Cirad’s Platform in Partnership (GREASE) Activities on Zoonoses in South East Asia

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• 70% of Emerging Infectious Diseases are Zoonoses
• Need for better management and surveillance of EIDs
Nipah virus (NiV)
Severe Respiratory Acute Syndrome (SRAS) virus
Highly Pathogenic Avian Influenza (HPAI) virus
Factors favoring emergence & transmission in South East Asia

- Close contact between human and livestock populations
  → provide excellent conditions for the frequent exchange of pathogens between animal and human populations.
- High human and animal density
- Globalization of trade
- Geographical position
- Warm and humid climate
- Richness in wildlife host species
- Socio-economic situation and the socio-cultural practices

Bordier & Roger 2013
Jones et al 2008

Need for Cross-Sectorial Collaborations
Targeted research for development

700 staff members based outside metropolitan France
12 regional offices in the French overseas regions and abroad
Collaborative projects in 90 countries
Researchers assigned to 40 countries
AXE 4: Animal Health and Emerging diseases

4 CIRAD Research Units: Eco/Epi (AGIRs), Animal Prod, Lab. and Trypanosomiasis
and collaborations with other units in the fields of mapping, sociology, modelling etc.

From knowing to controlling diseases

> Understanding the relations between pathogens, their domestic or wild hosts, and ecosystems
> Studying the ability of microbial genomes (viruses, bacteria) to evolve and adapt to change
> Understanding livestock immune responses to pathogens
> Organizing health networks to monitor and control diseases

CIRAD is an FAO and OIE collaborating centre for the “diagnosis, epidemiology and control of tropical animal diseases”. It is an OIE and/or FAO reference laboratory for seven major animal diseases.

It is the southern Europe contact point for the European Centre for Disease Prevention and Control (ECDC) vector and vector-borne disease surveillance network.

It is involved in numerous professional training courses and in higher education in France and abroad.
AGIRs: Animal & Integrated Risks Management

- Director: Dr François ROGER
- 6 (seniors) researchers in the executive committee
- 23 executive researchers
- 6 PhD & 2 Post Doc
- MSc students (5-10 / year)
- seconded researchers in other institutions – Wildlife Conservation Fundation
AGIRs: Animal & Integrated Risks Management

Multidisciplinary research team

GIS Engineer & Modeller
SOCIOLOGIST
GEOGRAPHER
ECOLOGIST
EPIDEMIOLOGIST

Synergy-based approach
Centers AGIRs

Mediterranean Wildlife/Human

RP-PCP Wildlife/Human/Domestic

GREASE
A regional network with the objective to support research activities for a better management of transboundary and emerging diseases in South-east Asia.

http://grease-network.com/

CIRAD presents in
- Thailand / Vietnam / Cambodia
- Collaboration Laos / Australia
- Future collaborations in Philippines / Indonesia
Development of a multidisciplinary approach through research projects and scientific networking

6 core members SEA (MoU)

NaVRI (Cambodia)  
NuOL (Lao PDR)  
CMU (Philippines)  
KU (Thailand) → Presidency (>2014)  
NIVR (Vietnam)  
Cirad (SEA) → Coordination (>2014)

+ 9 associated partners (Regional, International, Thais & French)

Institut Pasteur (Cambodia), Univ. Gadjah Mada (Indonesia), AIT, OIE, FAO RAP, Univ. Thammasat (Thailand), Mahidol University (Thailand)  
IRD, CNRS

+ Extension to Malaysia, China as key partners for emergence management
« One Health » concept
Animal and human health risks emerge from overlap between domestic animals, wildlife and humans
Operational objectives

→ Shaping crosscutting & inter-sectorial interest groups for risk management

→ Facilitating scientific exchanges & fund raising for projects designing (research & training)
Specific Syndroms & diseases: Diseases surveillance & control

Holistic Approach to health:
Health & Risk Management – Surveillance systems

Beyond official surveillance reporting networks

Cartography & measure relationships and interactions between peoples, groups, entities
Holistic Approach to health:
Emergence Dynamics – Wildlife-Livestock Interface

Specific Syndroms & diseases:
Bats & Rodent borne diseases...
Specific Syndroms & diseases:
Influenza (swine & avian)
GREASE: an adaptive process...

**GREASE**
**Training & Education**
- E-learning
- Trainings: participatory epidemiology, biostat R
- Master degree/PhD (InterRisk)

**Research Projects**

**Partners’ Needs**

Trainings: participatory epidemiology, biostat R

Master degree/PhD (InterRisk)
In Asia, acute encephalitis is among the most frequent and severe causes of pediatric hospitalization. Moreover, encephalitis etiologies remain unknown in more than 60% of patients. Because the epidemiological situation in developing Southeast Asian countries is particularly appropriate to reveal the circulation of emerging infectious agents, the surveillance and investigation of acute encephalitis syndrome is of utmost public health importance, both locally and globally.
Management of Health

Capacity of surveillance systems to detect zoonotic epidemics

Evaluation of surveillance systems in animal (Peyre et al. 2011)
Capture-recapture methods (Vergne et al. 2012)
Probabilistic approaches to optimize the detection of a disease (Goutard et al. 2012)
Systemic analysis of surveillance and control (Collineau et al. 2013)
Participatory approaches and socio-economic issues (Delabouglose et al. 2012)
Introduction of costing methods within simulation (Duboz 2012)

References
Duboz R (2012). Weighted Activity and Costing of Surveillance and Control in Animal Epidemiology. In the proceedings of Activity-Based Modeling & Simulation ACTIMS'2012, Cargese, France

Salient Findings summary
Performance Evaluation: Capture-Recapture

• Areas with under estimation of IAHP H5N1 outbreaks?
  • Study timing: 3 July 2004 - 5 May 2005
  • Zero inflated model

Main results

Virus has circulated in 2137 sub-districts
Only 779 detected
→ Se of surveillance at sub-district level at the time (2004-2005) = 37%

IAHP H5N1 outbreaks might have been underestimated around Bangkok area

Vergne et al. Zero-inflated regressions for assessing the efficiency of highly pathogenic avian influenza (H5N1) surveillance in Thailand.

Figure: Distribution of false-negatives probabilities
Economic evaluation of surveillance systems

Cost-effectiveness analyzes including epidemiology, economy, social and political approaches within the “One Health” perspective

Methods of prioritization of zoonoses: case study in SEA
Risk assessment

1. Risk mapping HPAI H5N1 - Thailande
   - Collaboration INRA-CIRAD-Kasetsart-DLD
   - Spatial heterogeneity of H5N1 outbreaks-risk factors
     → Paul et al. SVEPM proceedings 2010
     → Paul et al. Vet Res 2010

2. Multi Criteria Decision Making (MCDM) on AI factors
   - Thailande (data + maps); validation with outbreak maps
   - extension Cambodia, Laos, Vietnam
Wildlife-livestock-human interface: Emergence of zoonoses

Rodent-borne diseases: identification of areas with possibly a higher risk

new zoonotic pathogens


Wildlife-livestock interface

December to May

a) Main production cycles of paddy rice

b) Main production cycles of ducks in paddy fields

c) Resident wild ducks presence in Paddy Fields

Percentage of Resident Wild Ducks
GPS locations in Paddy Fields

d) Migratory wild ducks wintering period
Salient Findings summary

**Influenza**
Interesting model to implement *interdisciplinary* studies

**Spillback transmission** of H1N1p virus from humans to animals ([Trevennec et al. 2012; Rith et al. 2013](#)).

**Perception of risks** by local communities ([Figuie and Fournier 2008; Goutard et al. 2012a](#)).

**Evaluation of vaccination** in Vietnam ([Desvaux et al](#)).

**References**


Projects to be developed in 2014

Supporting capacity building, expertise, scientific skills

- Regional partners Training needs
- Networking and inter-sectorial dialogue facilitation for “One Health”
- EcoHealth in practice

Supporting SEA and European students PhD program

- TRF Royal Golden Jubilee PhD program: developing International research network “One Health”
- Biotechnology Research and Training Platform on Zoonosis in Southeast Asia
- Inter-risk Franco-Thai Master degree (Kasetsart University/ENVT)
« Inter-Risk » Master Program
International master in bio-sciences
• « One Health » framework
• Systemic thinking

• Training for better assessment and management of health risks at the human, animal and ecosystem interface
Framework

- Double-diploma French-Thai
- International program (SEA and UE)
- Institutional framework: 3 partners
  - CIRAD
  - ENVT (National Veterinary College of Toulouse, France)
  - Kasetsart University (Thailand)
Main lines of organization

- Opened to students from (human) public health, veterinary medicine, biological sciences
- Some modules will also be opened to professional engaged in a continuing education program
- All courses will be held in Kasetsart Univ. (Thailand)
• At the end of this course, graduates should be able to integrate epidemiological, ecological, economic approaches for the prevention and control of biological hazards of animal origin in a context of trade globalization and climate change.
Evaluation and management of risks in a systemic perspective

To set up a surveillance system

To set up a control program

To set up risk prevention activities

To integrate social and economical aspects in the activities

To identify and analyze health risks

To choose and use appropriate tools in a decision-making perspective

Complementary skills
International Students from UE, SEA
# Training modules for first year (M1)

1. microbiology and issues in antimicrobial resistance  
2. immunology, vaccinology and diagnostic  
3. disease ecology  
4. basic data management  
5. basic statistics and epidemiology  
6. livestock production systems and value chains  
7. scientific watch  
8. preparation to placement period

+ 3 months field training in a research institute or governmental organization / NGO
Training modules for second year (M2)

1. advanced statistics
2. advanced epidemiology
3. risk analysis
4. surveillance systems
5. prevention and control
6. animal health economics
7. social approaches in health risk
8. geographical information system
9. ecology
10. research methodology

+ 6 months field training in a research institute or governmental organization/NGO
Launching of the Master

- Information and advertisement early 2014
- Start of the Master 1: August 2014
  - Start of M2 in August 2015
- Opening for student registration: May-June 2014
Thank you for your attention