



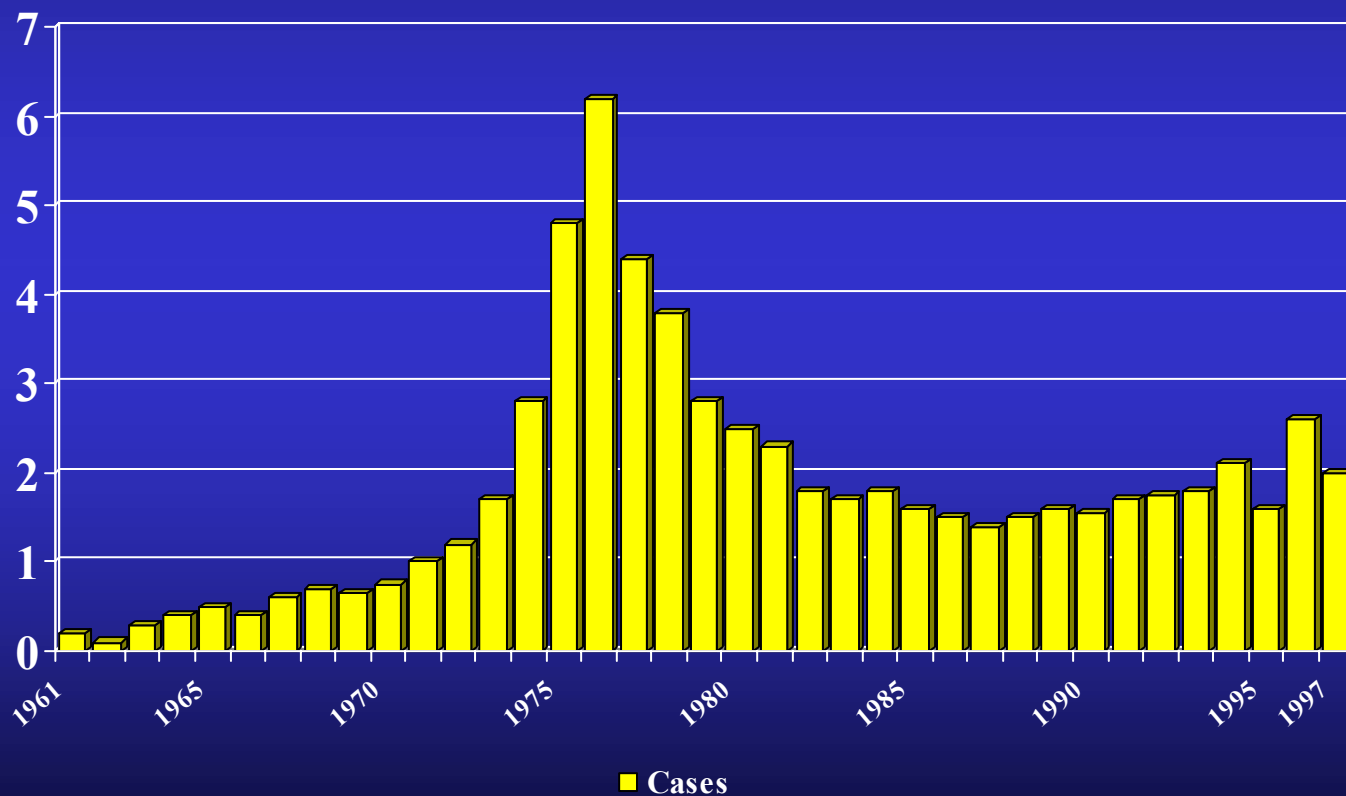
Emergence/Resurgence of Epidemic Vector-Borne Infectious Diseases

- ī Newly Recognized Diseases
- ī Expanding Geographic Distribution
- ī Increased Epidemic Activity

Epidemic Vector-Borne Parasitic Diseases, 1990-01



Reported Cases of Malaria in India, 1961 - 1997



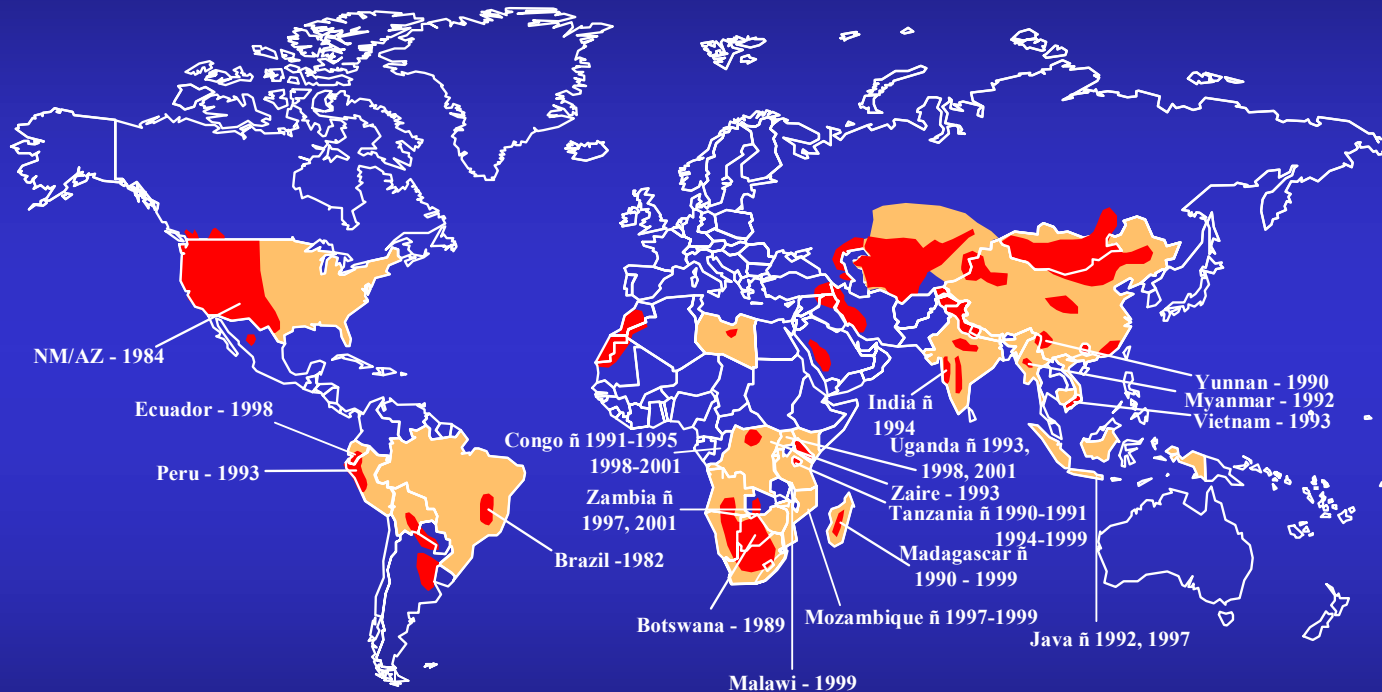
* Data from NMEP

Epidemic Vector-Borne Bacterial Diseases, 1990-01



Global Distribution of Plague

(Recent Human Plague Outbreaks)



Orange box: Countries reporting plague, 1970-2001

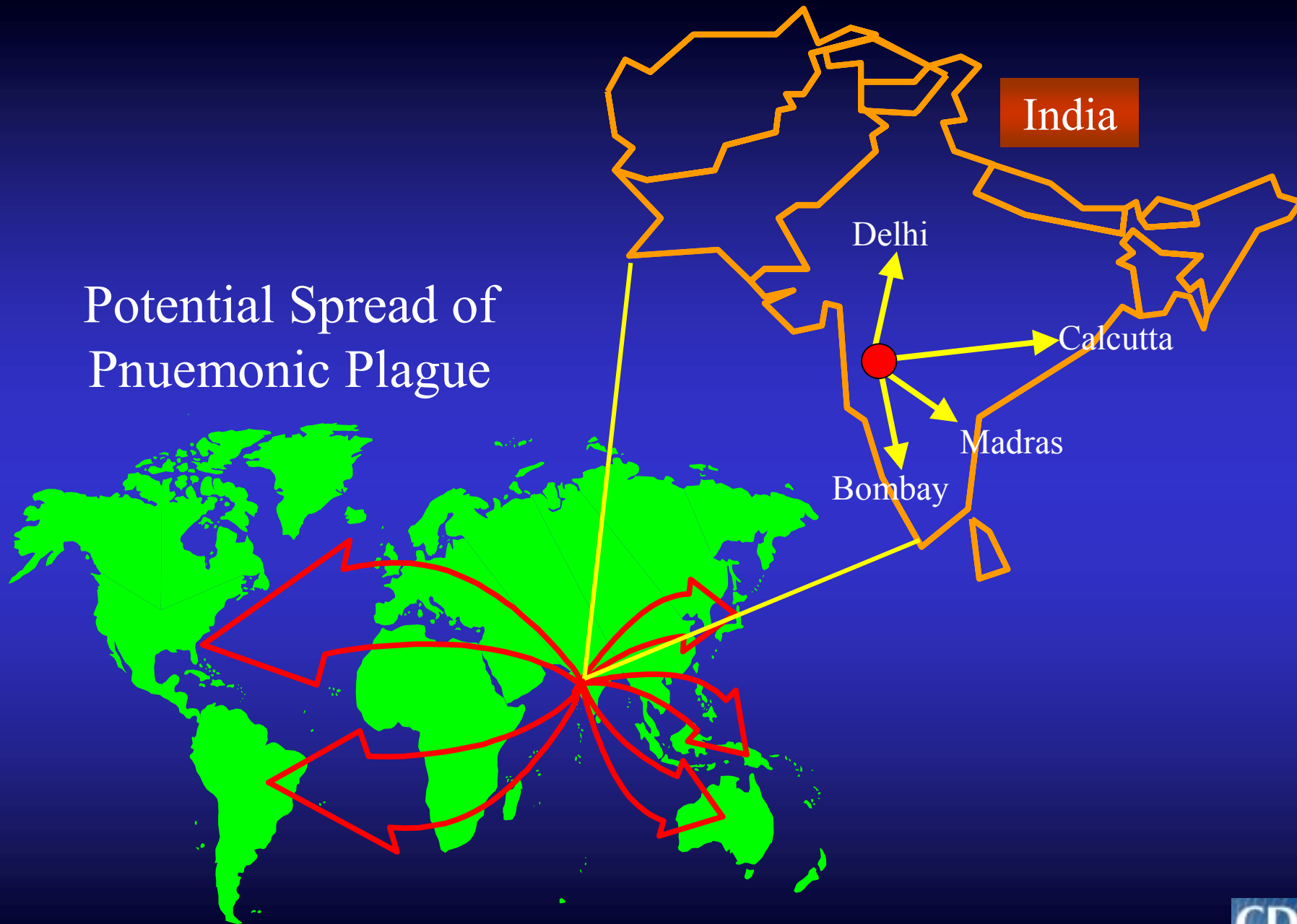
Red box: Probable Sylvatic foci

Compiled from WHO, CDC, and country sources

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Potential Spread of Pnuemonic Plague



India

Delhi

Calcutta

Madras

Bombay



Global Resurgence of Epidemic Arboviral Disease



BF - Barmah Forest
CE - California Encephalitis
Chik - Chikungunya
CCHF - Congo-Crimean Hemorrhagic Fever
DEN - Dengue
EEE - Eastern Equine Encephalitis
JE - Japanese Encephalitis
KFD - Kyasanur Forest Disease
LAC - LaCrosse Encephalitis

MAY - Mayaro
MVE - Murray Valley Encephalitis
ONN ñ Oínyong-nyong
ORO - Oropouche
RVF - Rift Valley Fever
RR - Ross River
SLE - St. Louis Encephalitis
SIN - Sinbis
TBE- Tick-Borne Encephalitis

VEE - Venezuelan Equine Encephalitis
WEE - Western Equine Encephalitis
WN - West Nile
WSL - Wesselsbron
YF - Yellow Fever

Resurgent/Emergent Vector-Borne Viral Diseases of Humans

- ï Dengue Hemorrhagic Fever
- ï Yellow Fever
- ï Japanese Encephalitis
- ï West Nile virus
- ï Kyasanur Forest Disease Virus
- ï Venezuelan Equine Encephalitis
- ï Epidemic Polyarthrititis
- ï Barmah Forest
- ï Rift Valley Fever
- ï Oropouche
- ï California Encephalitis
- ï Crimean-Congo Hemorrhagic Fever

The Emergence of Dengue Hemorrhagic Fever in the Americas

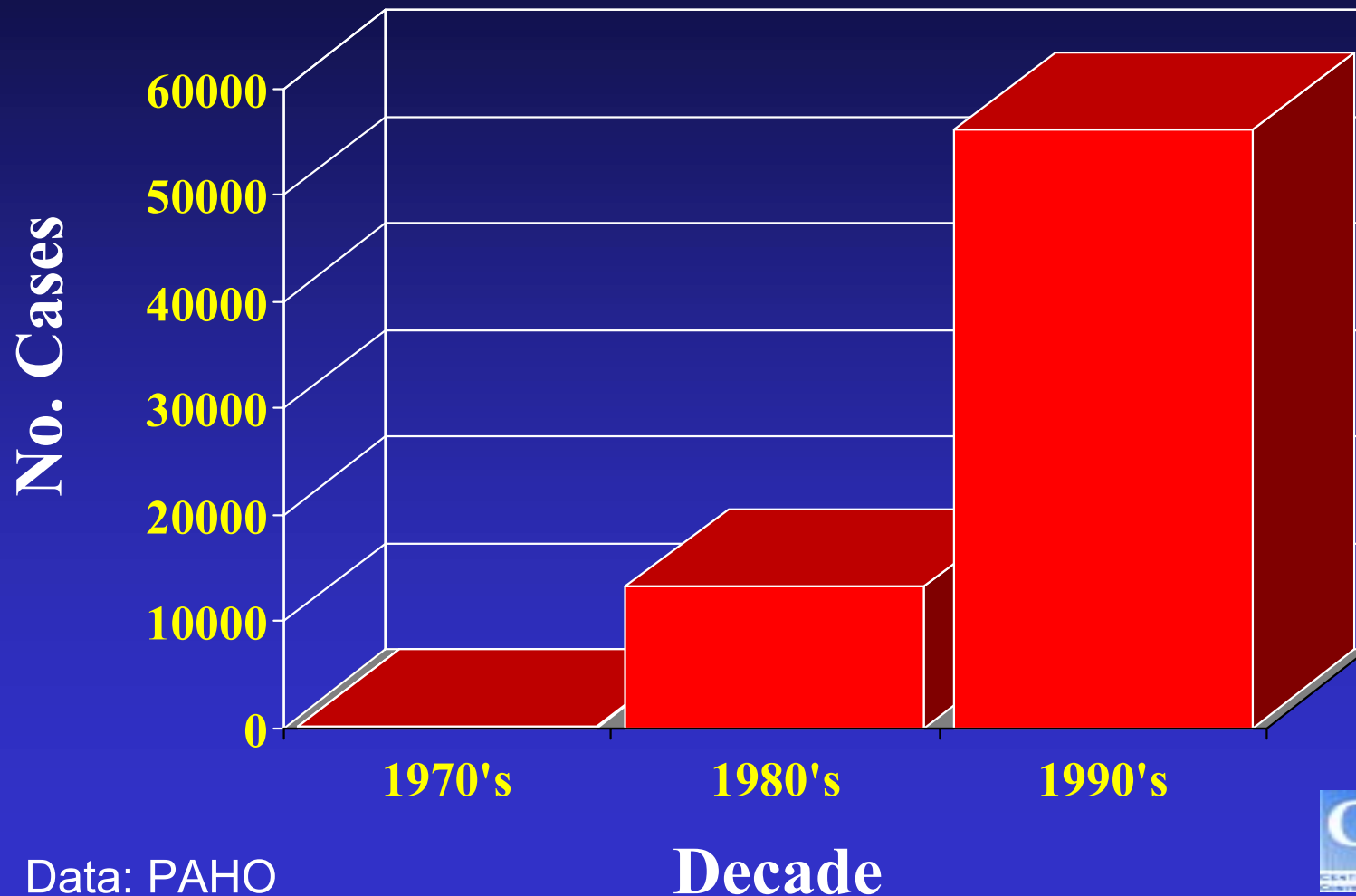
Prior to 1981



1981-2001



Dengue Hemorrhagic Fever in the Americas by Decade (1970 - 2000)



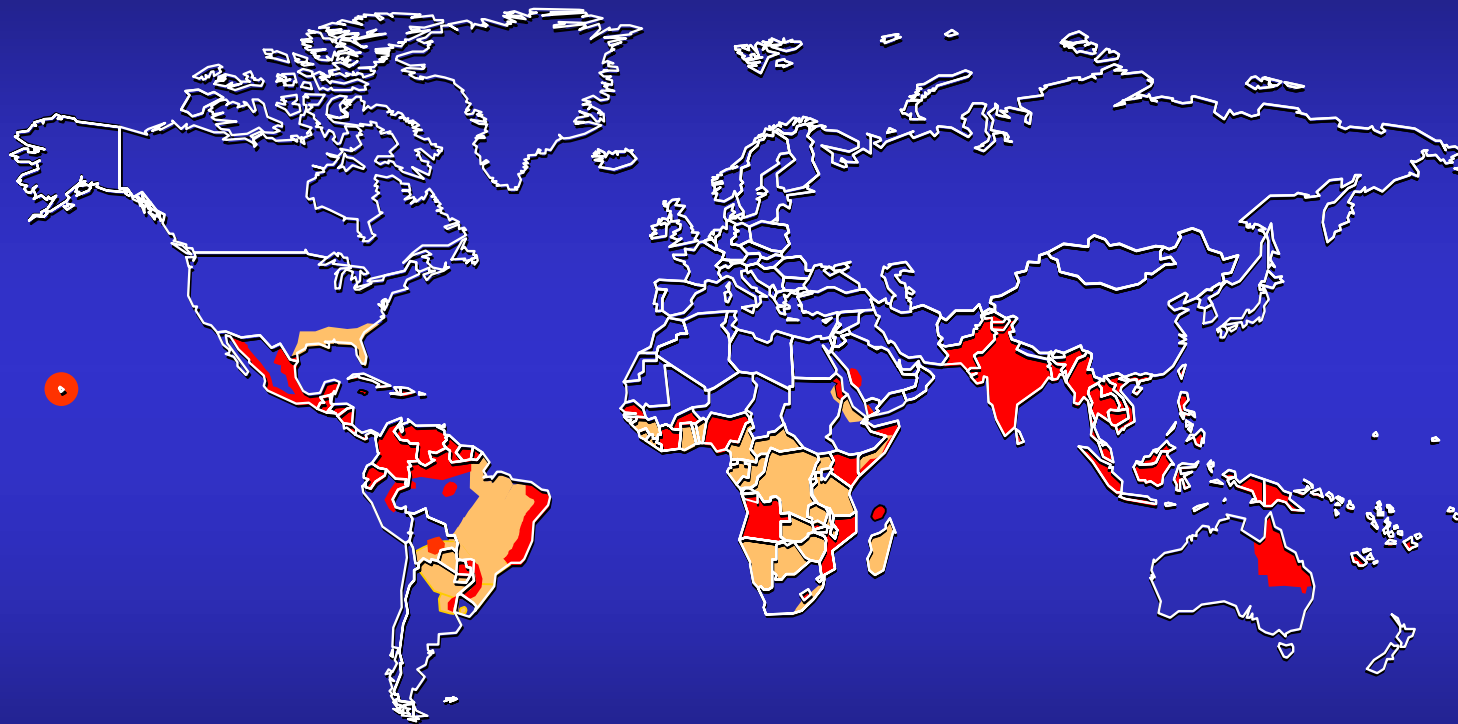
Data: PAHO

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World Distribution of Dengue - 2002

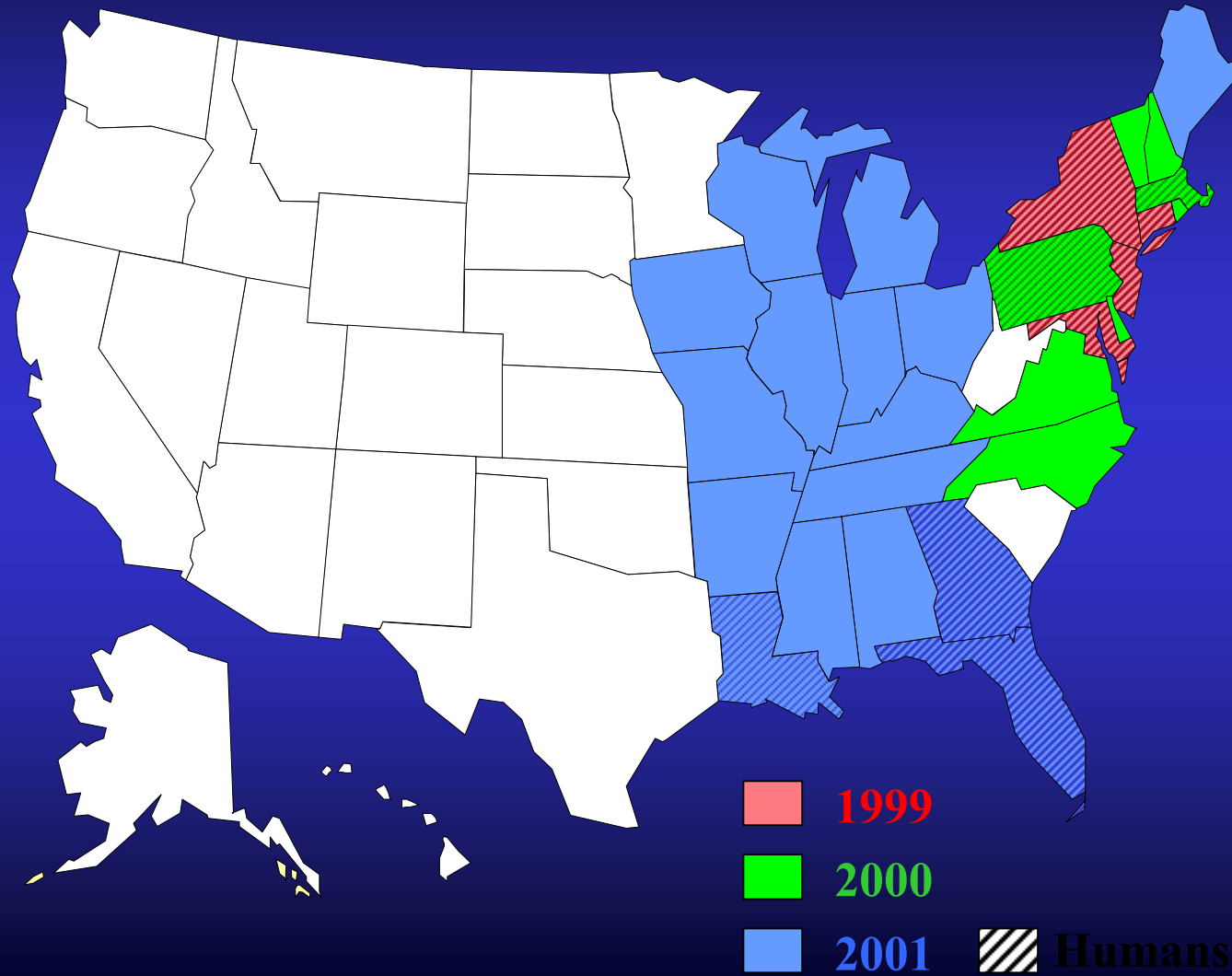


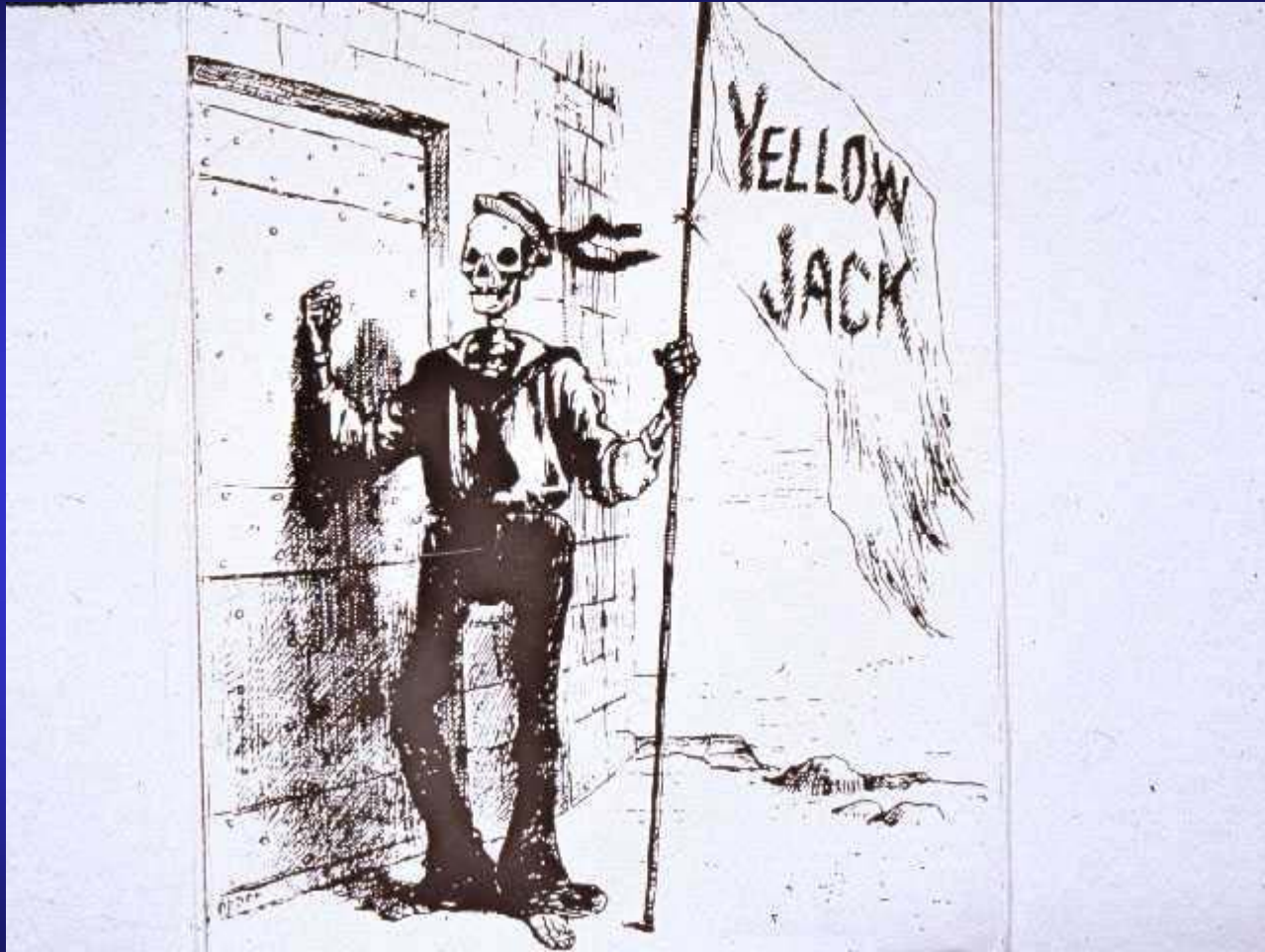
- Areas infested with *Aedes aegypti*
- Areas with *Aedes aegypti* and dengue epidemic activity



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Spread of West Nile Virus in the U.S.





Factors Responsible for Increased Epidemic Vector-Borne Diseases

- ï Population Growth
- ï Urbanization
- ï Air Travel
- ï Agricultural Practices
- ï Changing Life Styles
- ï Climate Change?

Vector-Related Research Accomplishments

- Molecular Biological Techniques and Approaches
- PCR
- Population Genetics
- Mapping of Loci that Condition Vector Competence
- Population Genomics
- Taxonomy of Vectors ñ Molecular Systematics
- Mosquito Genomics
- Tools for Characterizing Mosquito GOIs
 - virus expression systems
 - transformation

Vector-Related Research Accomplishments

- ï Determinants of Pathogen Vector Interactions
- ï Proof of Concept of Molecular Reduction of Vector Competence
 - ñ dengue and malaria
- ï New Targets for Interrupting Pathogen Transmission
 - ñ transmission blocking vaccines
 - ñ vector killing vaccines
- ï Perturbing Salivary Potentiation of Transmission
- ï Determinants of Host Seeking; e.g., Odorant Binding Proteins
- ï New Targets for Vector Control

Vector-Related Research Accomplishments

- Field Studies ñ Determinants of Vectorial Capacity
- Population Genomics ñ Marriage of Field and Laboratory
- GIS
- Modeling

Vector Research Needs

- ī Enhance the Armamentarium for Vector Control
 - ñ development of new, improved, environmentally sound pesticides
 - ñ Exploit novel strategies to prolong the use of existing pesticides (e.g., negative cross resistance)
 - ñ chemical pesticides augmented in IPM programs with other control measures, including biopesticides and biocontrol agents
- ī Develop New Control Agents/Techniques
- ī Develop New, Efficacious Repellants

Vector Research Needs

- Understand the Biological Determinants of Vectorial Capacity -- Field Research
- Develop New Vaccine Strategies to Control Vectors and Interrupt Vector Pathogen Transmission and Human Infection
- Enhance Surveillance for Prediction, Prevention and Control ñ Immediate Concerns
- Enhance Surveillance for Prevention and Control ñ Long Term Goals
- Training
- Into the Future