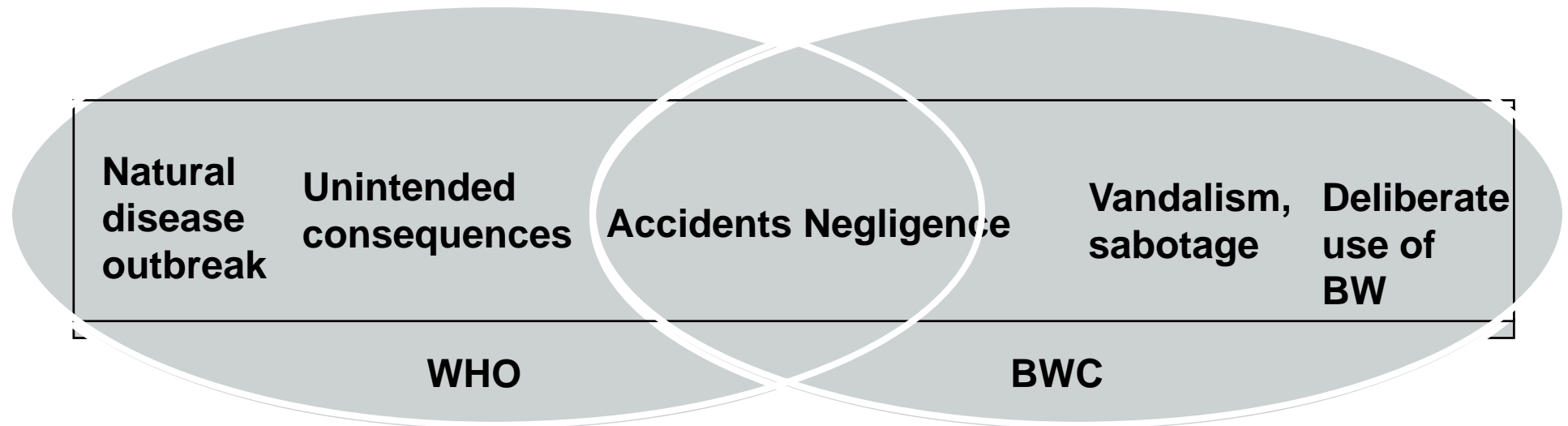


# THE WAY AHEAD



To advance fundamental knowledge in the field of molecular cell biology, and to apply such knowledge to the understanding, and the prevention of and treatment of human diseases

# Advances of Science and Technology and the Consequence of Biological Risks



**Many actors should be involves:  
Law enforcement, science and technology,  
education and training, public health,  
agriculture, custom and many more**

# Indonesia's Experience on Reducing Biological Risks



- ❑ Biosafety biosecurity prevention measures
  - Risk assessments
  - Biosafety laboratories infrastructures for dangerous pathogens
- ❑ Systems to detect, diagnose, track outbreaks and the origins of the outbreak of highly infectious diseases
- ❑ Emergency response systems for control and containment of infectious disease events
- ❑ Capacity building activities to support public health and security goals

# Indonesia – A Rapidly Developing Country with Serious Problems in Infectious Disease

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## **Malaria:**

- 15 million malaria cases and 42,000 deaths every year (2005)
- Highest case number and fatality rate in the world

## **Tuberculosis:**

- ranked third in TB burden following India and China
- TB is third of major causes of mortality in Indonesia
- WHO estimate, Indonesia has 269 TB cases/100,000 populations

## **Dengue:**

- Most important viral borne disease in Indonesia
- Outbreak in 2004: 78,690 cases with 954 deaths (CFR- 1.2%)
- In 2007: 123,174 cases with 1,251 deaths

## **Hepatitis B:**

- 10% (3.4-20.3%) of population are HBV carriers
- Moderate-to-high endemic (WHO)

## **Avian Influenza:**

- June 2005-June 2009: 262 positive cases; 115 deaths, CFR: 80%
- Highest case number and fatality rate in the world

# National Actions to Promote Capacity Building in Containment, Disease Surveillance, Detection and Diagnosis of Infectious Disease



- ❑ Building a safe, secure and sustainability capacity
- ❑ Best practices on biological safety and security
- ❑ Building capacity to detect, diagnose and track outbreaks of highly infectious diseases
- ❑ Enhancing cooperation



Institutions working on Avian Influenza and **BSL3 facilities**

# Why Need for a BSL3 Facility?



## RESEARCH IS AN ESSENTIAL COMPONENT OF RESPONSE TO EMERGING INFECTIOUS DISEASES

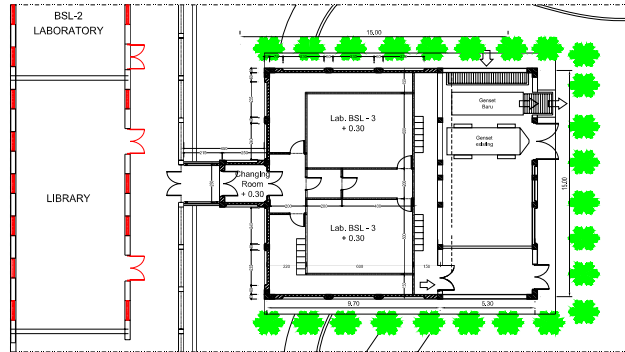
- ❑ Role in national response to Emerging Infectious Disease
  - To provide scientific and technological support to the national diagnostic laboratory network, including capacity building
  - As the leading research laboratory, in particular in genomic research (viral as well as host) and pathology
  - As the major back up diagnostic facility in emergency situation, such as in pandemic response
- ❑ Prepare for future emerging infectious disease threat e.g recent experience of NOT being able to respond scientifically to threat of SARS



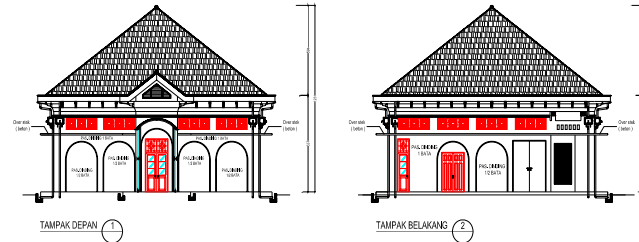
# Building a BSL3 Facility at Eijkman



Eijkman Institute



LAY OUT GEDUNG LAB. BSL 3



- Architecture has to fit with the historical colonial building
- For handling pathogenic microorganisms – bacteria, viruses
- No animal work carried out

Under very closed supervision – invite DNV from the very beginning *to review plans and proposed measures to ensure they are adequate and will result in a facility which is designed and constructed in line with internationally recognised good practice for BSL-3 laboratories in relation to HSE management and containment principles..*

# Capacity Building in Containment – BSL3 Facilities in Indonesia



Three facilities for human samples and two for animal works

## ***Planning vision:***

*What is the long term plan to ensure sustainability?*

*What support (financial, collaborative, others) will be needed for?*



# Capacity Building in Containment – Challenges in Best Practices



*Good facilities and procedures are not sufficient if personnel are not adequately trained and do not clearly understand their roles and responsibility*



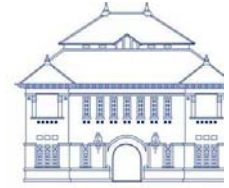
- ❑ Laboratory biosecurity training, complementary to biosafety training is provided - protection, assurance and continuity of operations



- ❑ Should not be a one-time event – offered regularly and taken currently. To refresh memories and to learn about new developments and advances in different areas

# Management System is the Key for a Good Laboratory Practice in Biosafety

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- History of running containment facilities?
- Management system had to be started from basics
  - Policies
  - Biosafety manual
  - SOPs
  - Risk assessments
  - Etc.
- New personnel
  - Laboratory manager
  - Staff
  - Maintenance
- Some documentation supplied from other institutes and support to get program started
- Need own system which fits individual institute and culture

# Capacity Building in Promoting and Implementing Biosafety and Biosecurity Management – Norway Indonesia Initiative



## Regional Seminar on Promoting and Implementing Biosafety and Biosecurity Management

Grand Hyatt, Jakarta  
4-5 June 2008

Co-Hosted by

Department of Foreign Affairs of Indonesia,  
Norwegian Ministry of Foreign Affairs,  
and the UN Biological Weapons Convention Implementation Support Unit

More than 70 representatives from 17 countries  
Contributions by the WHO, APBSA and academia

- ❑ Need to enhance capabilities in addressing challenges such as emerging and re-emerging diseases
- ❑ Capabilities must be adapted to local needs - complexities involved in setting up new laboratories, many challenges associated with construction, on-going maintenance and running costs
- ❑ Increased co-operation between countries – make a use of existing capabilities and resources

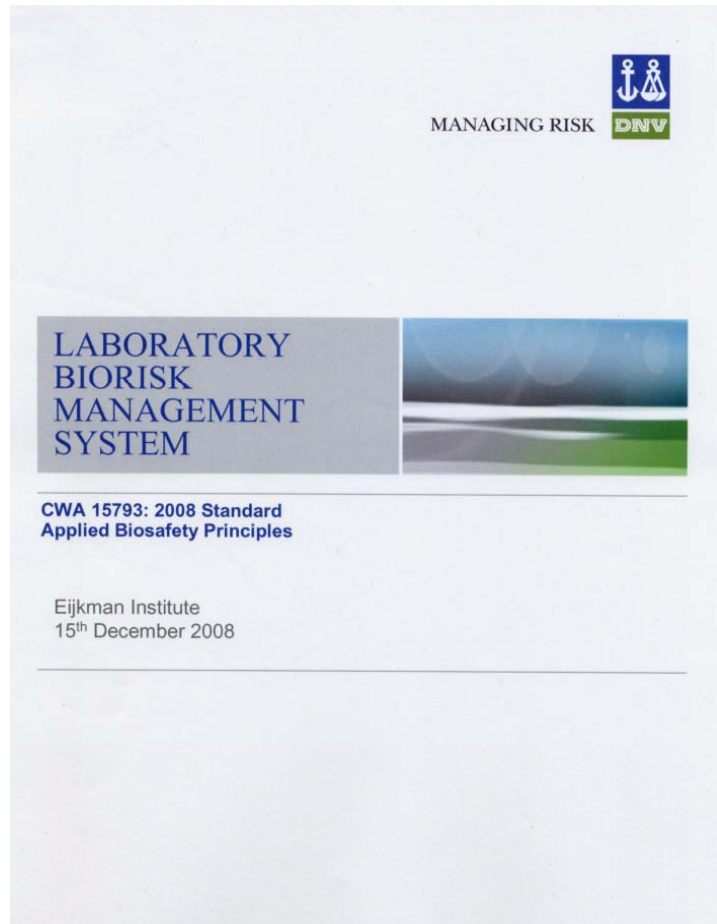
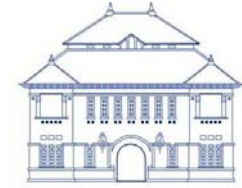
## *Summary of Regional Seminar on Promoting and Implementing Biosafety and Biosecurity Management, Jakarta, Juni 2008*



- ❑ Adequate systems to address biosafety and biosecurity are critical in overcoming these challenges - involve physical structures, strong commitment by senior management, development of safety and security procedures and training
- ❑ It was affirmed that countries in the region should learn from each other's experiences

*Experience from the Eijkman Institute is of particular relevance*

# Laboratory Capacity and Capability Building to Overcome Deficiencies in Management System

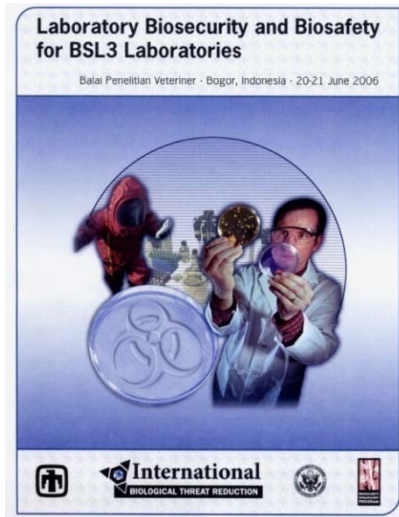


- ❑ Establishing an effective, best practice management system, incorporating safety and security management process and associated procedures
- ❑ Devising necessary document templates
- ❑ Developing the training programs and material
- ❑ Developing a generic model of the system which can be applied in other Institutes in Indonesia and elsewhere
- ❑ Enhancing communication around biorisk management and capacity building at all levels within SEA and beyond
- ❑ Concept and practices based on CWA 15793: 2008 Laboratory Biorisk Management Standard

*Supported by the Norwegian Ministry of Foreign Affairs*



# Manpower Development Through Training, Specific Workshops and Seminars



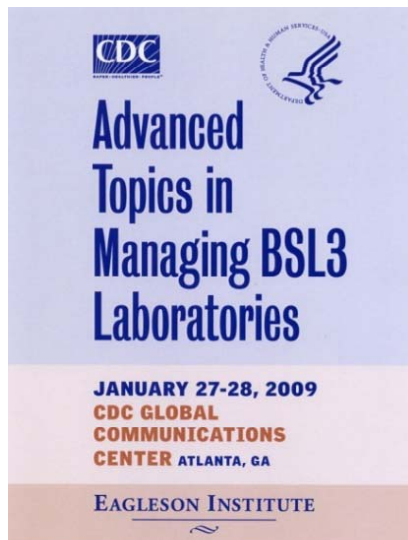
**2006** Laboratory Biosecurity and Biosafety for BSL3 Laboratories, Bogor; APBA Biosafety Management Course, Singapore, July

**2007** Lab for the 21<sup>st</sup> Century, High performance, Low Energy Design Course, Scottsdale, April; Safe BSL3 Work Practices and Procedures, Scottsdale; ABSA 50<sup>th</sup> Conference and Biological Safety Course, October

**2008** 3<sup>rd</sup> APBA Aerobiology Workshop and Conference, Bangkok; 3<sup>rd</sup> Annual Conference SEA Influenza Clinical Research Network, Bali; Regional Seminar on Promoting and Implementing Biosafety and Biosecurity Management, Jakarta, June; Laboratory Biorisk Management System Workshop, Jakarta, August

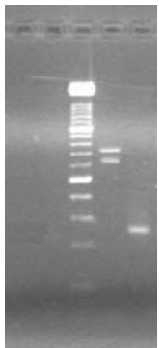
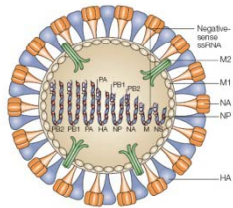
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**2009** Advanced Topics in Managing BSL3 Laboratories, CDC Atlanta, January; BSL3 Science and Safety Training Course at Emory University, Atlanta, March; 4<sup>th</sup> APBA Conference and CWA15793 Biosafety Standard Training, Implementation and Auditing Workshop and, Manila, April





# Building Capacity in Detection and Diagnosis of Infectious Diseases



## ❑ Development of diagnostic tests (AI)

- Diagnosed by virus isolation – hemagglutinating activity indicates the presence of influenza virus
- Reverse Transcription-PCR assay for molecular identification
- Positive test by RT-PCR should be confirmed by the second Institution
- RT-PCR and antigen testing carried out in BSL2

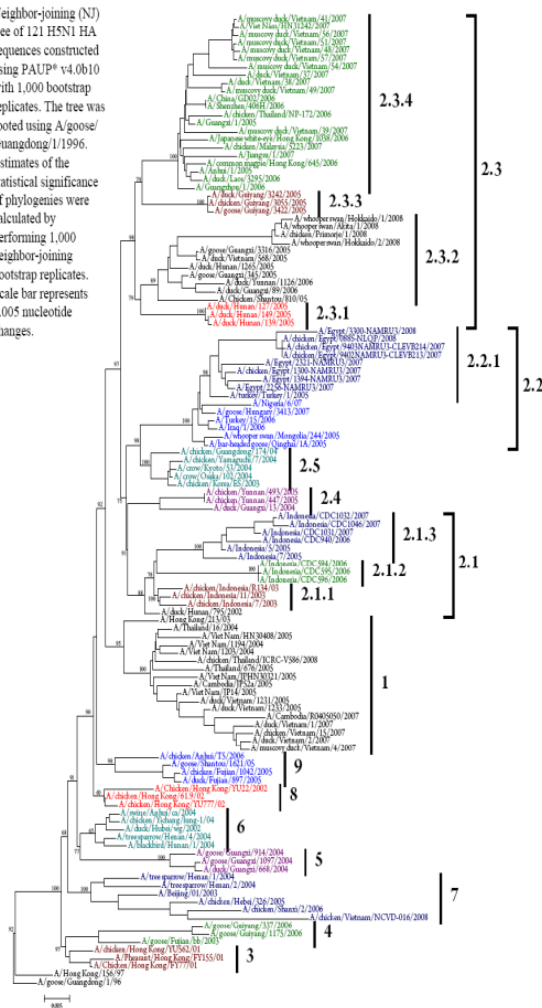
## ❑ Tracking outbreaks

- BSL3 laboratory conditions are required for HPAI viruses culture - detection of viral sequence changes (infection with other subtypes have been associated with outbreaks in other species)

# The Role of Science and Technology in Health Security – Preparedness for Pandemic



Neighbor-joining (NJ) tree of 121 H5N1 HA sequences constructed using PAUP\* v4.0b10 with 1,000 bootstrap replicates. The tree was rooted using A/goose/Guangdong/1/1996. Estimates of the statistical significance of phylogenies were calculated by performing 1,000 neighbor-joining bootstrap replicates. Scale bar represents 0.005 nucleotide changes.



## Risk Assessments

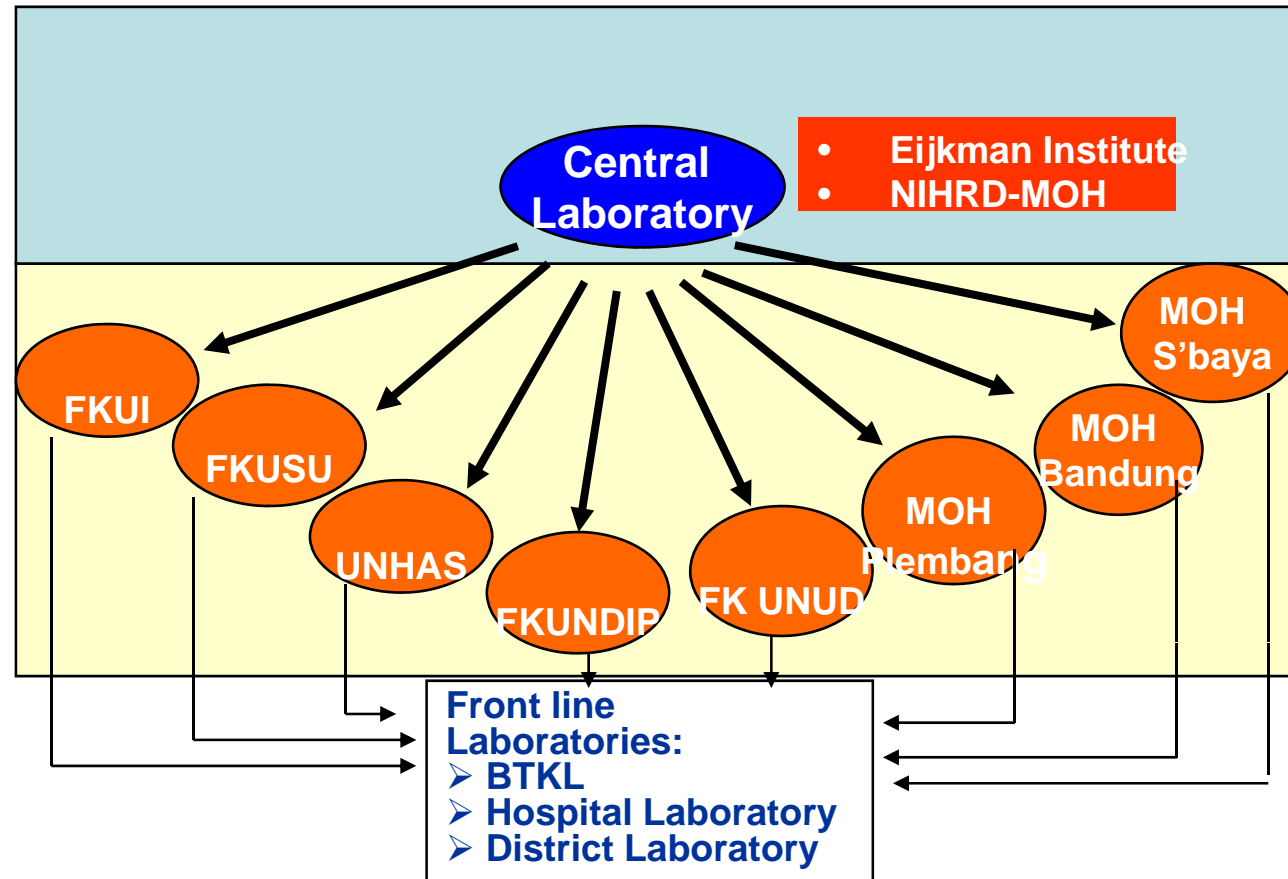
### □ Epidemiology:

- Grouping of H5N1:Virological clades or subclades - **H5N1 of Indonesian isolates clustered together – no new strain**
- Surveillance - tracing sources of infection

### □ Characteristics of Virus

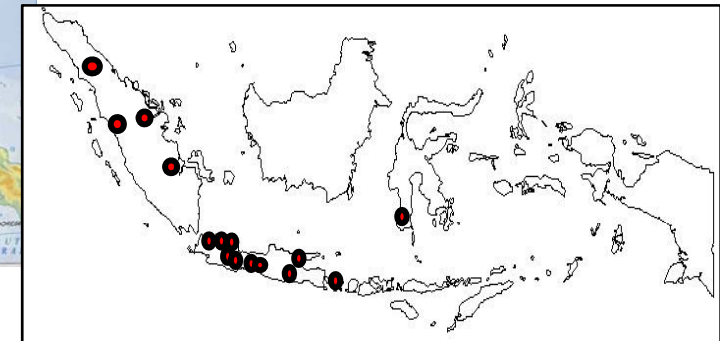
- Alteration of interaction with host receptors - **Pandemic need changing in specificity of avian type receptor ( $\alpha$  2,3) into human-type ( $\alpha$ 2,6) - showed the presence of avian-type receptor**
- Change of virulence
- Drug resistance –no sign

# National Capacity in Emerging Infectious Diseases Diagnostic and Laboratory Network



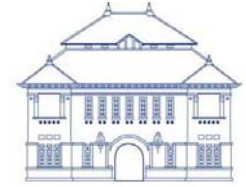
44 Reference laboratories for emerging infectious diseases were developed to increase national capacity in detection and diagnostic. Quality control and sustainability of the operation is very important!

# Indonesia: Challenges in Promoting Capacity Building in Diagnosis and Detection of Infectious Diseases

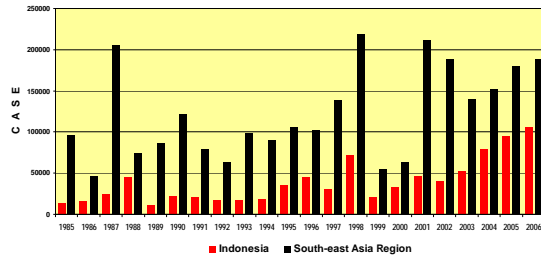


- ❑ A maritime continent
- ❑ Have 700 languages – population very diverse
- ❑ A crossroad of ancient migration – influenced the genetic background of host and pathogen
- ❑ Hepatitis, Dengue, Malaria, Tuberculosis show disease complexity

# Dengue Situation in Indonesia – Management of Disease is not Simple, Need a Strong Disease Surveillance and Fundamental Research



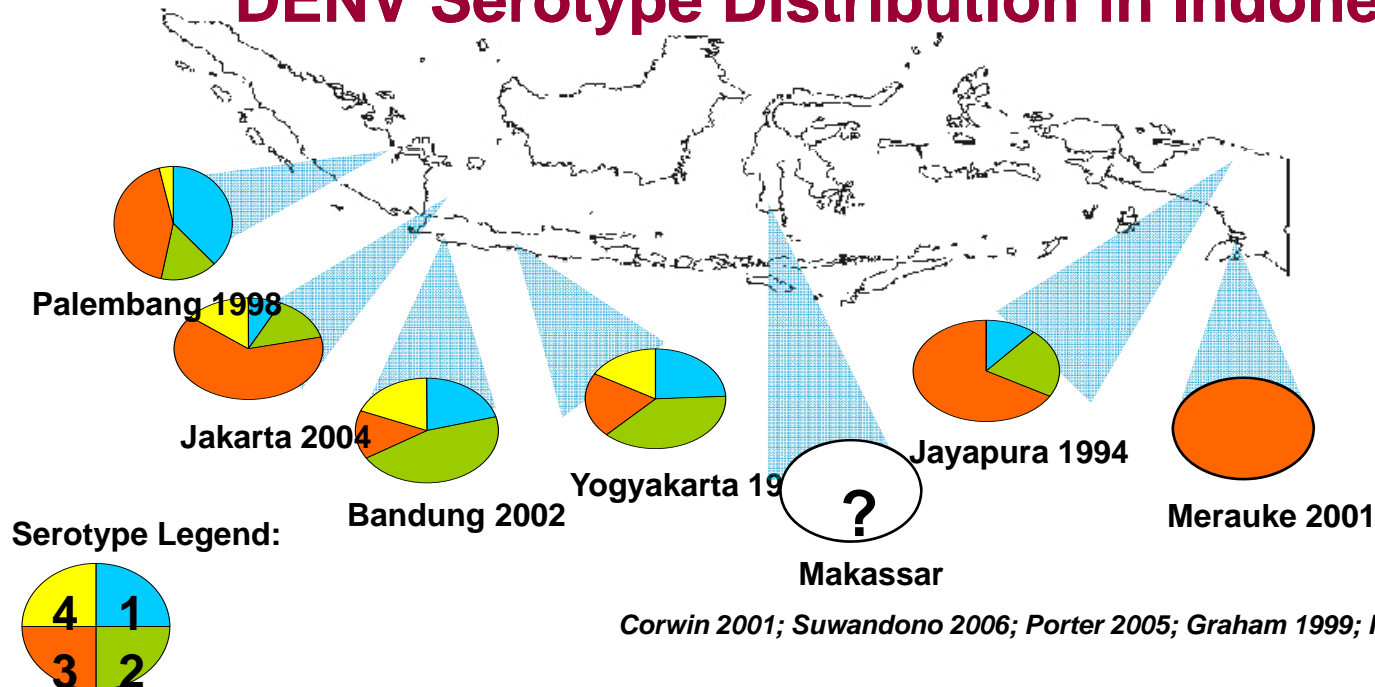
DENGUE TREND IN INDONESIA AND SOUTHEAST ASIA 1985-2006



2007: 157,442 cases with 1,446 deaths (WHO SEARO)

Reported dengue cases is rising but case fatality rate is maintained below 1%

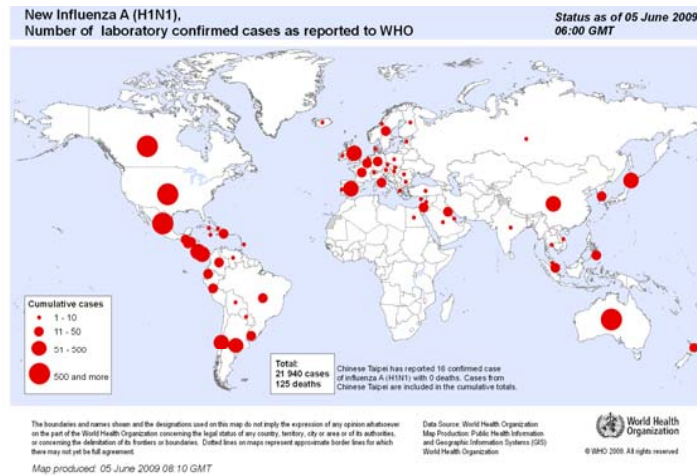
## DENV Serotype Distribution in Indonesia



Four antigenically distinct serotypes: infection with one serotype does not provide protection to the other three

Corwin 2001; Suwandono 2006; Porter 2005; Graham 1999; Richards 1997; Sukri 2003

# Preparedness for New Emerging Infectious Diseases



- ❑ **FROM BENCH TO BEDSIDE** - the capability to respond to a new emerging infectious diseases – i.e. designing new detection method for A/H1N1 on HA, NA and PB2 genes based on 133 sequences deposited at GISAID
- ❑ Adopt new detection protocol (CDC and SEARN – Oxford)

*Management of Disease is not Simple, Need a Strong Disease Surveillance and Fundamental Research*



# Capacity Building Through Education and Awareness on Code of Conduct on Biosecurity

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- ❖ The Indonesian Academy of Science (AIPI) with its partner the Royal Netherlands Academy of Arts and Sciences (KNAW) - to produce, promote and disseminate Code of Conduct on Biosecurity in Indonesia.
- ❖ KNAW has produced its Code of Conduct on 2007 as required by BTWC which was ratified on 1972 and endorsed by the Inter Academy Panel (68 national academies of science )

## **Principles endorsed by including the Indonesian Academy of Sciences, working through Inter Academy Panel (IAP):**

raising awareness, research and publication policy, accountability and oversight, internal and external communication, accessibility and shipment and transport.

# Enhancing Cooperation



ARF Biological Threat Reduction Forum, Manila, 10-11 June 2009, attended by 60 participants from 22 countries and agencies such as WHO, FAO, INTERPOL and UN Office of Disarmament Affairs



❑ Networking with interagency counterparts, personal in health, academia, law enforcement, defense and multiple stakeholders including industry, medical, professional organizations and the media.



❑ Regional cooperation is necessary not only in the field of biosafety and biosecurity but also in infectious diseases research and surveillance - APBA, ABSA, SEA Network of Influenza and many other associations



# THE WAY AHEAD

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- ❑ Raising awareness of biological threats globally – **BWC, BTR, Dual Use, Code of Conduct**
- ❑ Strengthening laboratory biosafety and biosecurity to protect laboratory capacity and safely combat infectious diseases – **Training, SOP**
- ❑ Expanding the use of safe and modern diagnostics – **National capacity building in fundamental and translational research**
- ❑ Participation in infectious disease surveillance networks – **Sharing quality data/information**
- ❑ Ensure the sustainability of maintenance and management
- ❑ Maximize existing resources and facilities to enhance effectiveness and efficiencies
- ❑ New vaccines, antibiotics and a basic understanding of pathogenic nature of diseases are critical for health security  
- **invest in basic science and fundamental research**

*Together, We Can*



*Thank you and greetings from Indonesia*

Herawati Sudoyo MD PhD, Eijkman Institute for Molecular Biology, Indonesia