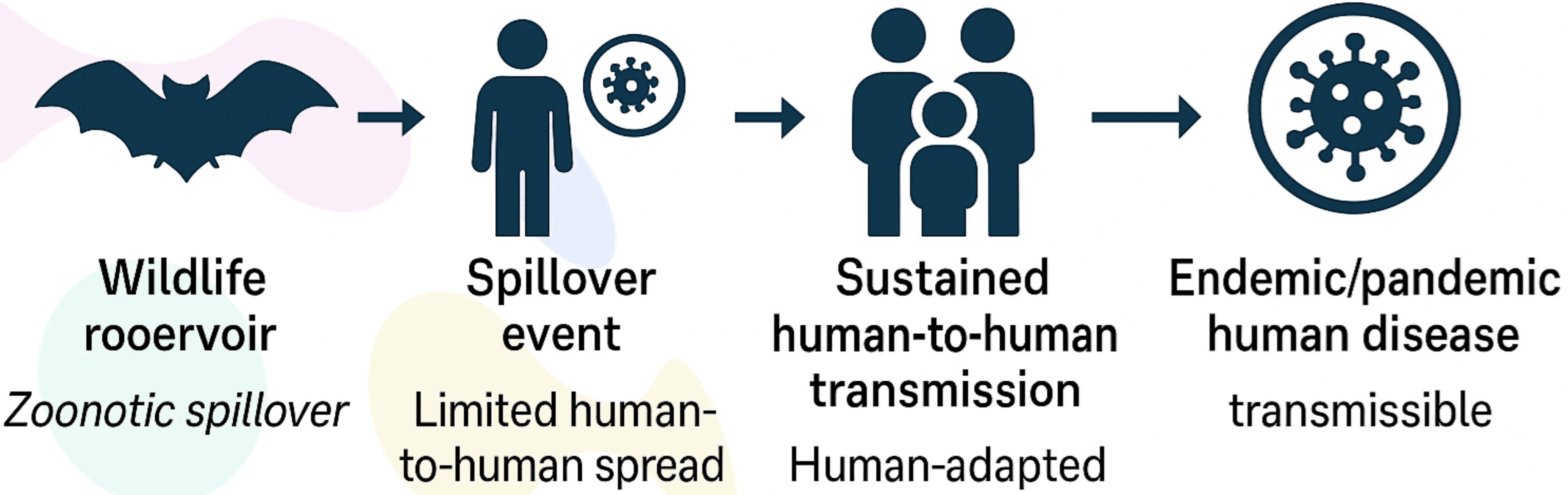
1. <u>Overview of Zoonotic Infections</u>
2. Reducing the global burden of neurological zoonotic infections
3. Case sharing on clinical management of neurological zoonotic diseases
4. From Ebola to Zika: public health emergencies from the UK experience

Overview of Zoonotic Infections

- Introductory Comments
- Zoonotic Diseases – general principles
  - Emergence
  - Spread
- Examples

Definitions

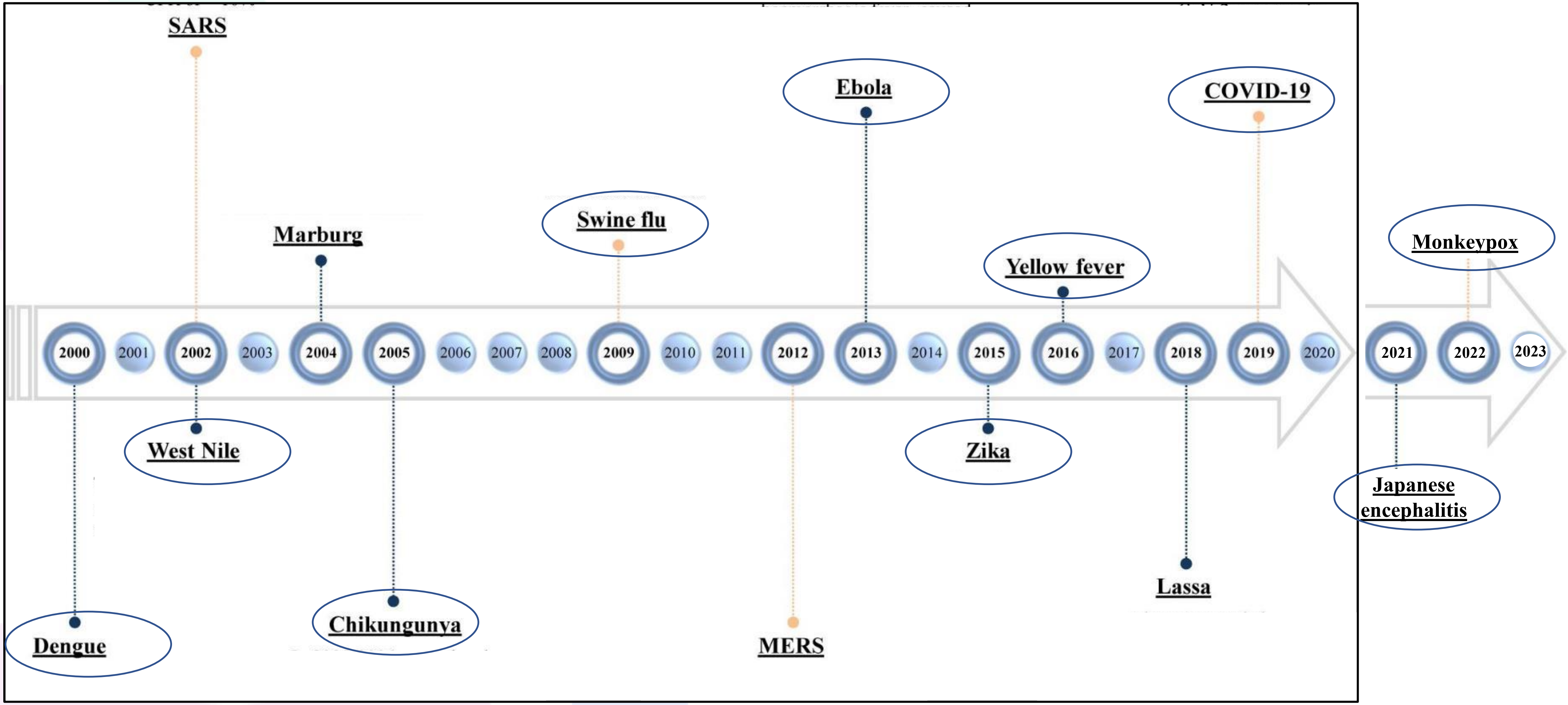
- Pathogen
  - Bacteria, virus, parasite, causing disease
- **Zoonotic Infections**
  - **Spread from animals to humans**
- Arbovirus infections
  - Arthropod-borne viruses
  - i.e. transmitted by insects or ticks (arthropods)
- One Health
  - The concept that the health of humans, animals and the environment are linked


Wildlife rooervoir
Zoonotic spillover
Spillover event
Limited human-to-human spread
Sustained human-to-human transmission
Human-adapted
Endemic/pandemic human disease
transmissible

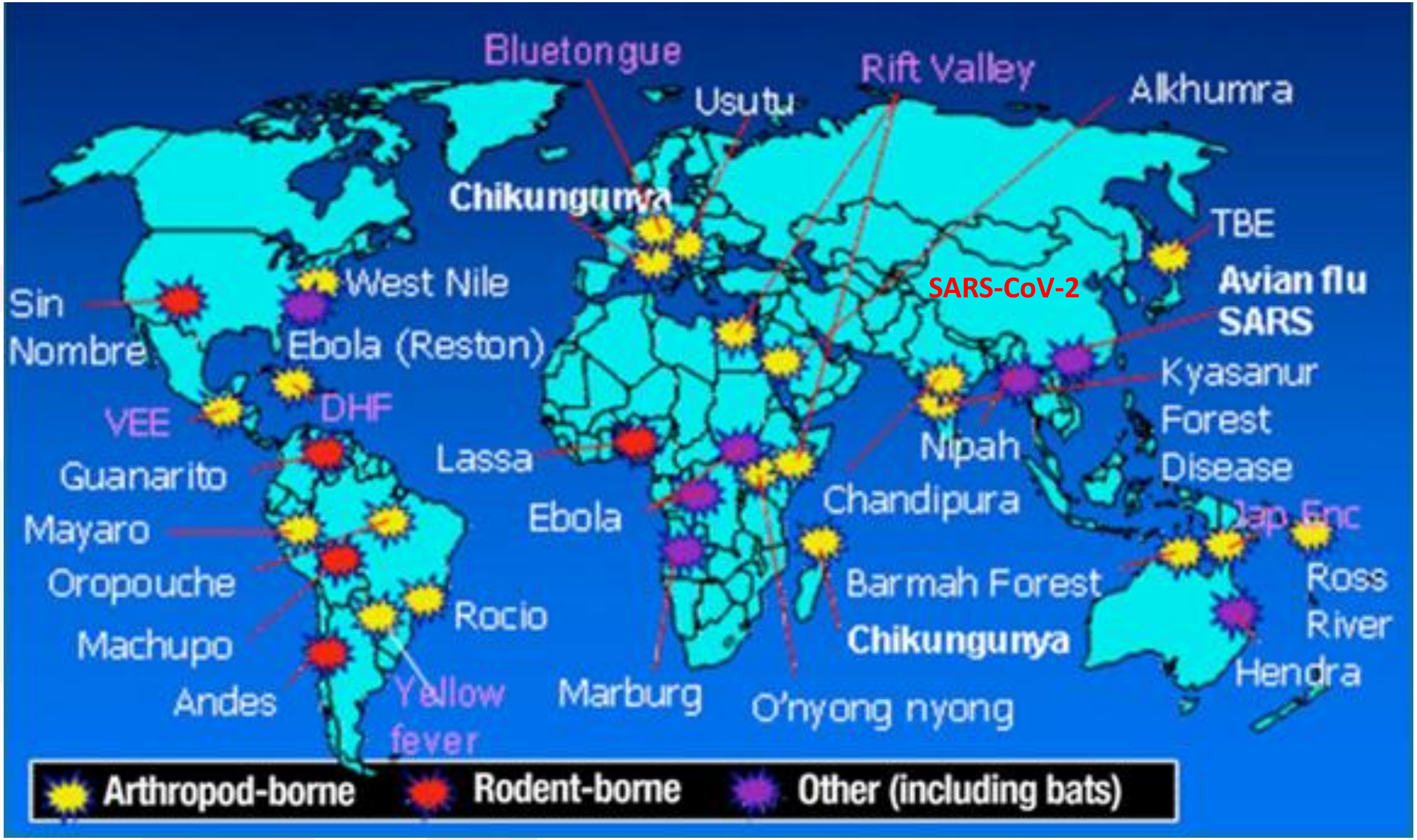
Major Categories of Zoonosis & Examples

- **Viral zoonoses**: Rabies, Influenza (avian, swine), SARS, MERS, COVID-19, Ebola, Nipah.
- **Bacterial zoonoses**: Anthrax, Brucellosis, Leptospirosis, Plague, Salmonellosis, Campylobacteriosis.
- **Parasitic zoonoses**: Malaria (simian reservoirs), Toxoplasmosis, Leishmaniasis, Trypanosomiasis.
- **Fungal zoonoses**: Dermatophytoses (“ringworm”), Histoplasmosis.

Emerging Infections since 2000



Most (70%) emerging infections are zoonotic, arthropod-borne, or both



www.earthintransition.org/

Human and Animal health, Terms and Examples

Human Health Term	Animal Health Equivalent	Meaning	Human Examples (Asia / Hong Kong)	Animal Examples (Asia / Hong Kong)
Zoonosis	**Zoonosis**	A disease that can be transmitted between animals and humans.	Rabies (China and SE Asia), Nipah virus (Malaysia/Bangladesh), Avian influenza (Hong Kong, SE Asia)	Same agents affecting animal reservoirs (dogs, bats, pigs, poultry)

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Anthroponosis	**Anthroponosis**	A primarily human disease that can also spread to animals.	Human tuberculosis spreading to elephants; COVID-19 transmitted from humans to zoo animals and mink	Animal infections resulting from human-to-animal transmission (reverse zoonosis)

Transmission Routes of Zoonotic Infections

- **Direct contact**: Touching animals, bites, scratches (rabies, ringworm).
- **Indirect contact**: Contact with areas contaminated by animals (soil, water, fomites).
- **Vector-borne**: Transmitted via mosquitoes, ticks, fleas (malaria, Lyme disease, plague).
- **Foodborne**: Eating contaminated meat, milk, or eggs (salmonella, avian influenza).
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Overview of Arboviral Ecology. A hypothetical arboviral cycle

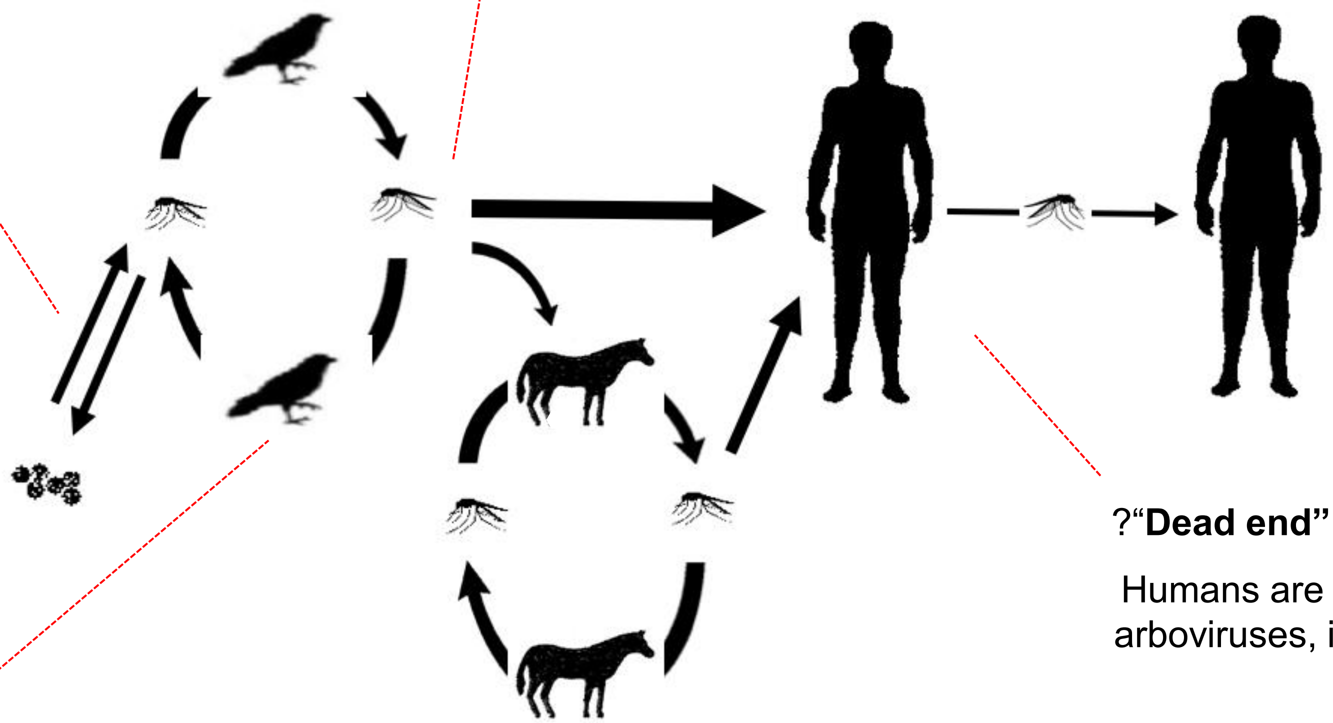
Bridging vector

usually anthropophillic vectors – i.e. they prefer biting humans

Vertical transmission

In **transovarial transmission** the virus is passed from the vector to its eggs.

For ticks, **transtadial transmission** from larvae to nymphs, then to adults also occurs.



?"**Dead end" host**

Humans are dead end hosts, for most arboviruses, ie don't transmit the virus further

Enzootic cycle

- Causes disease in animals
- "Sylvatic cycle" if these are wild animals
- Ornithophilic mosquitoesfeed on birds

Epizootic cycle

- Outbreak in animals

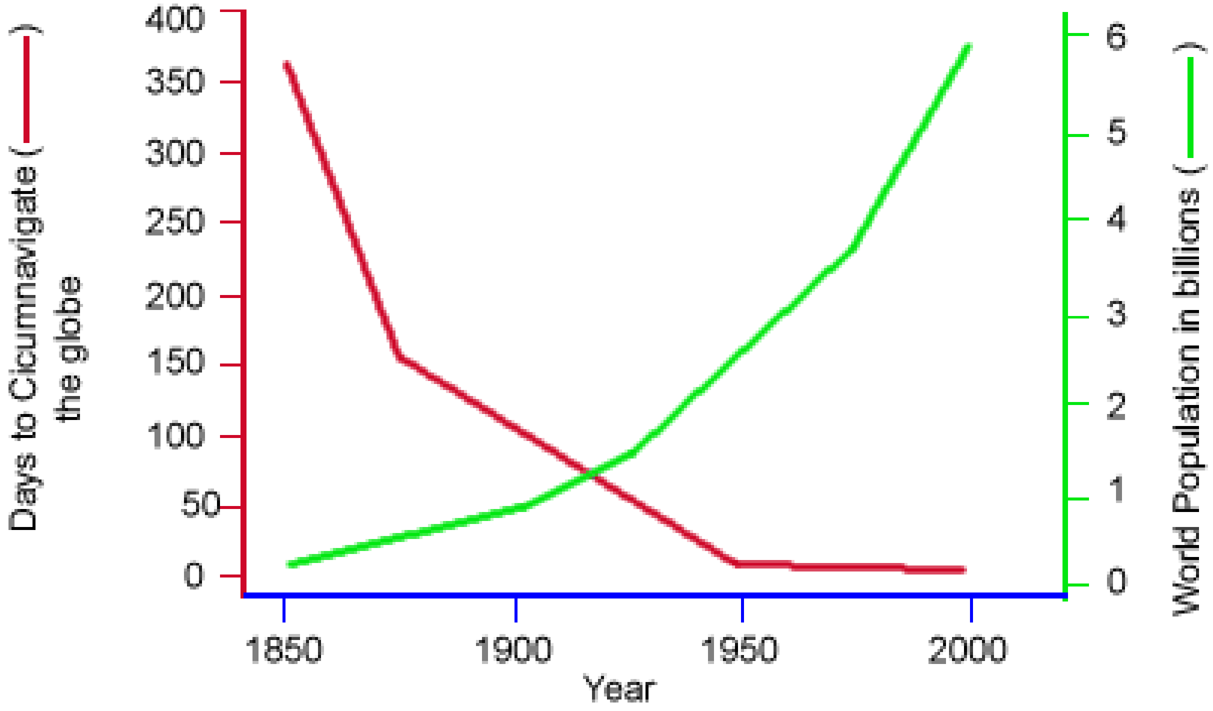
From: Solomon T, Whitley RJ. Arthropod-borne viral encephalitides. In: Scheld M, Whitley RJ, Marra C, editors. Infections of the Central Nervous system. 2nd ed. Philidelphia, PA: Lippincott Williams and Wilkins; 2004.

Emerging Zoonoses – why?

Emerging Zoonoses – why?

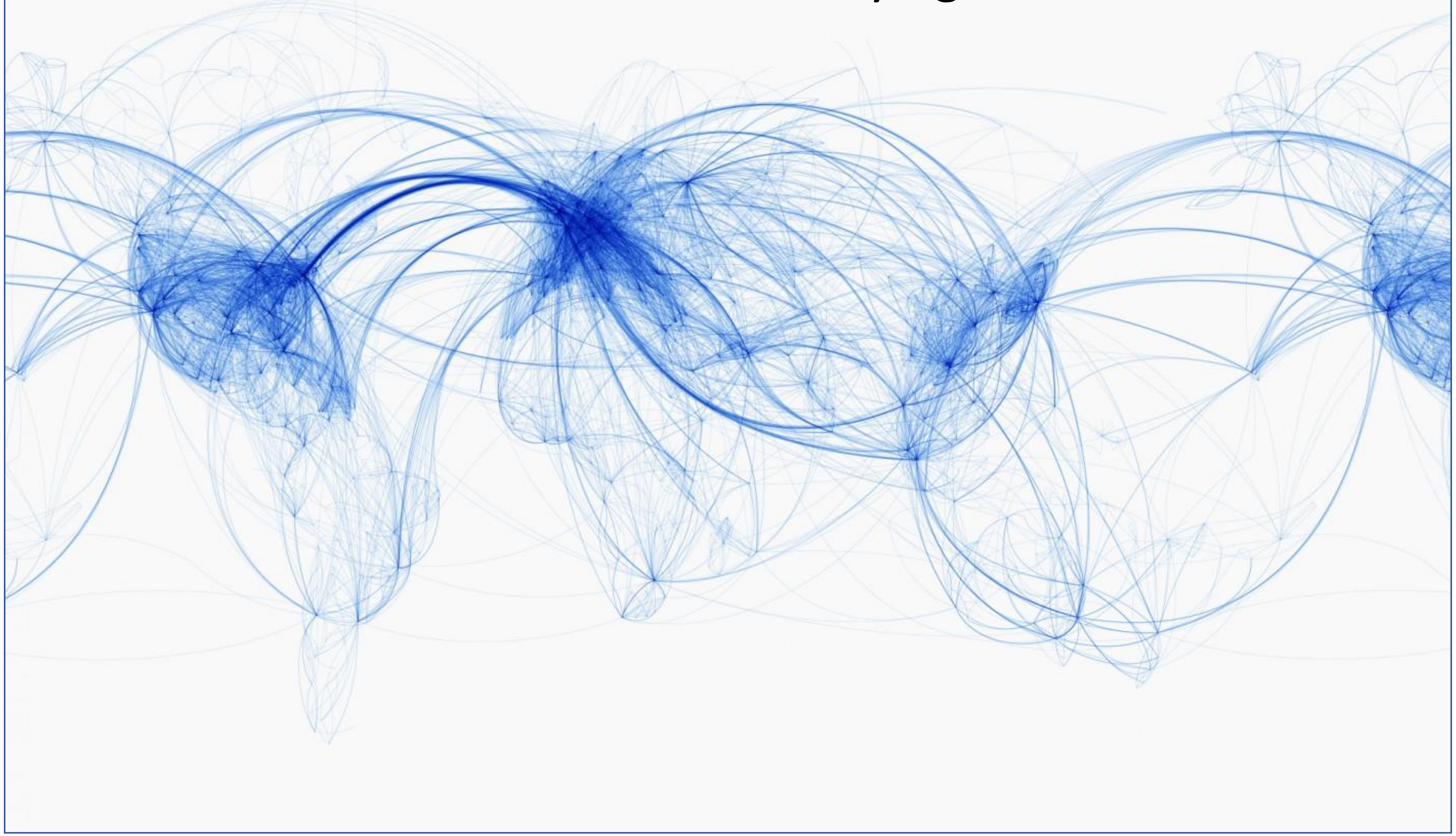
- Increasing & more rapid human travel
- Overpopulation
- Changing agricultural
- Global warming
- Pathogen mutations

  - Better diagnostics
  - Better reporting
  - Greater awareness



From: Murphy and Nathanson. Semin. Virol. 5, 87, 1994

Airline Routes – No. Of airlines flying each route



http://commons.wikimedia.org/

Emerging Zoonoses – why?

OVERCROWDING

~1894

~1994

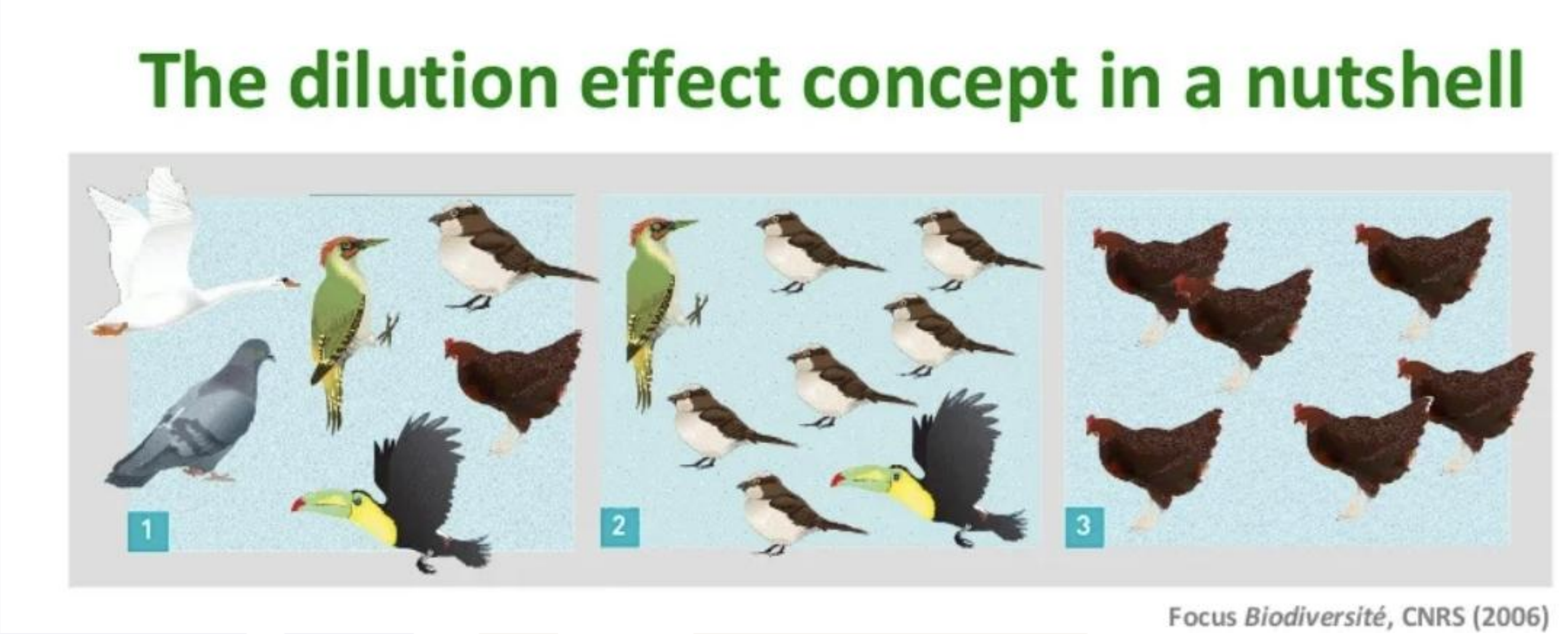

~2014


~2024

Emerging Zoonoses – why?

LACK OF BIODIVERSITY

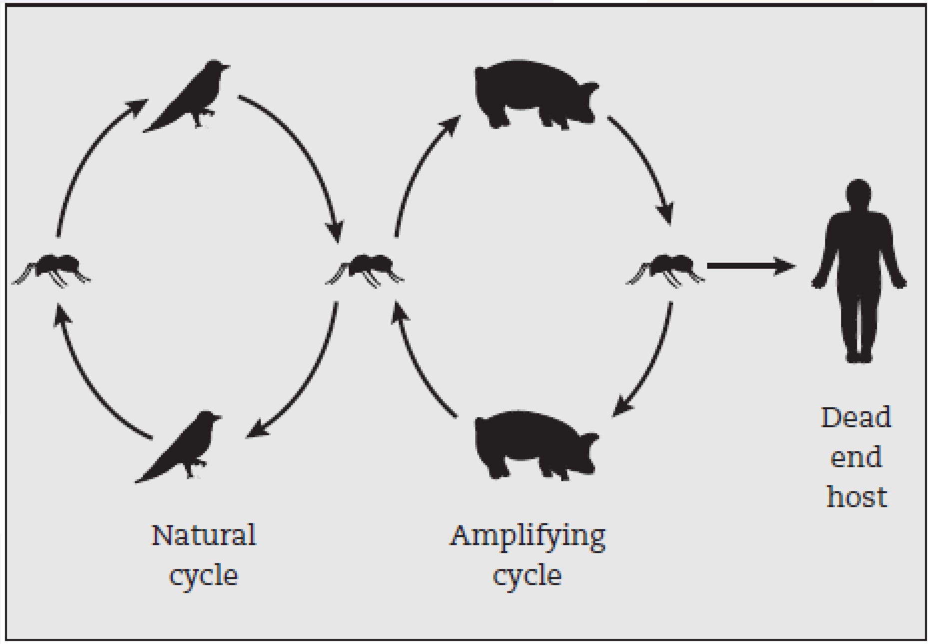
Biodiversity

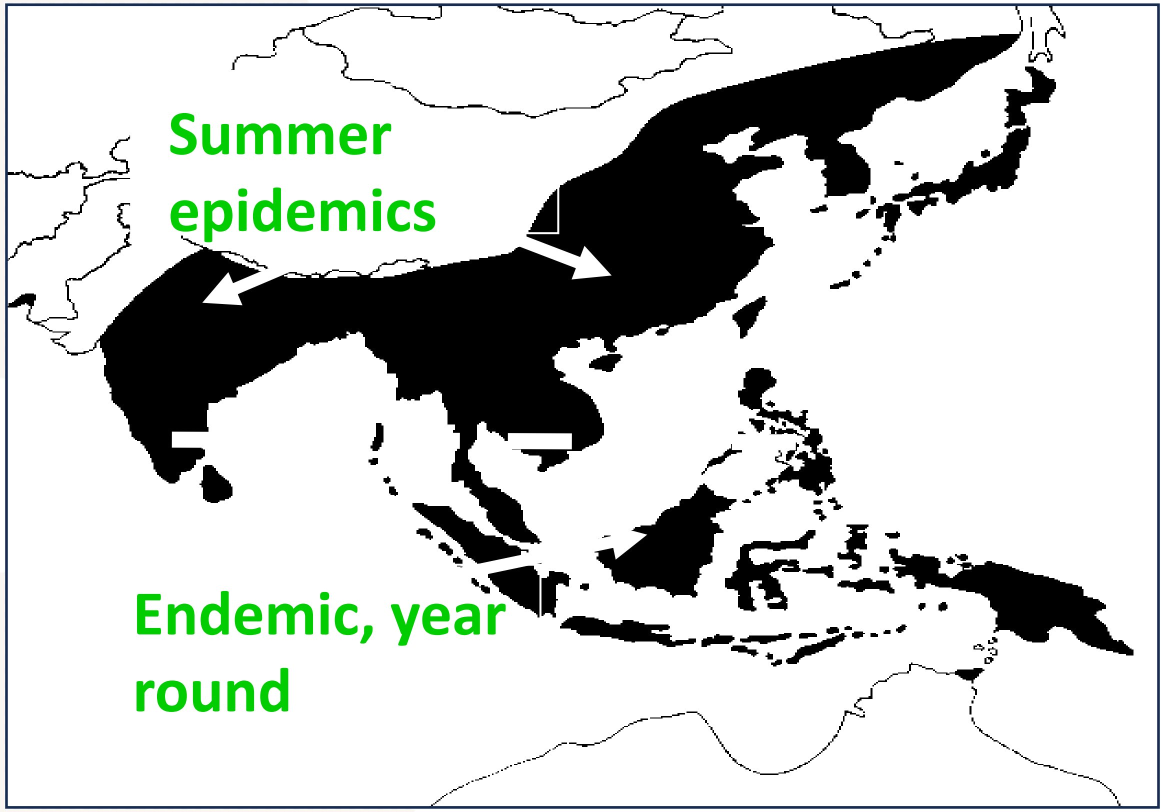


Emerging Zoonoses – why?

CLIMATE CHANGE

Japanese encephalitis virus (JEV)





Japanese encephalitis

- **Geographic Range:** Endemic to rural areas of Asia and the Western Pacific, posing a risk to more than 3 billion people.
- **Severity:** While most infections are asymptomatic or mild, about 1 in 250 result in severe illness.

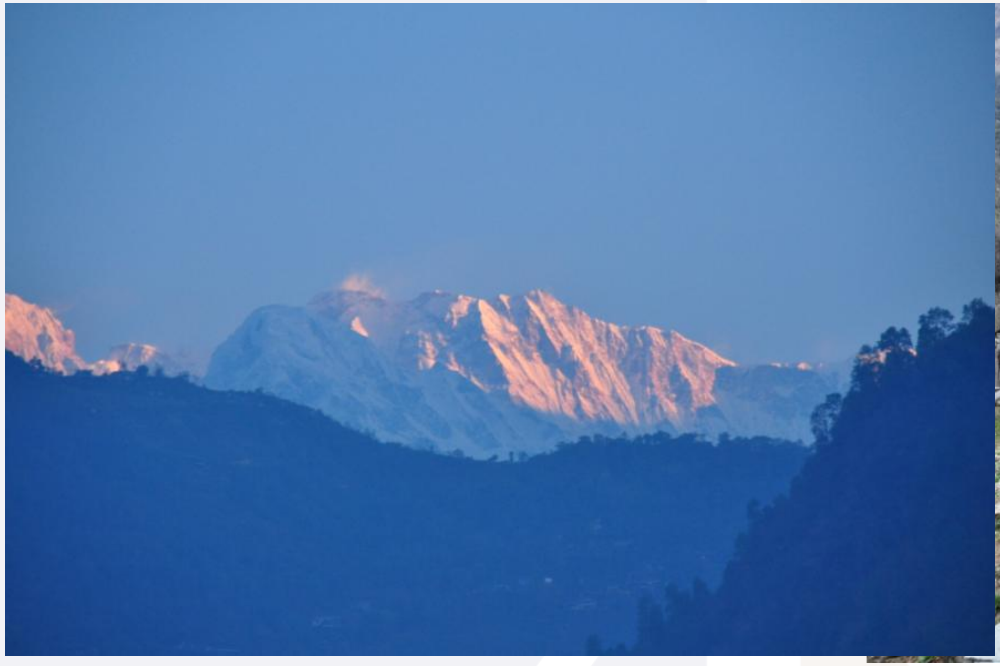
- **Vector:** Transmitted by *Culex* species mosquitoes, which primarily bite between dusk and dawn.
- **Amplifying Hosts:** Mosquitoes become infected by feeding on vertebrate hosts, mainly pigs and waterbirds. Pigs are "amplifying hosts" that significantly multiply the virus.
- **Dead-End Host:** Humans are "dead-end" hosts, meaning they do not transmit the virus back to mosquitoes.

- **Symptoms and Outcomes**
- **Mild Cases:** Most infections are mild, with symptoms such as fever, headache, and vomiting.
- **Severe Cases:** A small percentage of patients develop severe neurological disease, which may include high fever, neck stiffness, seizures, coma, and spastic paralysis.
- **Fatality and Sequelae:** Among those who develop encephalitis, up to 30% may die. Up to 50% of survivors may be left with permanent neurological, cognitive, or behavioral issues.

- **Prevention and Treatment**
- **Vaccination:** Safe and effective vaccines are available and recommended for high-risk groups, including residents and travelers to endemic areas.
- **Mosquito Bite Avoidance:** The best prevention for all individuals is to avoid mosquito bites, especially during peak biting hours.

- **Supportive Care:** There is no specific cure or antiviral treatment for Japanese encephalitis. Care is supportive and focuses on managing symptoms.
- This is for informational purposes only. For medical advice or a diagnosis, consult a professional.

Japanese encephalitis emergence in the Himalayan foothills




LADAKH
Leh
AMMU AND
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Jammu
HIMACHAL
PRADESH
Jalandhar
जलंधर
CHANDIGARH
UTTARAKHAND
HARYANA
New Delhi
नई दिल्ली
Bareilly
बरेली
UTTAR
PRADESH
Jaipur
जयपुर
Lucknow
लखनऊ
Gwalior
ग्वालियर
Kanpur
Nepal
Kathmandu
काठमाडौं
Gorakhpur
गोरखपुर
Muzaffarpur
मुजफ्फरपुर
TIBET
Lhasa
拉萨市
SIKKIM
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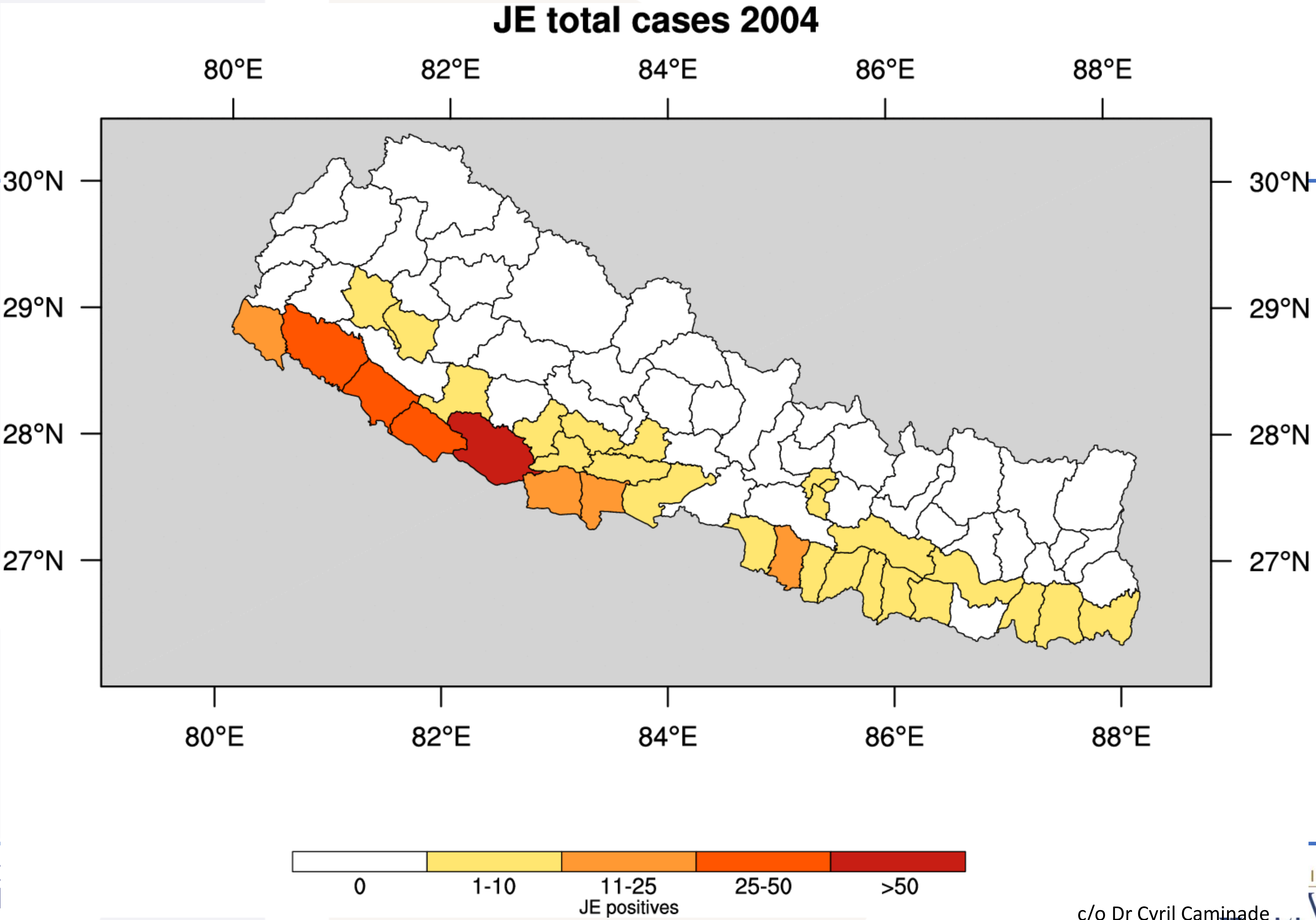
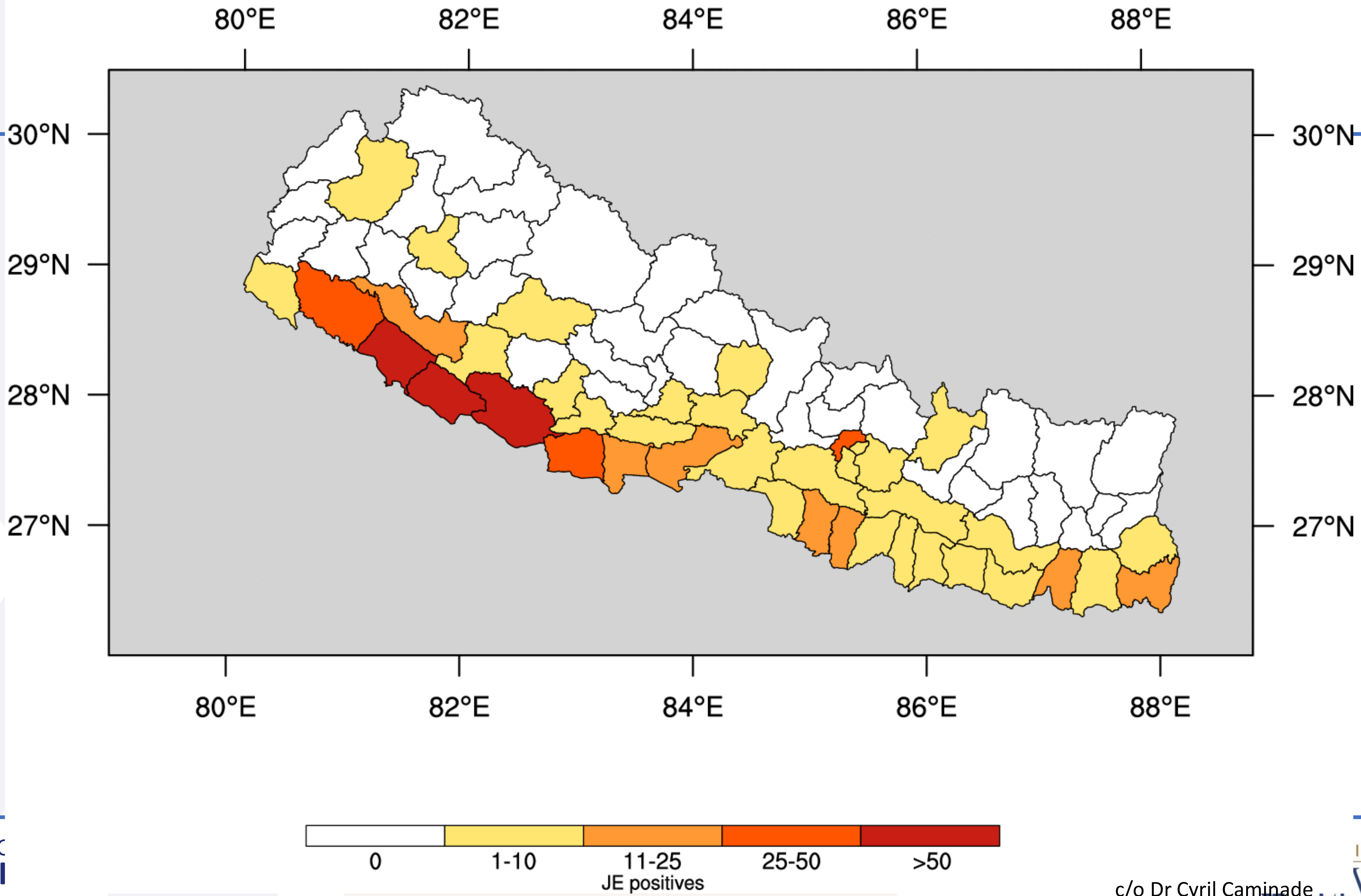
Siliguri
ARUNACHAL
PRADESH
Dibrugarh
Jorhat
ASSAM



c/o Dr Cyril Caminade

JE total cases 2005



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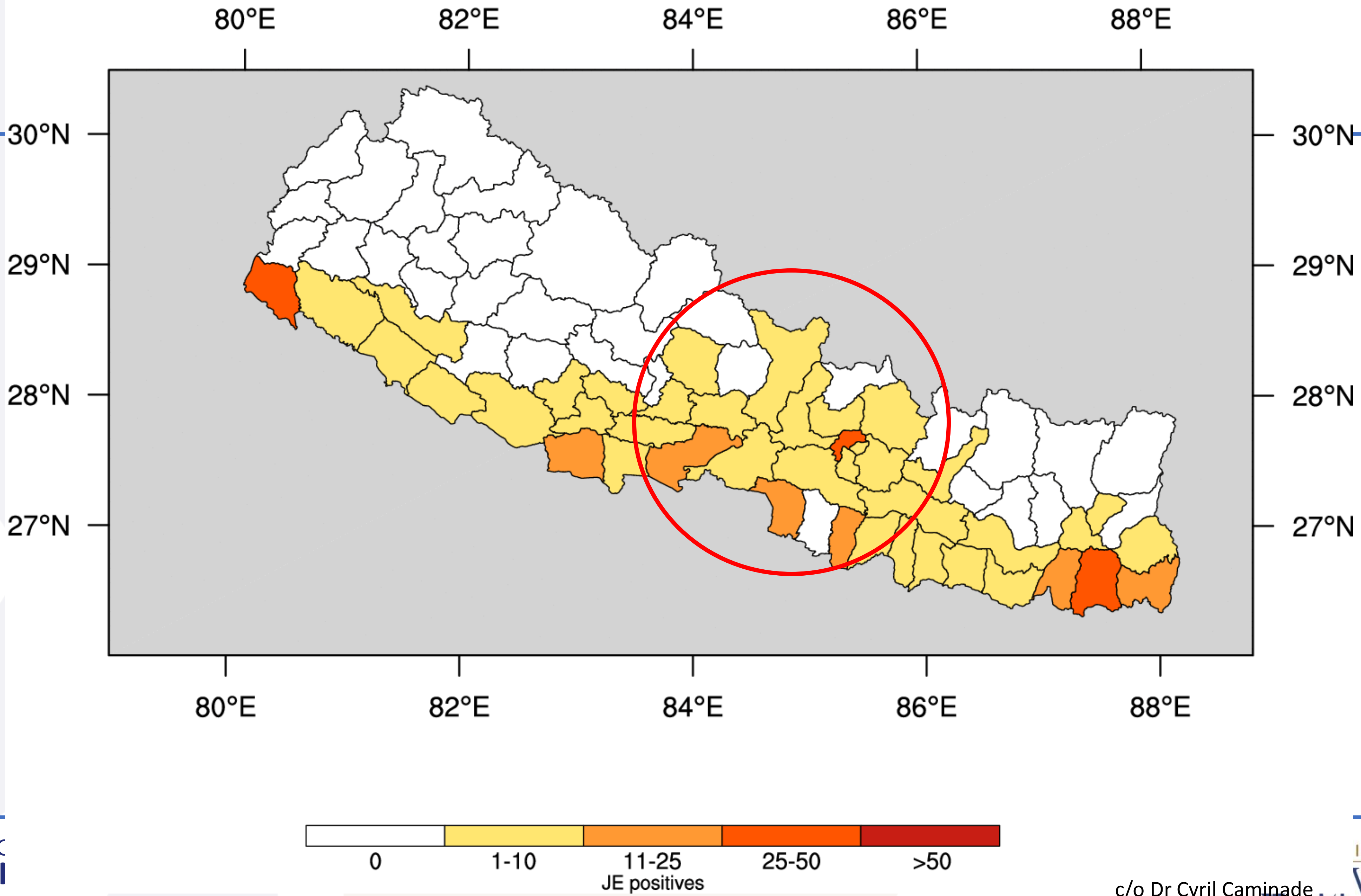
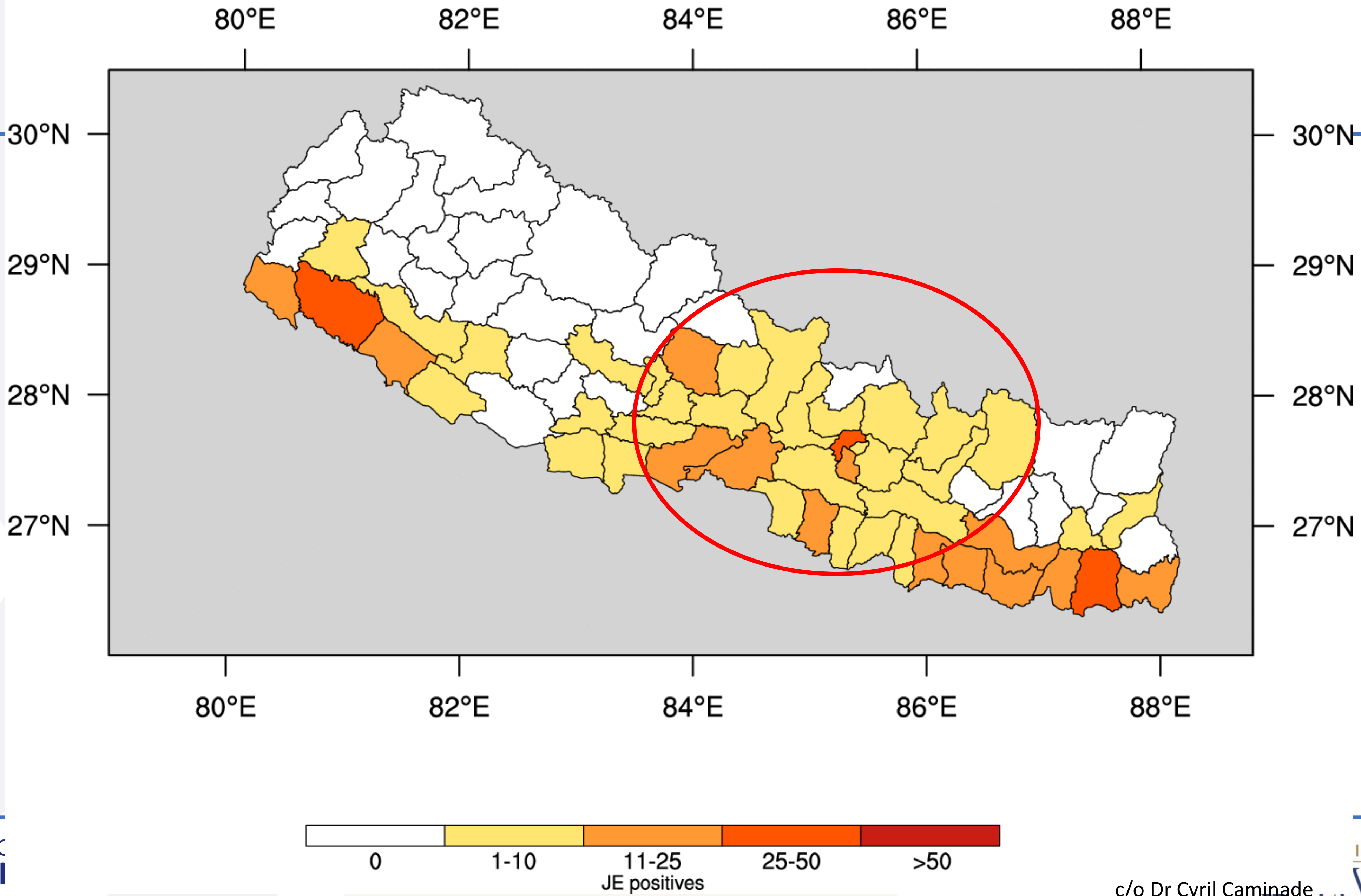
JE total cases 2006



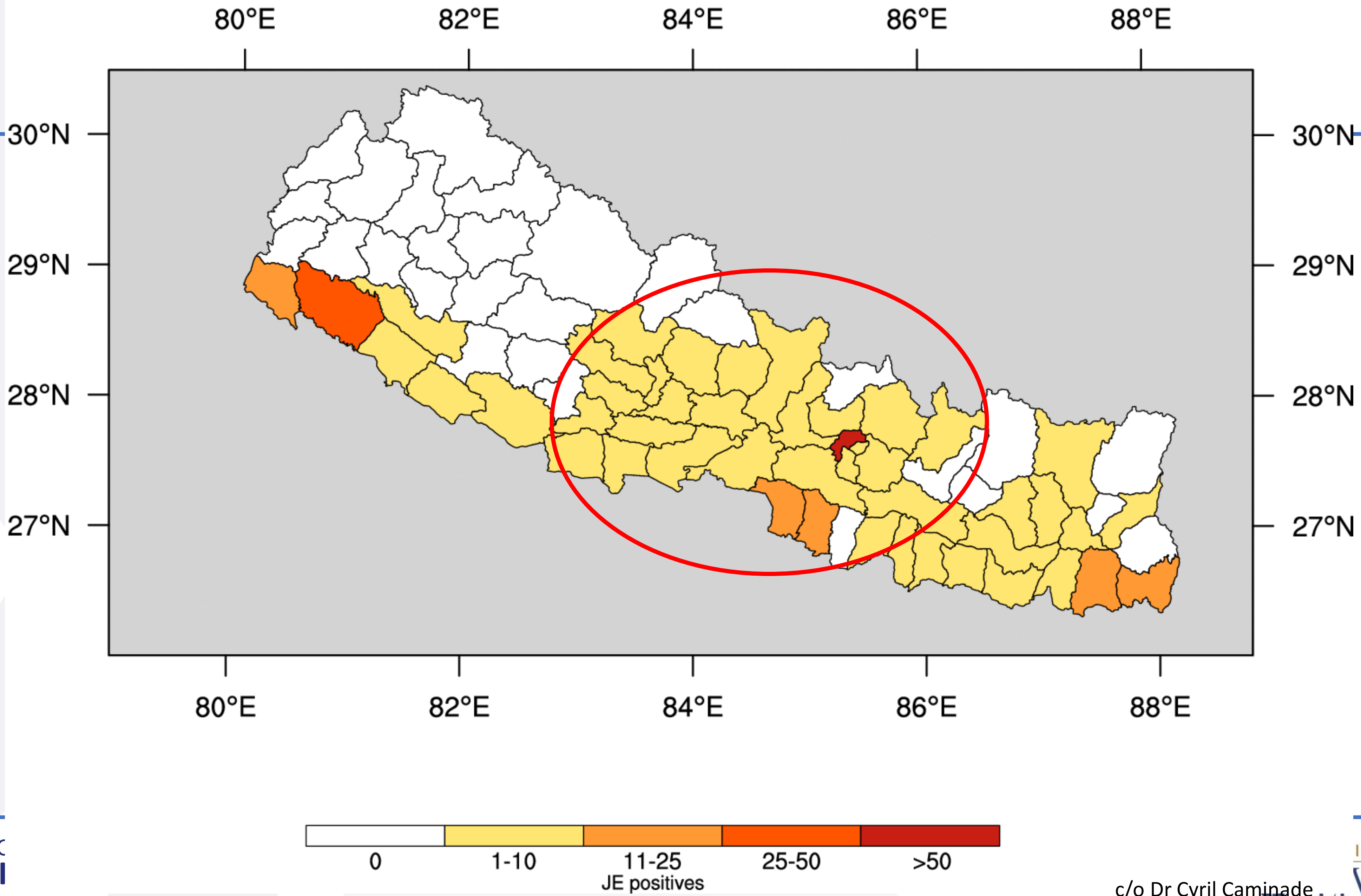
c/o Dr Cyril Caminade

JE total cases 2007



c/o Dr Cyril Caminade

JE total cases 2008

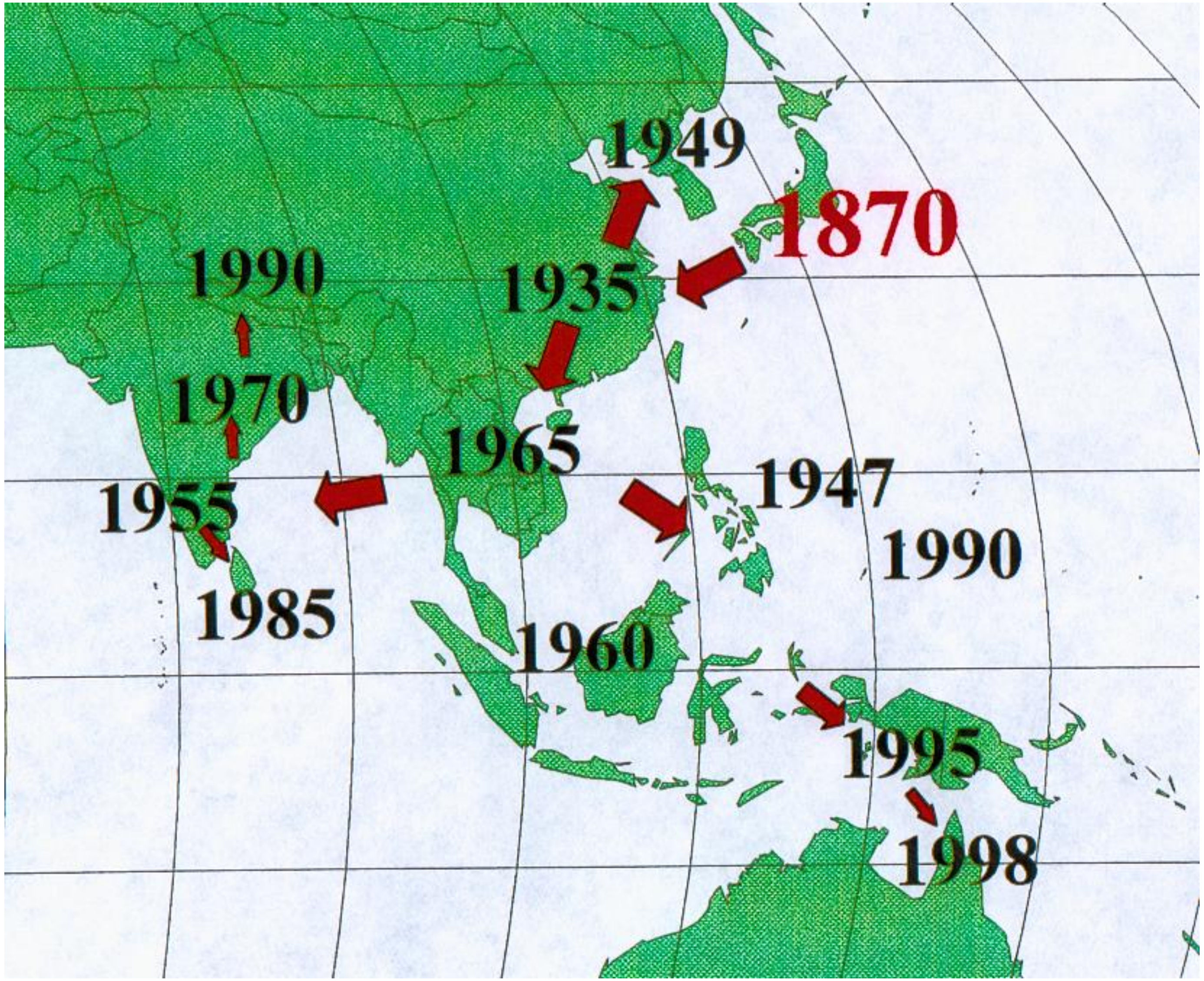


c/o Dr Cyril Caminade

Drivers of Spread

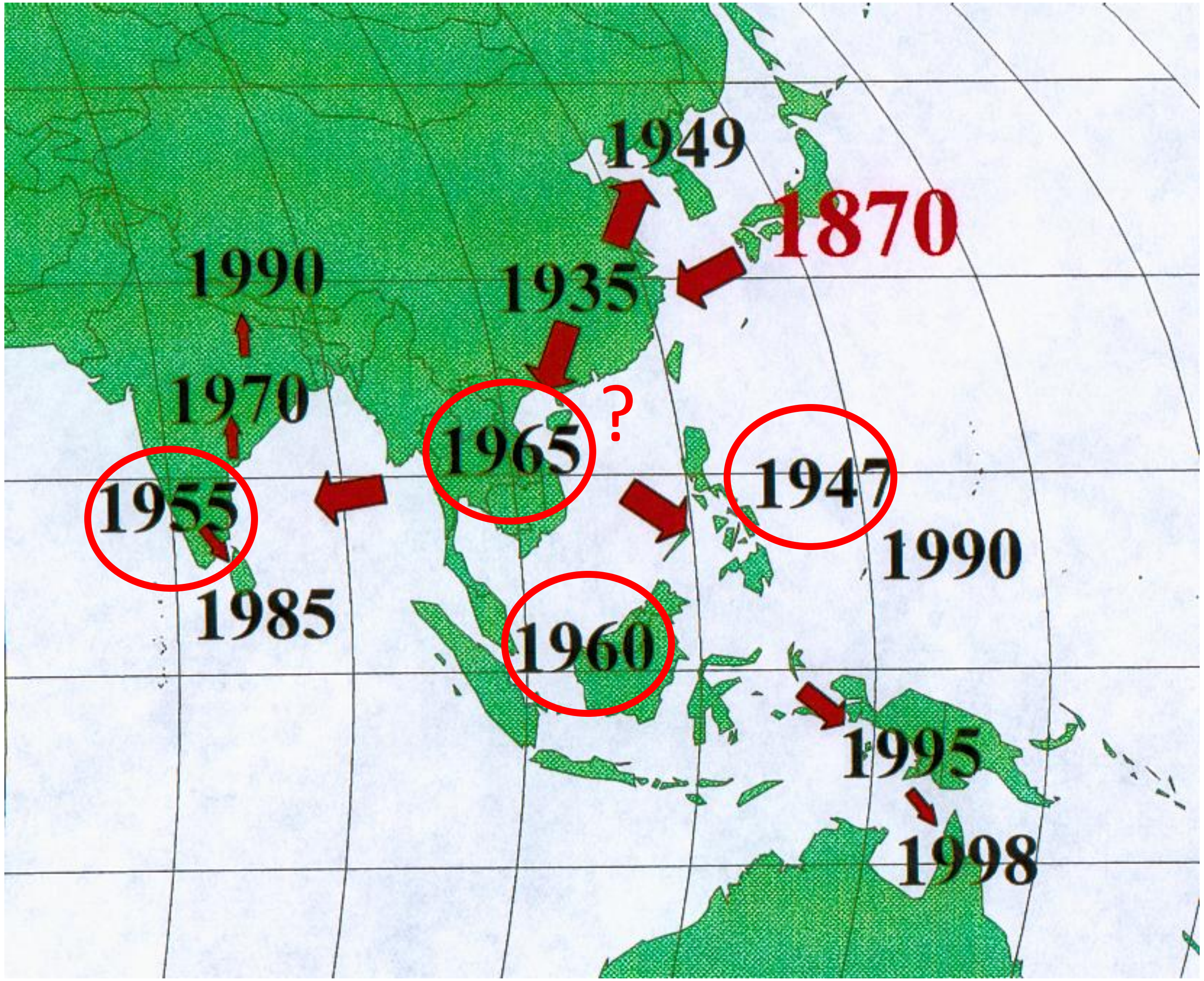
- RNA viruses (arthropod-borne and other)
  - RNA viruses, rapid mutation rate, no proof reading mechanism
  - Single nucleotide changes may be critical
  - Arrival in new areas causes large outbreaks

JE: Epidemiology



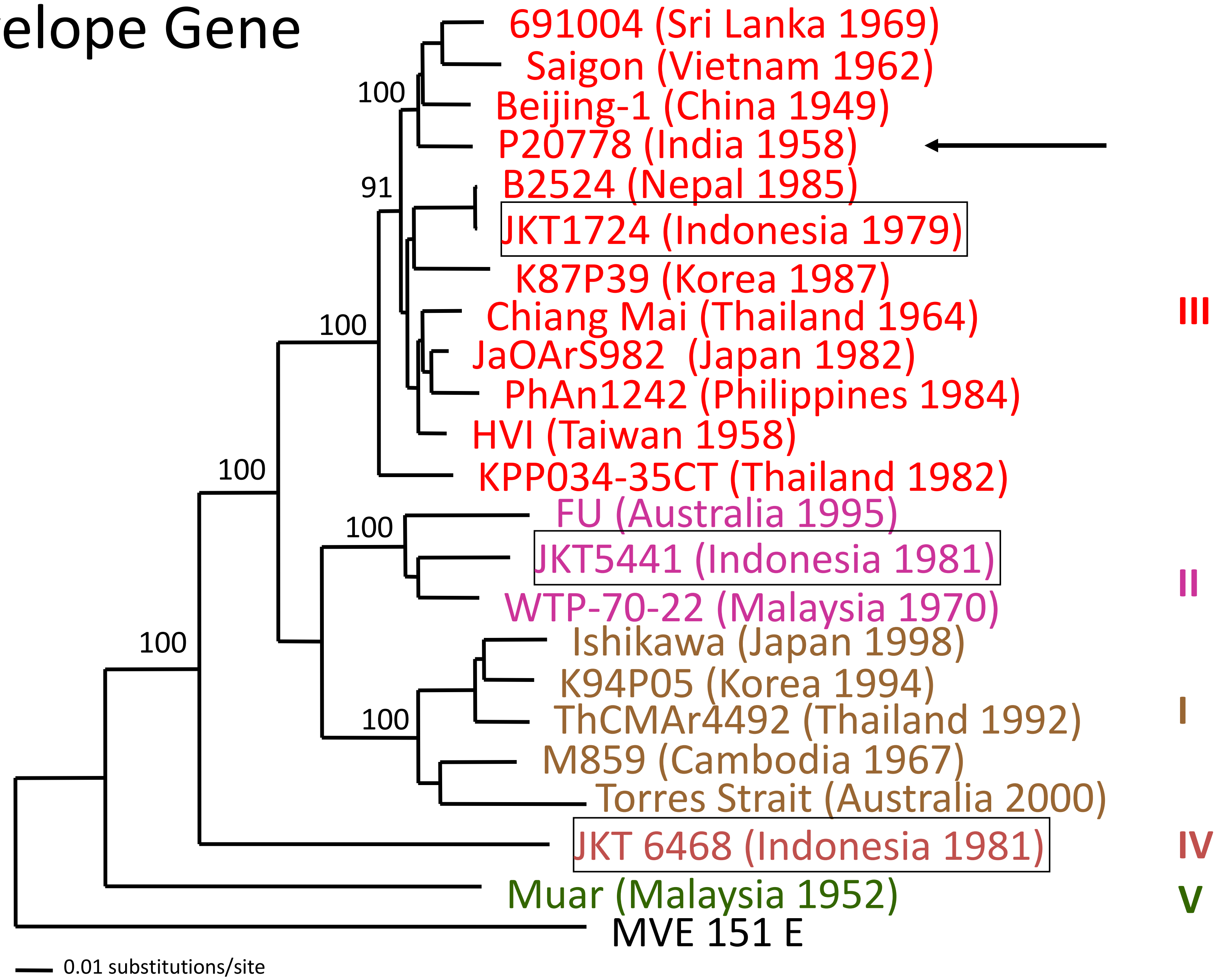
JNNP 2000; 68:405-15

JE: Epidemiology



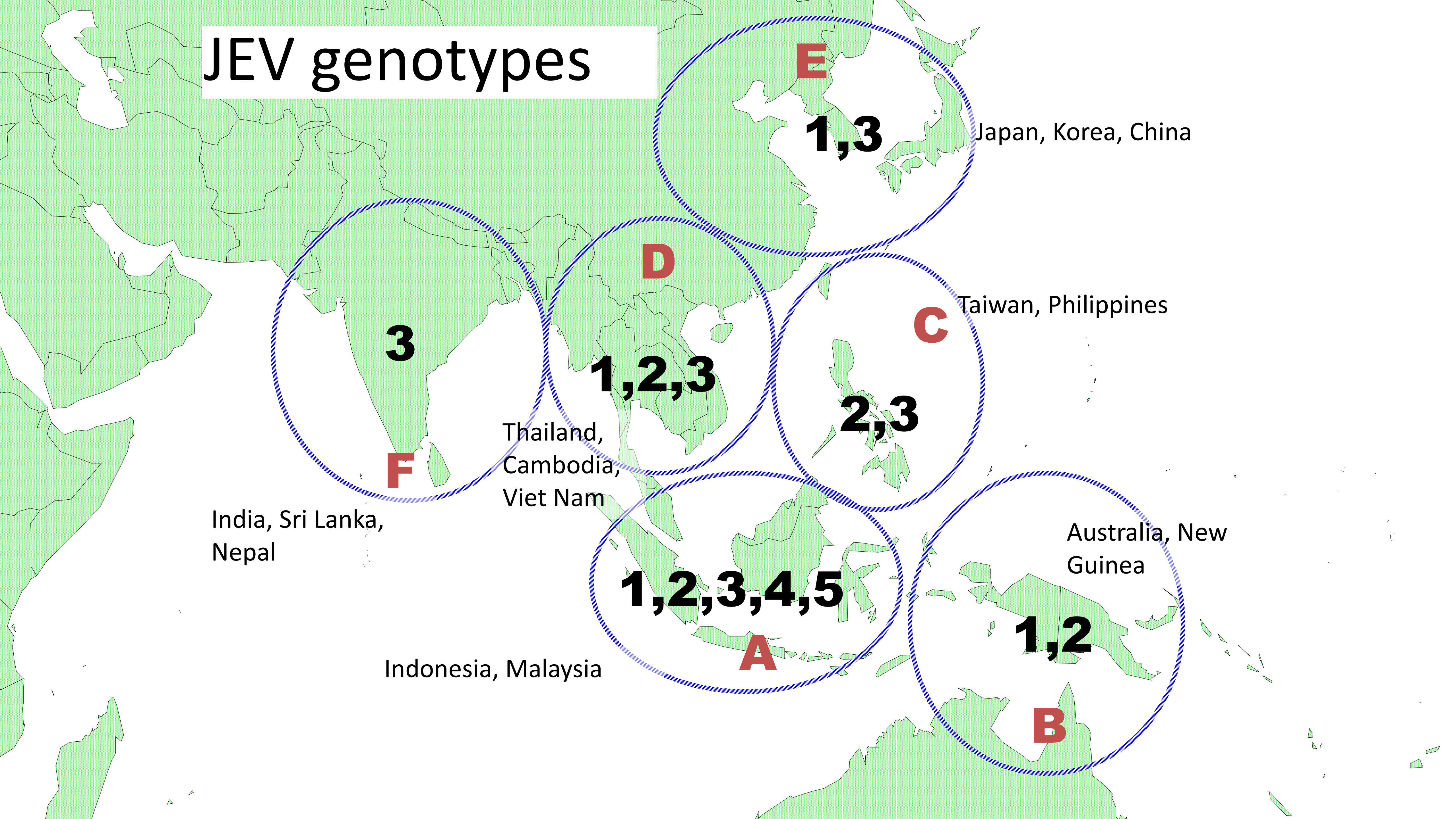
JNNP 2000; 68:405-15

Envelope Gene

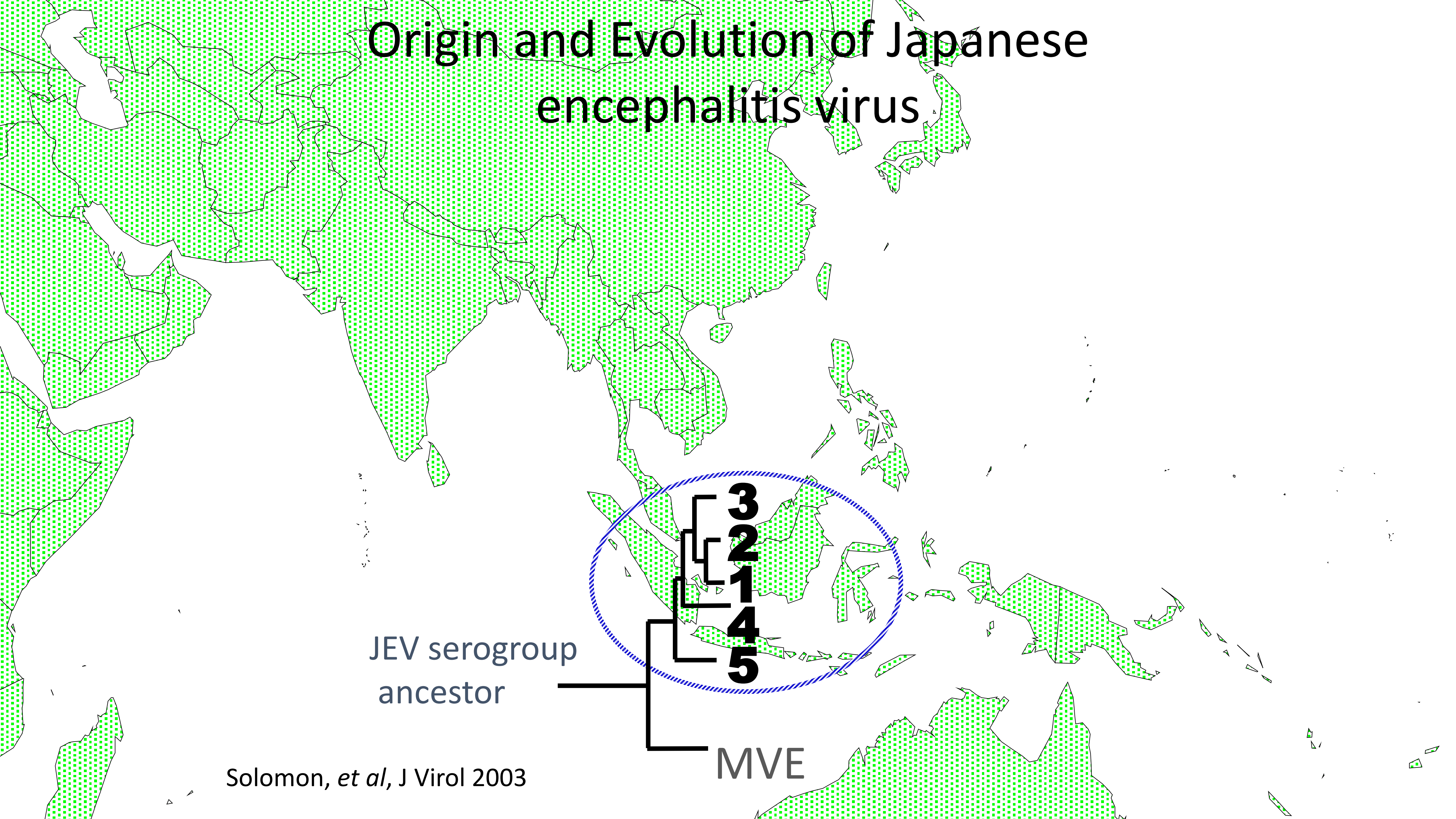


Distribution varies in different countries; 5th Genotype

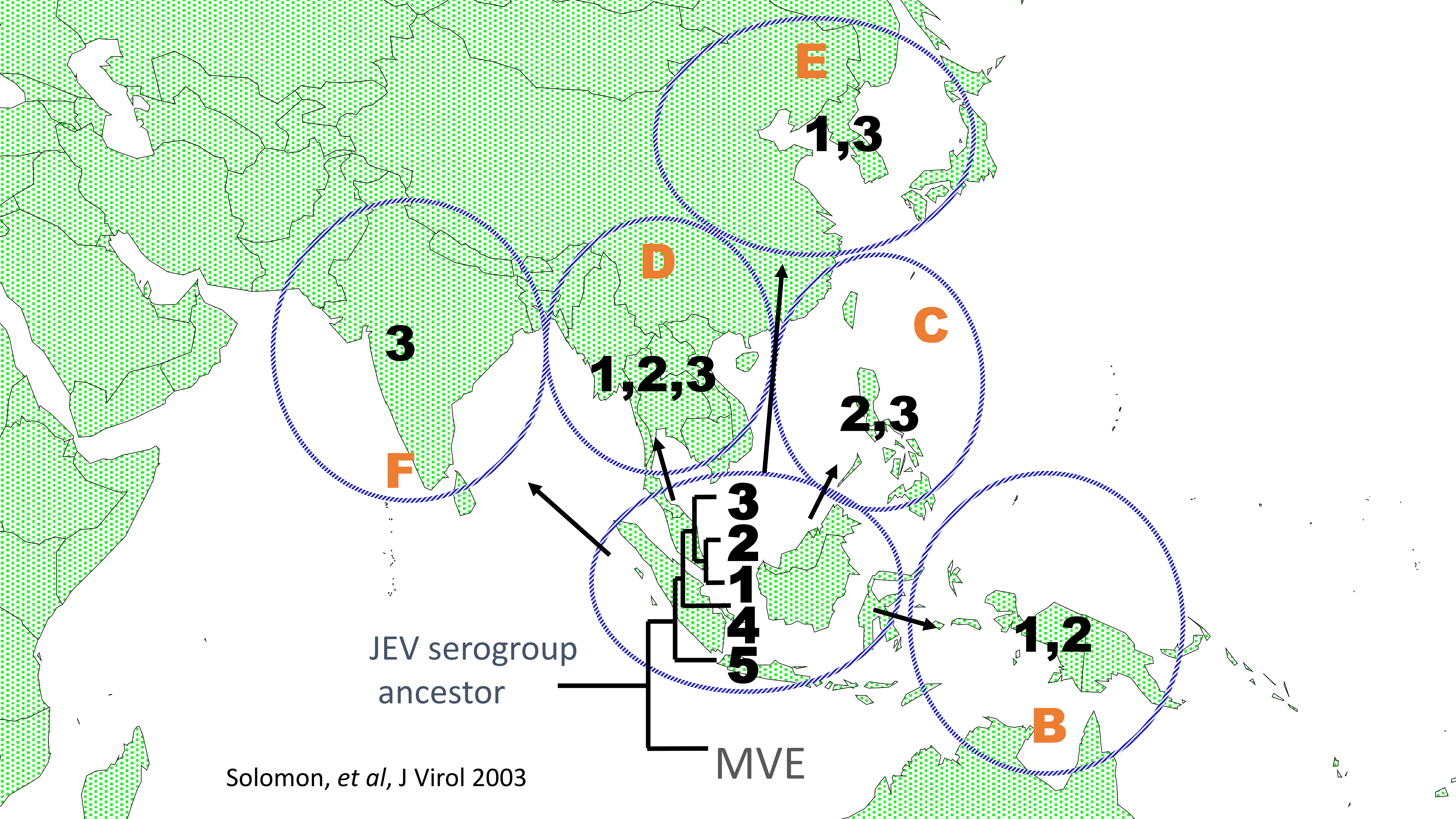
JEV genotypes



Origin and Evolution of Japanese encephalitis virus



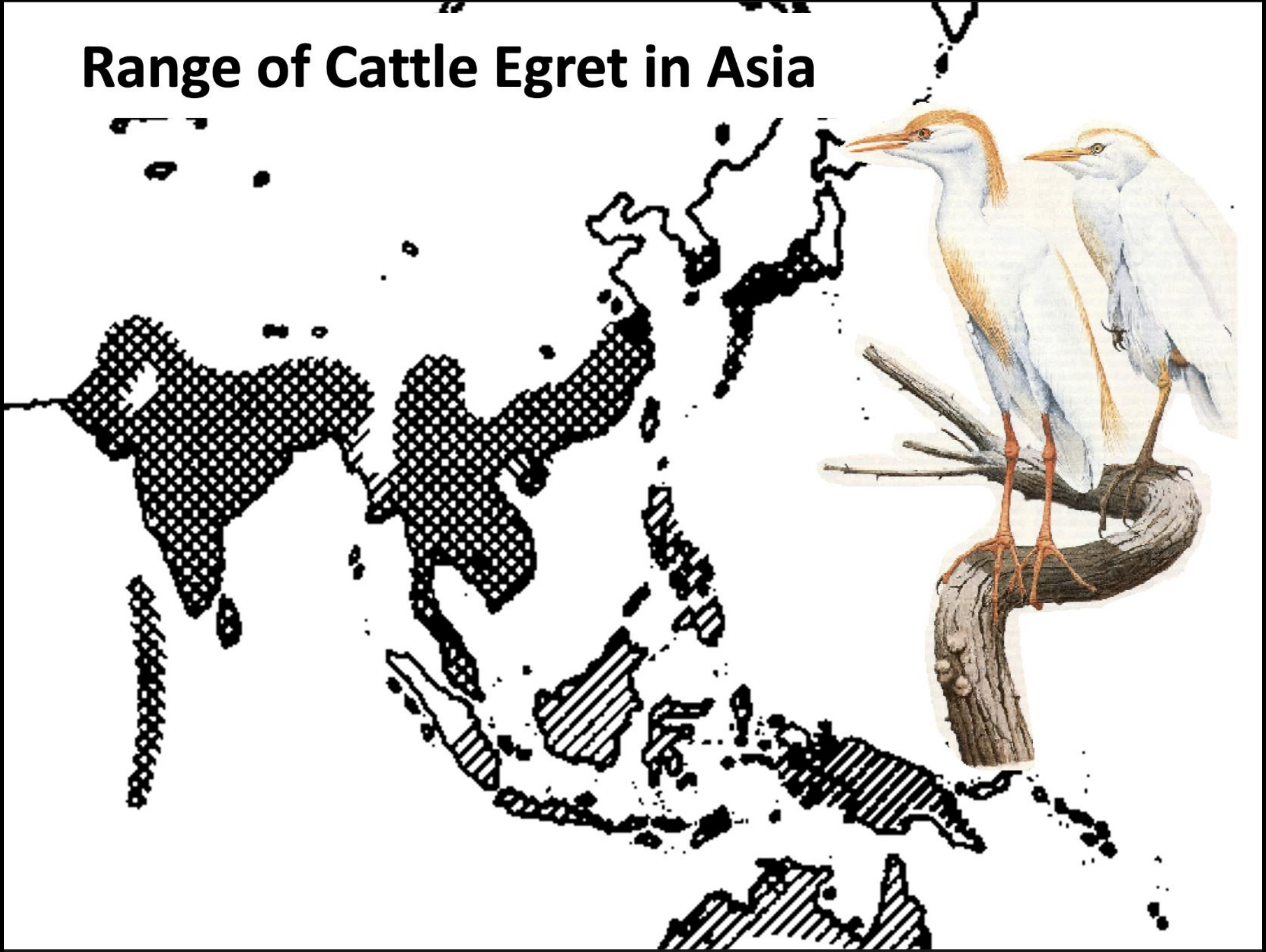
Solomon, *et al*, J Virol 2003



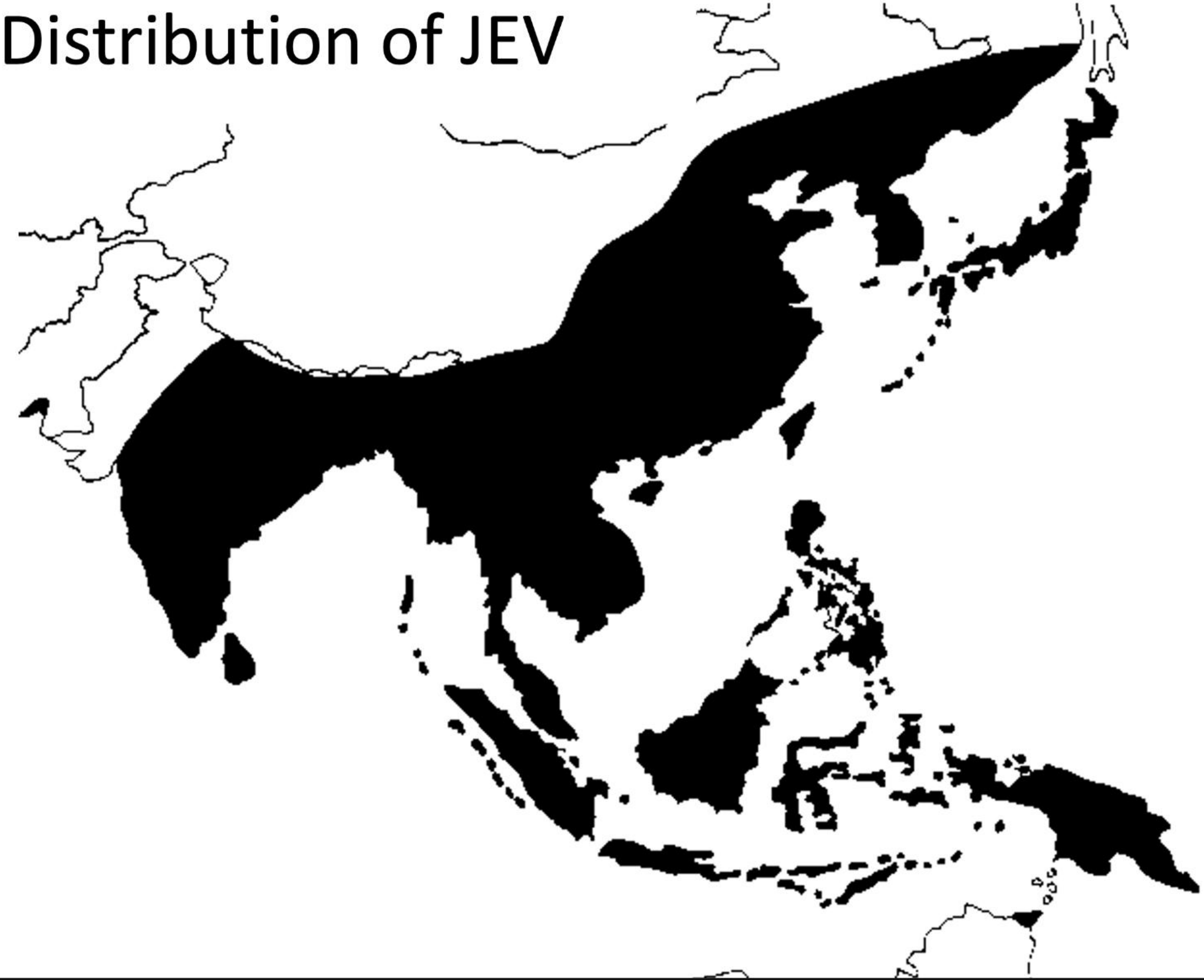
Solomon, *et al*, J Virol 2003

Spread of recent JEV genotypes?

Range of Cattle Egret in Asia



Distribution of JEV



JEV vectors and hosts

- *Culex sp.*

  tritaeniorhynchus, vishnui, pseudovishnui, whitmorei, gelidus, fuscocephala, pipiens, quinquefasciatus, bitaeniorhynchus

- *Aedes & Ochlerotatus sp.*

  aegypti, albopictus, togoi, subpictus, chemulpoensis, vexans, alcasidi, curtipes

- *Anopheles sp.*

  hyrcanus, barbirostris, tessalatus

- *Mansonia sp*

  uniformis

- *Armigeres sp*

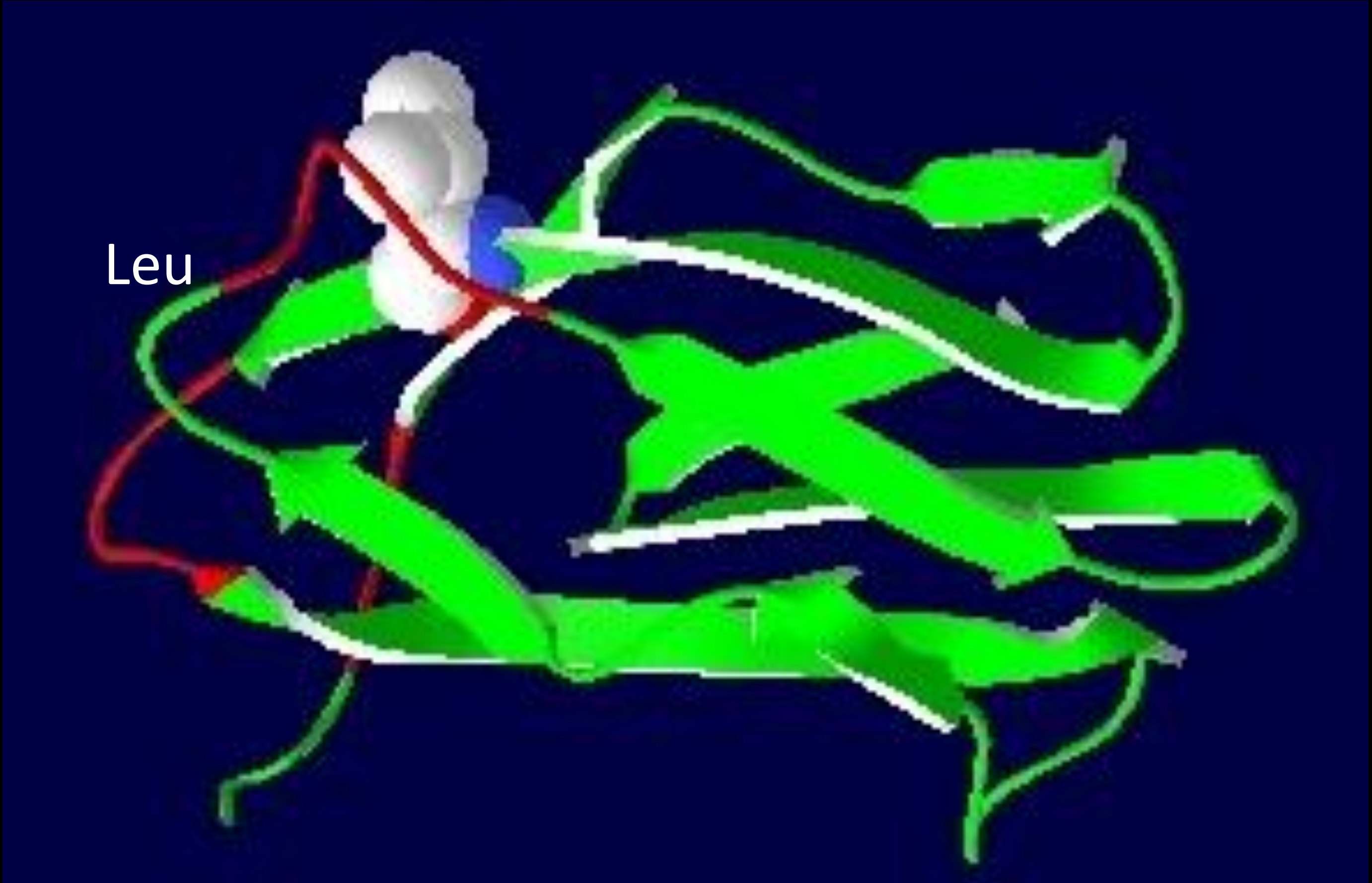
  obturans, flavus

- Egrets/herons
  - Cattle egret
  - Black crowned night heron
  - Plumed egret
  - Lesser egret
  - Pond herons
  - Great egret

- Swine
- Horses
- Bats
- Reptiles

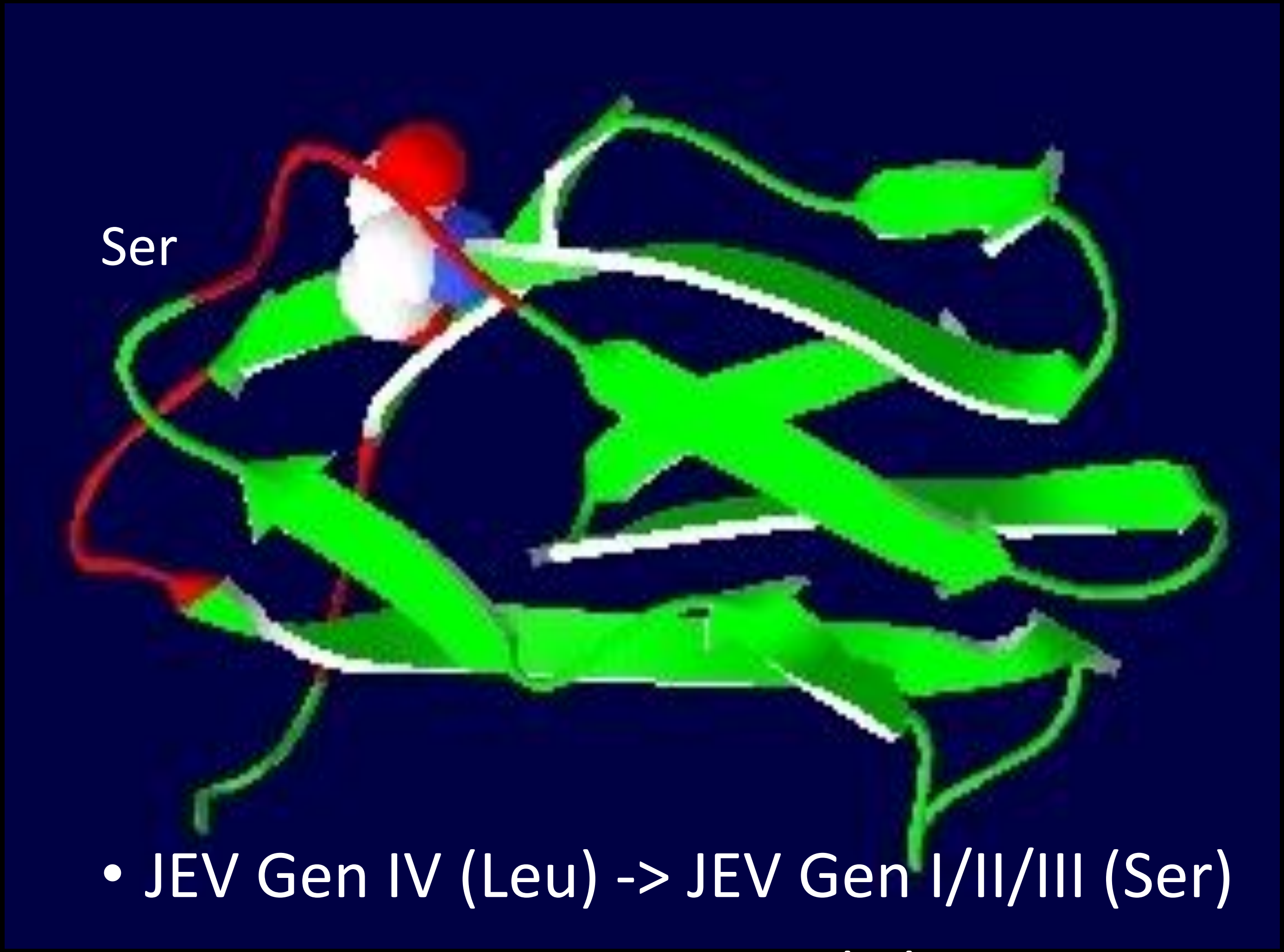
- Reptiles
- Amphibians
- Snakes
- Frogs

Change in domain III associated with evolution of JEV genotypes



- JEV Gen IV (Leu) -> JEV Gen I/II/III (Ser)

Change in domain III associated with evolution of JEV genotypes



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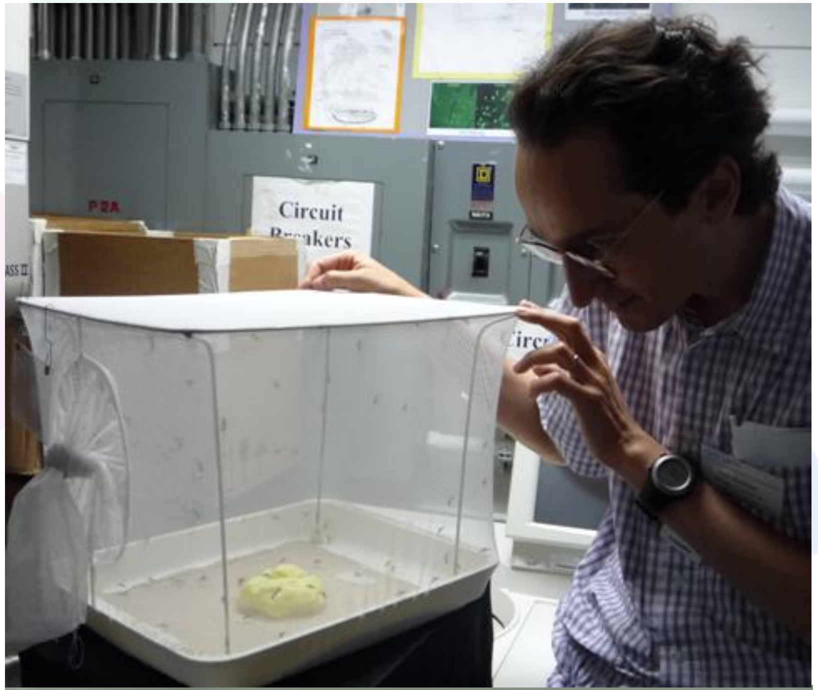
Transmission of Japanese encephalitis virus through mosquito vectors

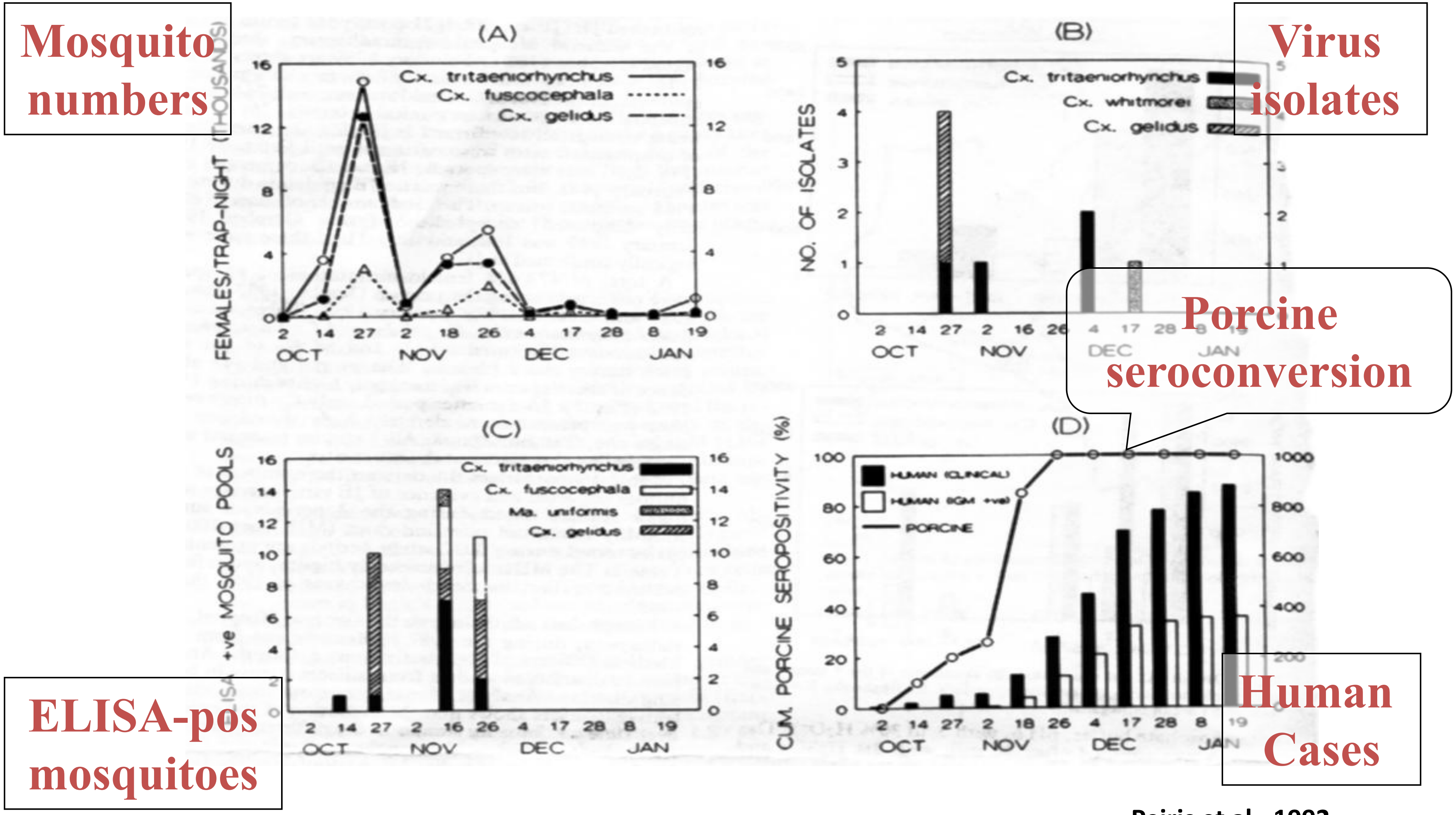


Daniel Impoinvil

- Containment Level III insectory
- Does vector competence differ for different genotypes?
- How might climate change affect this?
- Can this inform modeling of disease spread?

- Leverhulme Foundation (£750,000)
    - Matthew Bayliss (Vet School, PI)
    - Mike Lehane (School of Tropical

JE Epidemic in Sri Lanka, 1987



Peiris et al., 1992

Emerging Zoonoses – why?

CLIMATE CHANGE

(+human behaviours?)

Microcephaly is the severe end of the spectrum

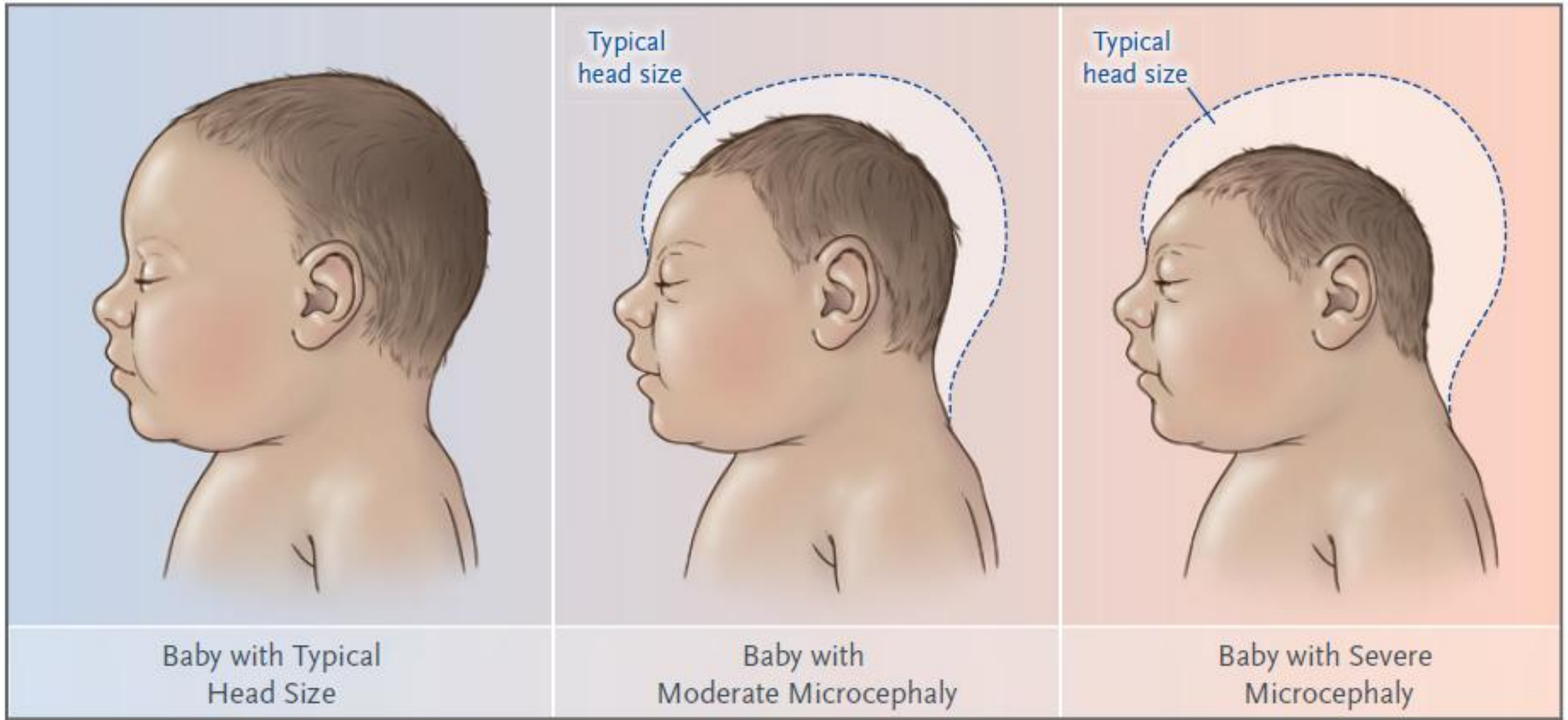
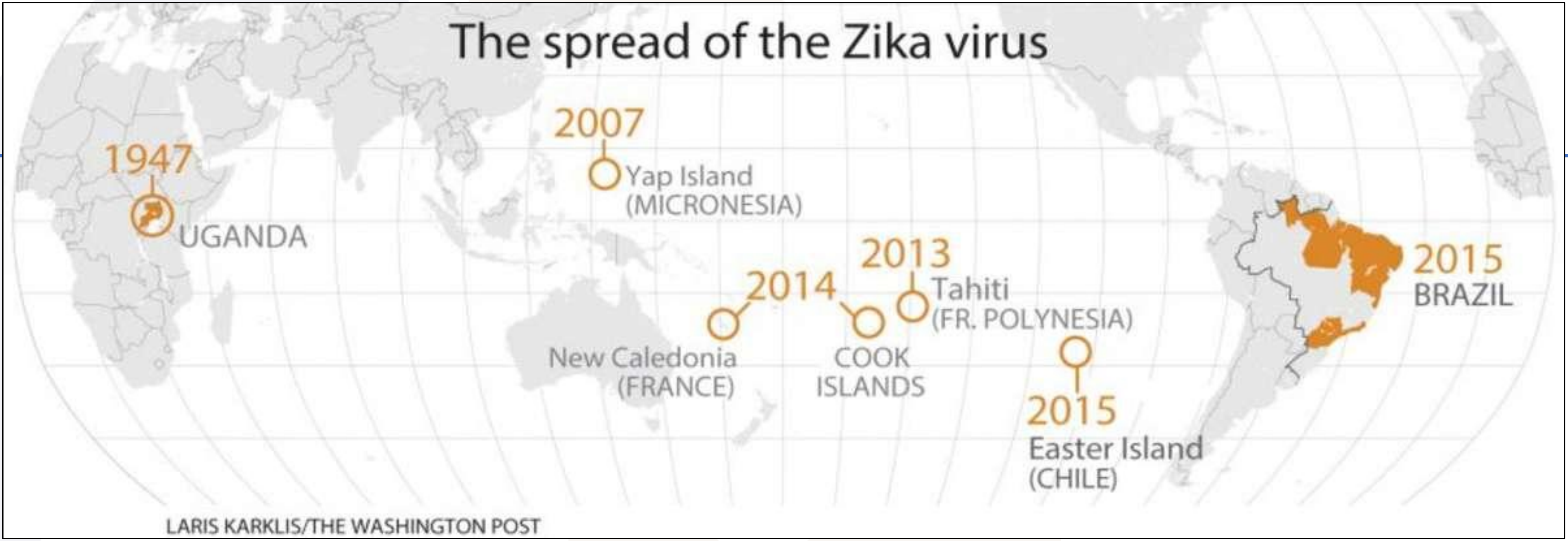


Figure 4. Infants with Moderate or Severe Microcephaly Associated with Maternal Zika Virus Infection, as Compared with a Typical Newborn.

Petersen et al NEJM 2016



- 1952-2007 occasional cases of fever arthralgia rash caused by Zika, in Africa and Asia…
- 2007 small outbreak in Yap, Federated States of Micronesia,
- 2013 28,000 cases in French Polynesia, in 4 months
- 2015 Brazil

PNAS PNAS PNAS PNAS

Global risk model for vector-borne transmission of Zika virus reveals the role of El Niño 2015

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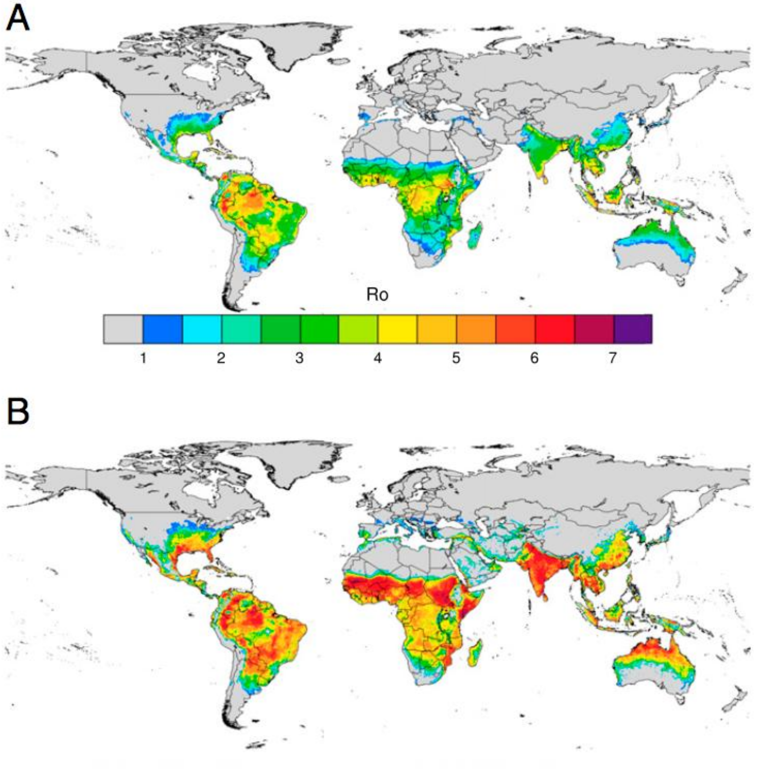
Zika, a mosquito-borne viral disease that emerged in South America in 2015, was declared a Public Health Emergency of International Concern by the WHO in February of 2016. We developed a climate-driven R_0 mathematical model for the transmission risk of Zika virus (ZIKV) that explicitly includes two key mosquito vector species: *Aedes aegypti* and *Aedes albopictus*. The model was parameterized and calibrated using the most up to date information from the available literature. It was then driven by observed gridded temperature and rainfall datasets for the period 1950–2015. We find that the transmission risk in South America in 2015 was the highest since 1950. This maximum is related to favoring temperature conditions that caused the simulated biting rates to be largest and mosquito mortality rates and extrinsic incubation periods to be smallest in 2015. This event followed the suspected introduction of ZIKV in Brazil in 2013. The ZIKV outbreak in Latin America has very likely been fueled by the 2015–2016 El Niño climate phenomenon affecting the region. The highest transmission risk globally is in South America and tropical countries where *Ae. aegypti* is abundant. Transmission risk is strongly seasonal in temperate regions where *Ae. albopictus* is present, with significant risk of ZIKV transmission in the southeastern states of the United States, in southern China, and to a lesser extent, over southern Europe during the boreal summer season.

Zika virus | R_0 model | El Niño | *Ae. aegypti* | *Ae. albopictus*




2014
FIFA WORLD CUP
Brasil


BNDES
VIPER VA'A
gettyimages
YASUYOSHI CHIBA

Prevention and Control of Zoonotic Infections

- **Surveillance**: Integrated “One Health” systems linking veterinary, environmental, and human health data.
- **Vaccination**: For both animals (rabies, anthrax, brucellosis) and humans (rabies, yellow fever, COVID-19).
- **Vector control**: Reducing mosquito/tick habitats.
- **Food safety**: Pasteurisation, meat inspection, hygiene.
- **Behavioural measures**: Safe handling of animals, protective equipment for farmers/handlers.

Preventing Zoonotic Emergence

Surveillance

- Sentinel-based
    - E.g. check 10% of sputum samples from all respiratory patients every 3 months
- Event-based surveillance
    - Something unusual happening; check all patients

“Disease Detectives” Surveillance and diagnosis

- Describe the syndrome
    - Brain infections
    - Respiratory
    - Gastrointestinal
    - Mucocutaneous
- Then determine the microbiological cause

Examples

Case of the jitters

- 12 year old girl in Malaysia
- 2 days fever, headache
- Intermittent rhythmic jerking movements L leg
- Mild L hemiparesis

- Until 4 months ago, helped on her fathers pig farm
- At that time, she developed a febrile illness
- Father died of encephalitis at same time

An unusual outbreak of encephalitis Malaysia 1999

- Initially Attributed to JEV
  - But…
  - Mostly adults rather than children
  - Associated with illness in pigs
  - Epidemiology?
- Mass JE Vaccination
  - →Enceph patients pos for JEV abs!

  - Outbreak due to **Nipah virus**
    - ?Morbillivirus like measles; Henipavirus
  - Our patient had late SSPE-like presentation due t Virus

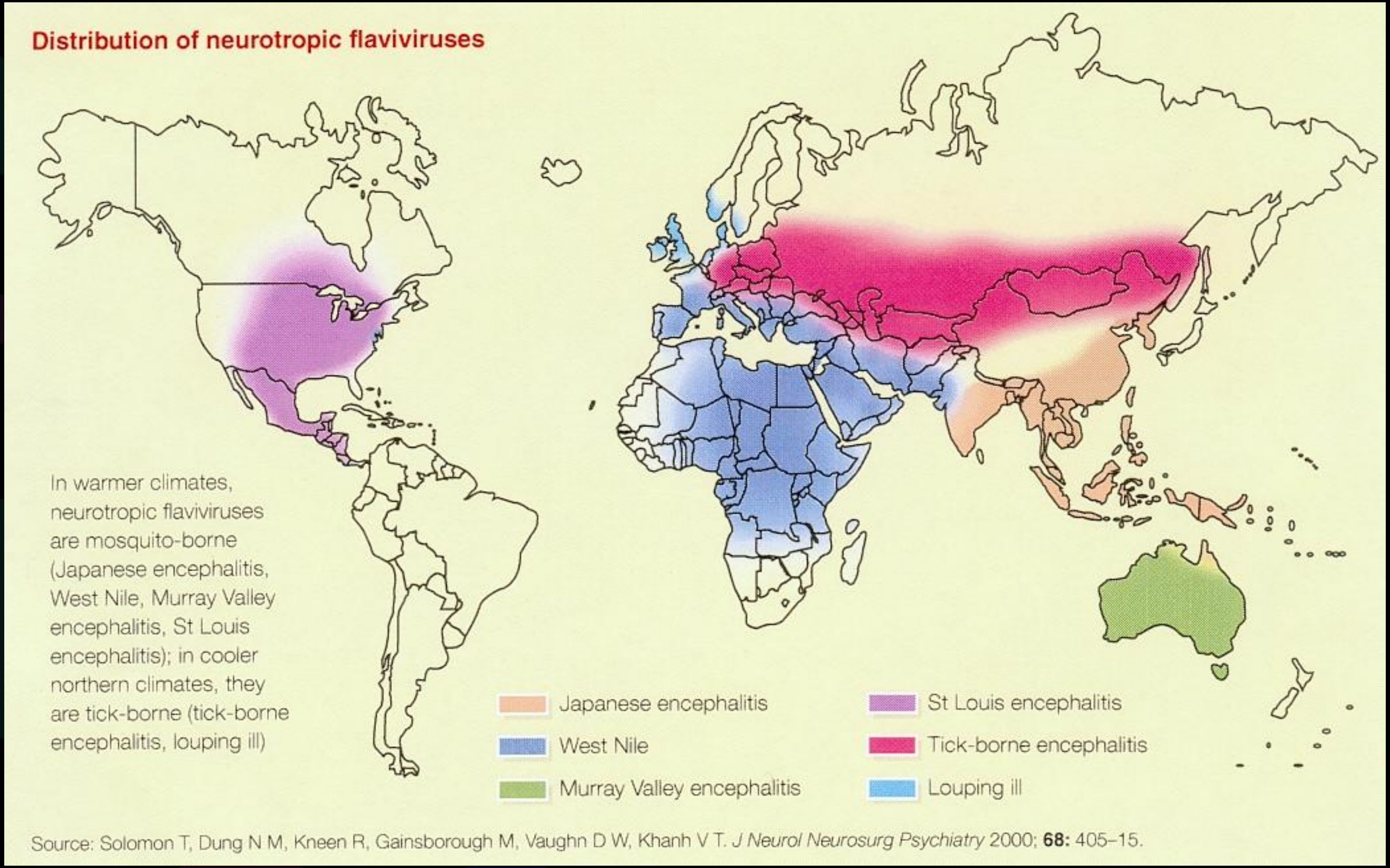
Wong et al. J Neurol Neurosurg Psychiatry **2001**

Cardosa et al. BMC Microbiol 2002

Nipah Virus

- **A lethal zoonotic disease** case fatality rate between 40% and 75%.
- **First identified** in 1999 - Malaysian pig farmers.
- **Outbreaks recur** in South and Southeast Asia, including Bangladesh and India.
- **Natural Reservoir:** Fruit bats (*Pteropus* genus), which excrete the virus in their saliva, urine, and feces.
- **Animal-to-Human:**
  - **Contaminated Food:** raw date palm sap or fruit soiled by infected bats.
  - **Intermediate Hosts:** Direct contact infected animals pigs or horses, can cause spillover.
- **Human-to-Human:** close contact with an infected person's bodily fluids

Encephalitis Outbreak, New York 1999



Wednesday, September 8, 1999 Published at 10:23 GMT 11:23 UK

Health

New York sprayed to control brain virus

The virus causes the brain to swell

Insecticide has been sprayed across thousands of acres of New York City in an attempt to halt an outbreak of St Louis Encephalitis.

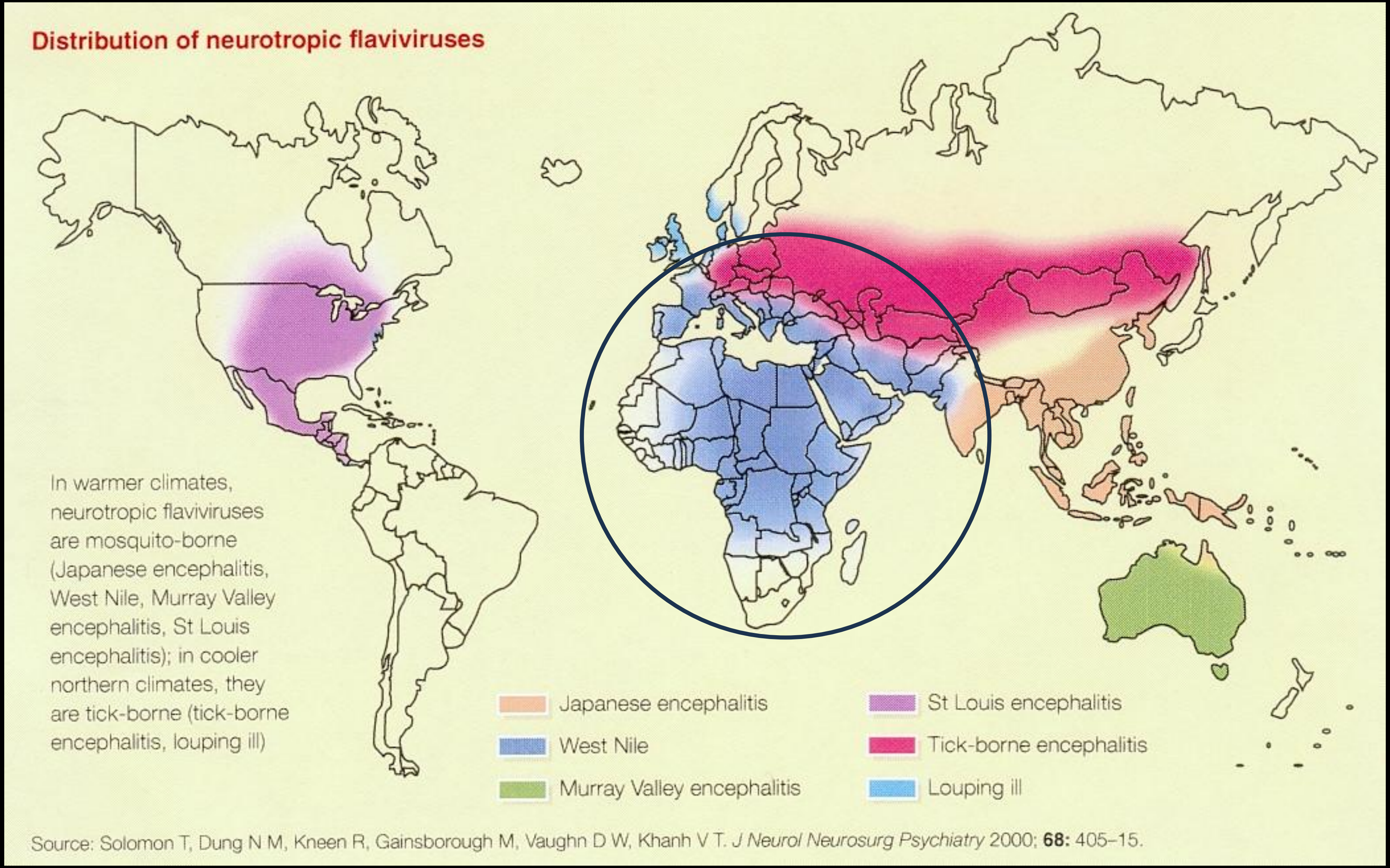
The virus - which is spread by mosquitoes - has been responsible for the deaths of two elderly people in the city's Queens district since the outbreak was reported

“An unusual cluster of encephalitis cases in Bronx, NY, 1999”

Sick birds at the Bronx Zoo

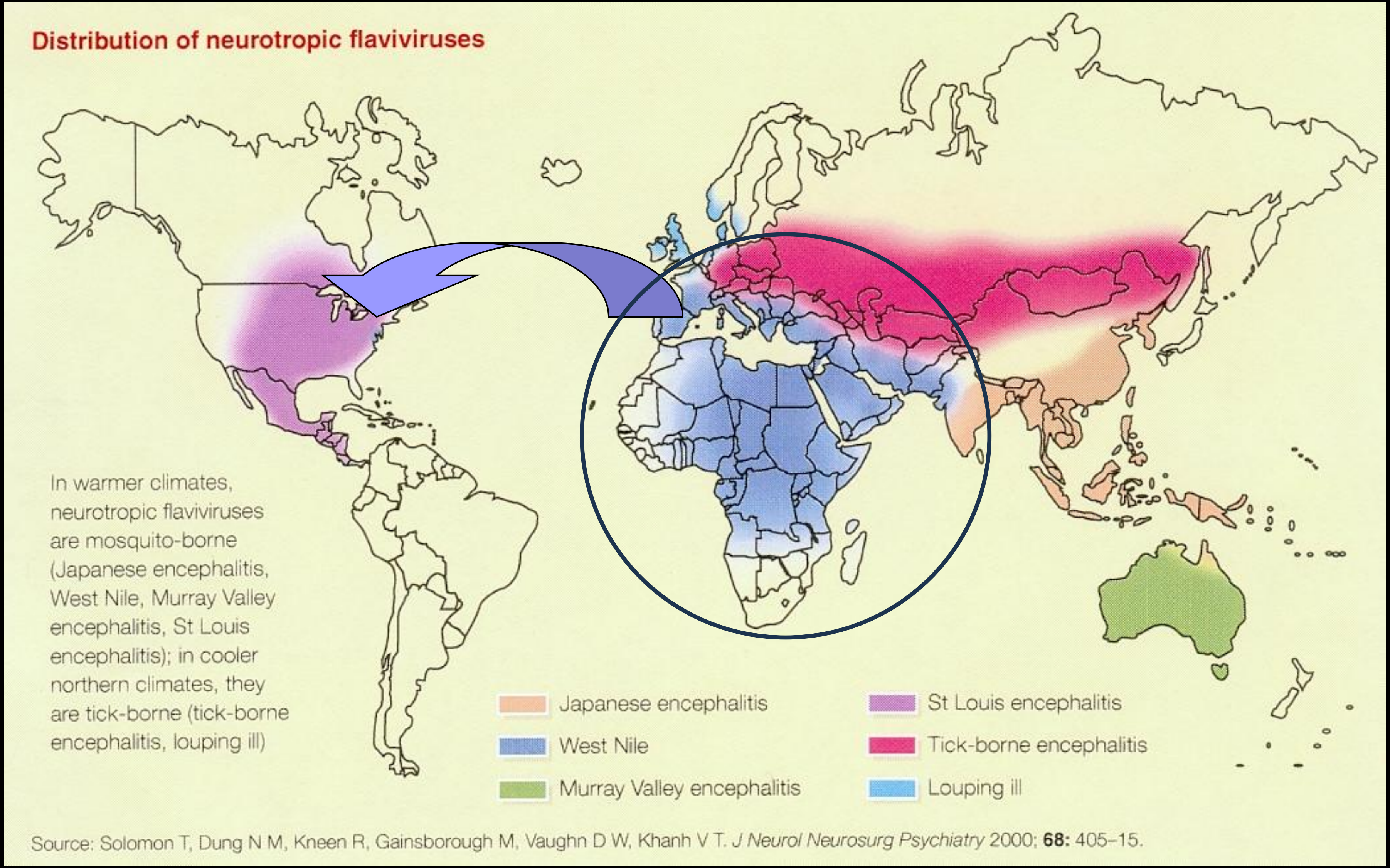
- **Deborah Asnis,**
- **infectious disease specialist**

West Nile virus



1999: West Nile virus arrives in USA

West Nile virus



1999: West Nile virus arrives in USA

West Nile Virus

- **1937 - Discovery in Uganda:** a woman with a fever.
- **1990s - Increased Severity in Europe**
    - Neuroinvasive disease occurred in Romania (1996) and Russia (1999).
- **1999 - Arrival in North America**
- **2002 - Major US Epidemic**
- **2002 - New Transmission Routes Identified:** Transmission via blood transfusion and organ transplantation

Detecting Emergence

- Disease in unusual populations
  - Encephalitis in adults in Nepal (the arrival of Japanese encephalitis)
- Co-occurring disease in animals may be the clue
  - Birds falling out of the sky → West Nile virus in New York
- Unusual pattern of disease syndrome
  - Hand-foot-and –mouth diseases with encephalitis (Enterovirus 71 in Malaysia)
- Disease at unusual time of year
  - “Japanese encephalitis” in the dry season was Chandipura virus

Useful lessons from history

Another Important Zoonotic Infection

Bubonic Plague

Viet Nam 1995

華英日記
THE IMPERIAL
ENGLISH AND CHINESE DIARY
AND ALMANAC
1894
No 1
INTERLEAVED WITH BLOTTING PAPER
KELLY & WALSH, LIMITED.
6 SATURDAY
7 SUNDAY

Hong Kong Plague 1894

Alexandre Yersin

James A Lowson

Shibasaburo Kitasato

Who identified the Plague Bacillus?

Hong Kong's Eastern and Western medical history

On 1 July 1997, 156 years after the British first set foot on the island, Hong Kong reverted to Chinese rule. In that time it has changed from what the Foreign Secretary Lord Palmerston called 'a barren island with hardly a house on it'[1] to a metropolis of some 6 million people. In line with this, its medical facilities have grown from a handful of traditional Chinese practitioners to a comprehensive Western medical system that matches any in the world. However, this transformation has not always been a smooth one. This article will review Hong Kong's turbulent medical history, concentrating on the differences between the Eastern and Western approaches in the nineteenth century, which influenced not only the shape of medicine in the Colony but also the Western attitude to Chinese medicine for years ahead.

Cession of Hong Kong

In the middle of the nineteenth century as Britain's empire grew, she was keen to increase her trade with foreign powers, particularly in the Far East. However, the Chinese Celestial Empire saw all foreigners as barbarians and imposed severe restrictions. Tensions came to a head in 1839 when the Chinese attempted to confiscate opium which the British East India Company was illicitly selling at Canton (Guangzhou)[1]. The 'First Opium War' followed, at the end of which Hong Kong was ceded to the British. On 2 February 1841 Captain Charles Elliot RN, the Chief Superinten- dent of Trade and Britain's Plenipotentiary to China issued a proclamation announcing British sovereignty British traders were relieved to have a permanen trading base of their own, rather than relying o Portuguese Macao or suffering the restrictions a Canton. Lord Palmerston was far from pleased however, commenting that 'Hong Kong will not be th mart of trade any more than Macao is.' Hong Ko consisted of little more than fishing villages, and Ell assured the few hundred inhabitants that they wo 'be governed, pending Her Majesty's further pleasu according to the laws, customs and usages of Chinese, every description of torture excepte These words, intended to appease the native pop tion, and smooth the running of the colony, wer have important repercussions many years later, the practice of traditional medicine was certai Chinese 'custom and usage' and it would be clai that it had been given official approval recognition.

The early years; white man's grave

The colony rapidly expanded with Chinese labour from Canton, but for the early European settlers, it was a 'white man's grave'[2]. In 1843, the year that the first Colonial Surgeon was appointed, nearly a quarter of the troops and a tenth of the civilian population died, and the early settlers considered abandoning the colony altogether[2]. In addition to cholera, dysentery and typhoid there was the mysterious 'Hong Kong fever' which was probably malaria[3]. The high incidence of disease was attributed by some to the unnatural environment of the island: 'In the intervals of rain a nearly vertical sun acts with an intense evapo- rating power, and a noxious steam or vapour rises from the fetid soil, yielding a gas of a most sickly and deleterious nature.'[3] The growing Chinese community was affected by phthisis (pulmonary tuberculosis), and smallpox. Opium smoking was common, from 1873 to

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Alexandre Yersin and the plague bacillus

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SUMMARY

To most doctors, the name Yersin is known only for its eponymous connection plague bacillus, Yersinia pestis. In Vietnam, where he lived for over 50 years, Al Yersin is a legendary figure. On the 100th anniversary of the identification of th bacillus, a review of this extraordinary man and his controversial discovery is

Keywords: Yersin, Yersinia pestis, plague, History of Tropical Medicine

xandre Yersin was born in Vaud, Switzerland on 22 tember 1863. After a year in Germany, he com- ed his medical education in Paris, and started as an tant to Emile Roux and Louis Pasteur (Mollaret & ...

1890). This discovery of the ... first isolation of a bacterial ... Clearly, ahead of Yersin ...

Hong Kong, 1894: the role of James A Lowson in the controversial discovery of the plague bacillus

Tom Solomon

That the plague bacillus *Yersinia pestis* is named after Alexandre Yersin is well known. However, it is less well known that it was many years before he received full credit for his discovery. During the Hong Kong plague epidemic of 1894, when rival French and Japanese teams were investigating the cause of the disease, it was ibasaburo Kitasato who first claimed to have identified pathogen. Kitasato published his work in *The Lancet* was credited with the discovery for many years. sequently, the bacillus became known as the Kitasato- n bacillus, but in more recent years Yersin has red sole recognition for the renamed *Yersinia pestis*.[1-3] the centre of the events during the Hong Kong nic was a 28-year-old Scottish doctor, James Alfred n (figure 1). As acting superintendent of the Civil l, he diagnosed the first cases and was responsible peration with the investigating teams.[4] Lowson was July 1, 1866, in Forfar, Scotland, graduated from th University in 1888, and soon after left for ng. His diary has recently been released to the ng Museum of Medical Sciences.[5] Hastily ries, with notes added in later years, give a new this important landmark in infectious disease. le, I review the controversial discovery of the lus, and reconsider Lowson's role in the light idence.

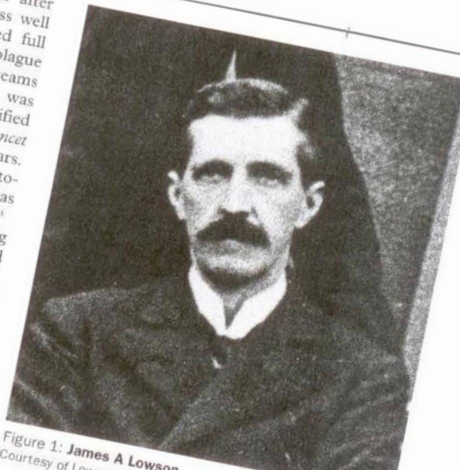


Figure 1: **James A Lowson**
Courtesy of Lowson's grand-daughter, F M Ashburner.

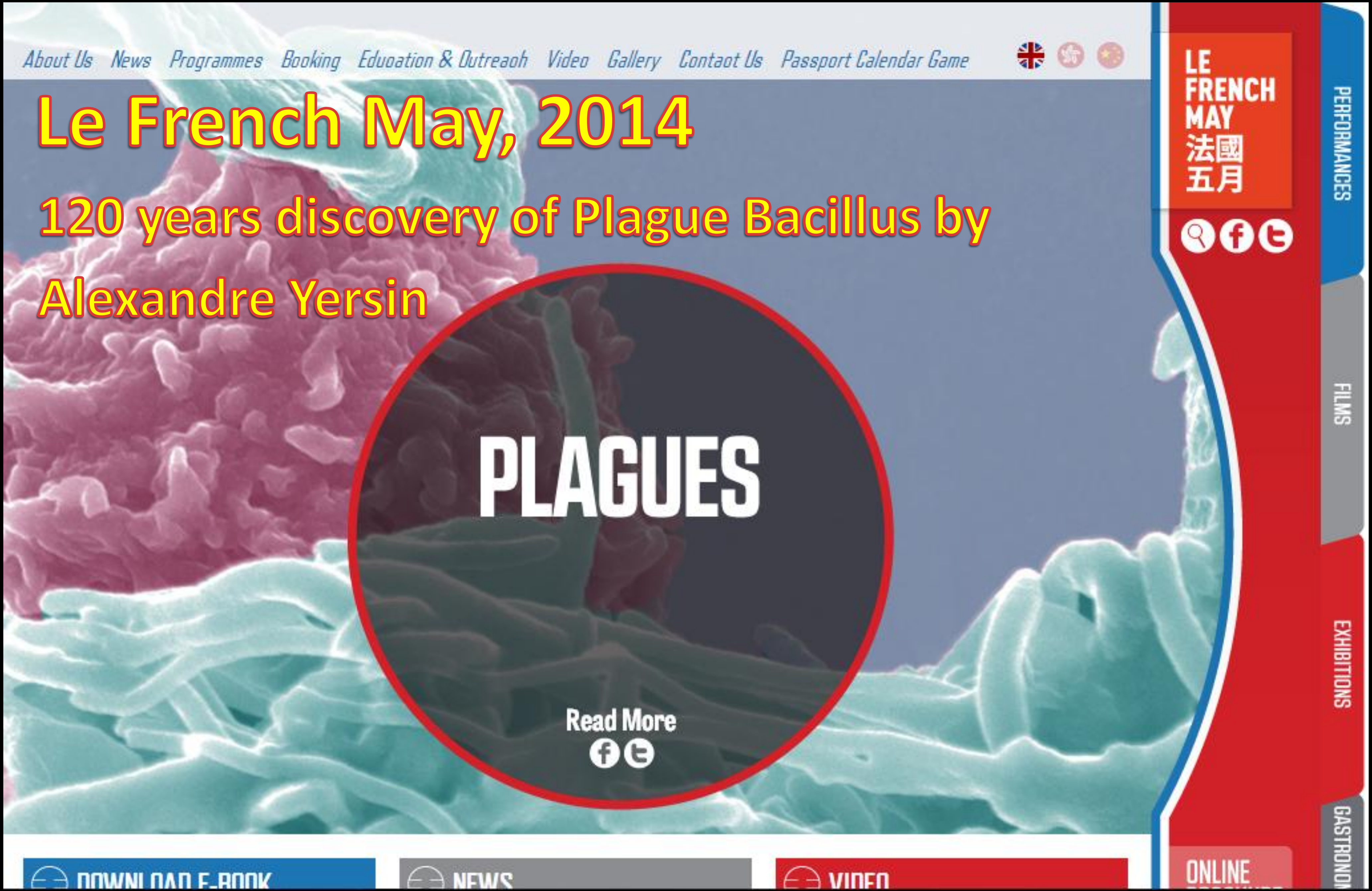
ong plague

890s, bubonic plague was spreading along rough southern China, and by 1894 had iolent intensity in Canton (Guangzhou). nly 140 km downriver, was obviously Lowson was sent by the Colonial Ayres, to investigate.[6] On his return he Kong's first case. His diary of May 8 agnosed A. Hung as suffering from the l him".[5] 2 days later at the Chinese-run al Lowson "found approximately 20 affected with the plague - all in an e disease".[5] Most came from Tai Ping rowded Chinese neighbourhood ital. The hospital used only Chinese and was blamed by Lowson for failing to diagnose plague cases earlier: "I cannot denounce this hotbed of medical and sanitary vice in sufficiently strong terms... a Disgrace and Danger to the Public Health of Hong Kong".[5] The Tung Wah Hospital was not alone in being blamed for the epidemic. Lowson also attacked the Health Officer of the Port, and even blamed the Hong Kong Governor himself for not following Lowson's earlier advice to examine all river boats from Canton.[5] His report was later described as "an egotistical and garrulous document", written by someone who "evidently wants to make a name for himself".[6]

On the afternoon of May 10, Hong Kong's Sanitary Board met to consider the report of Ayres and Lowson, which recommended house-to-house searches for cases, disinfection of affected dwellings, rapid di... corpses, and isolation of patients on ... *Hygeia*.[6] Although the ... clear that ...

Le French May, 2014

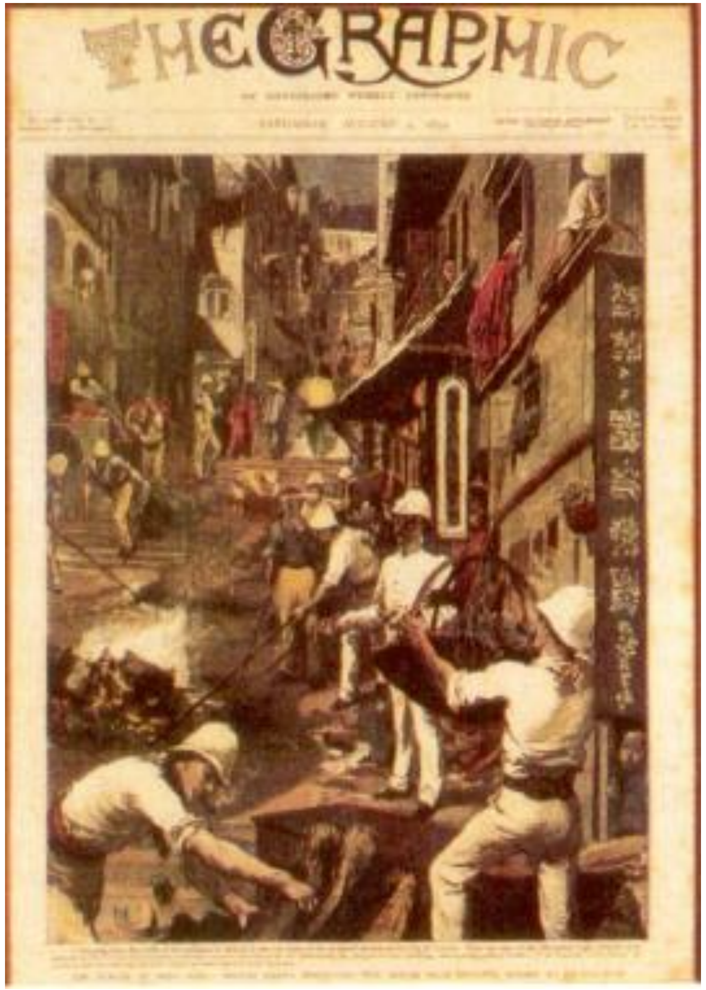
120 years discovery of Plague Bacillus by Alexandre Yersin



Plagues – then and now

Plague 1894

SARS 2003

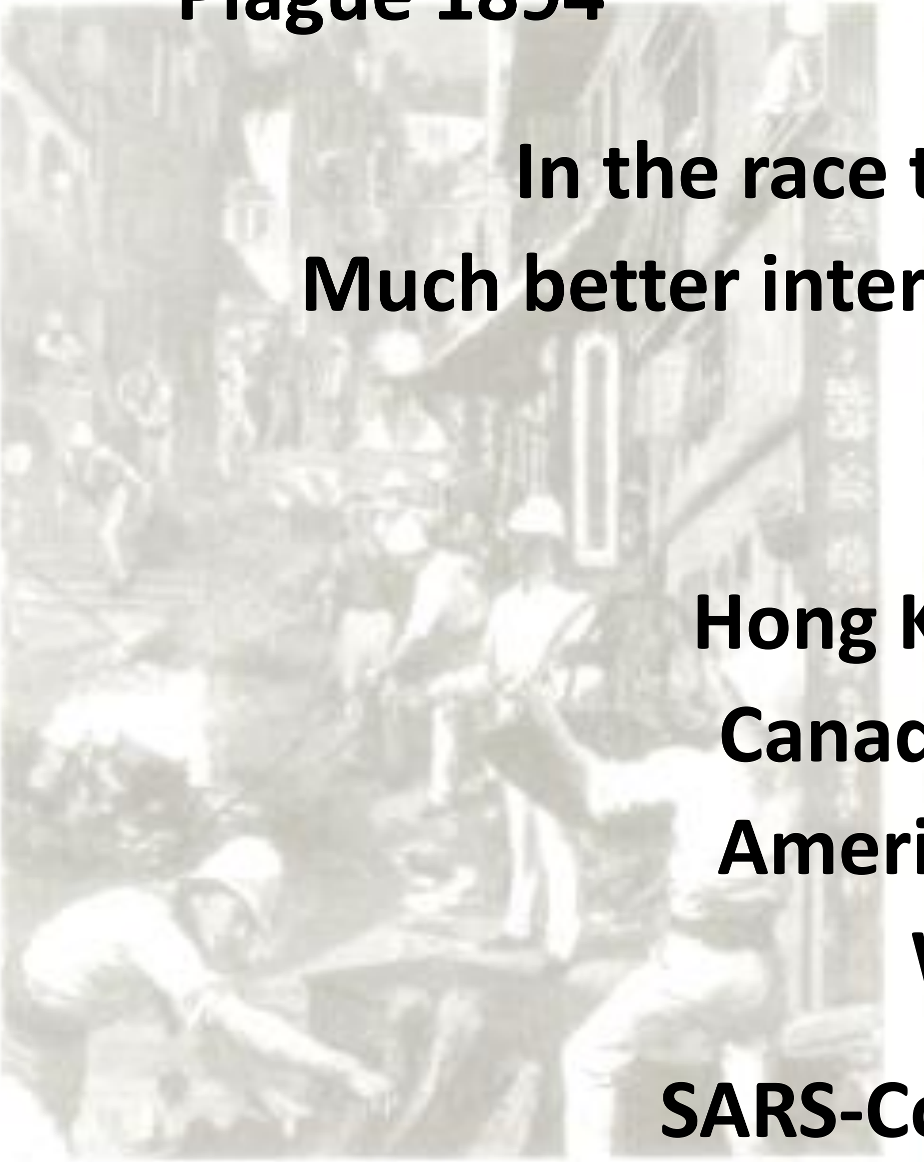


SIMILARITIES

Plague 1894	SARS 2003
• Spread from Canton	Guanzhou
• Difficulty Identifying	SARS Coronavirus
• Poor Sanitation	Amoy Housing Estate
• Traditional remedies	Vinegar
• Panic, People Fled	Rapid Global Spread
• Quarantine	MacLehose Camp
• Extraordinary bravery	SARS Heroes
• Medical Fatalities	Dr Urbani, Vietnam
• Plague riots	Civil unrest

ONE BIG DIFFERENCE

Plague 1894 | **SARS 2003**



In the race to identify cause

Much better international collaboration

Hong Kong Teams

Canadian Teams

American teams

WHO

SARS-CoV-2 2019?

Lessons: Tackling Emerging Zoonotic Infections

- Worth knowing your clinical epidemiology
  - Unusual epidemiological patterns herald an unusual pathogen
    - Nipah, Malaysia 1998
    - West Nile Virus, New York 1999
- Worth knowing a bit of history
- Worth medics understanding a bit about zoonotic infections!

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