Avian Influenza Research Activities in Cambodia

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H5N1 Outbreaks in Animals & Humans
Cambodia, 2004 – 2007

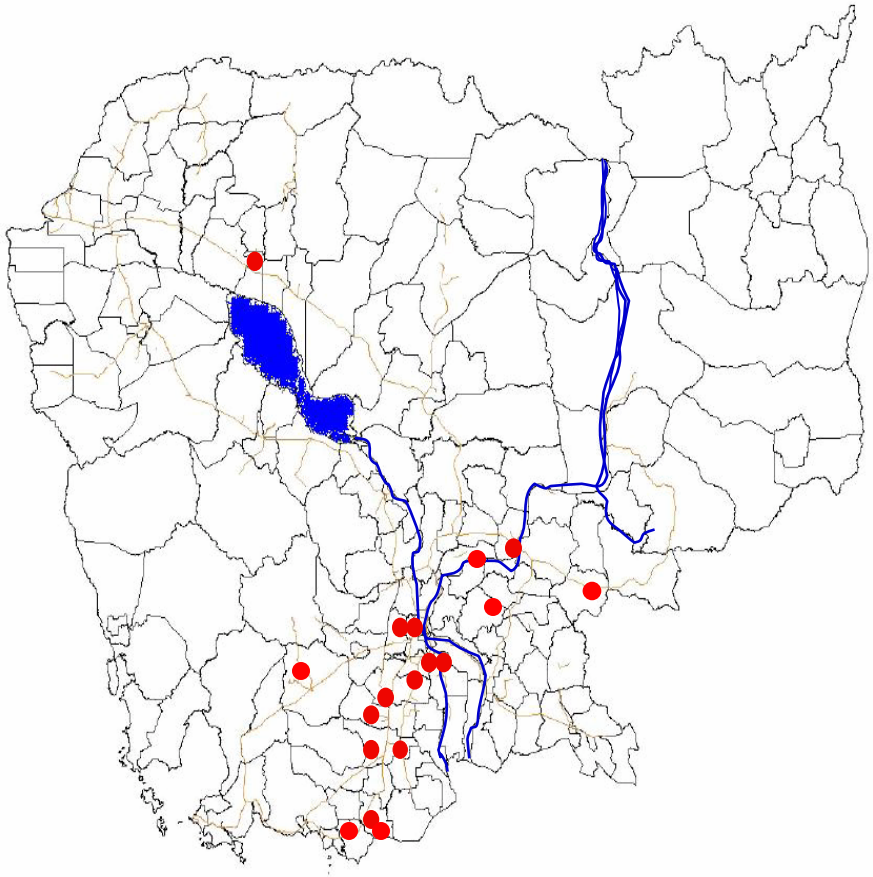
*IPC Unpublished data; slide courtesy of P Buchy, IPC

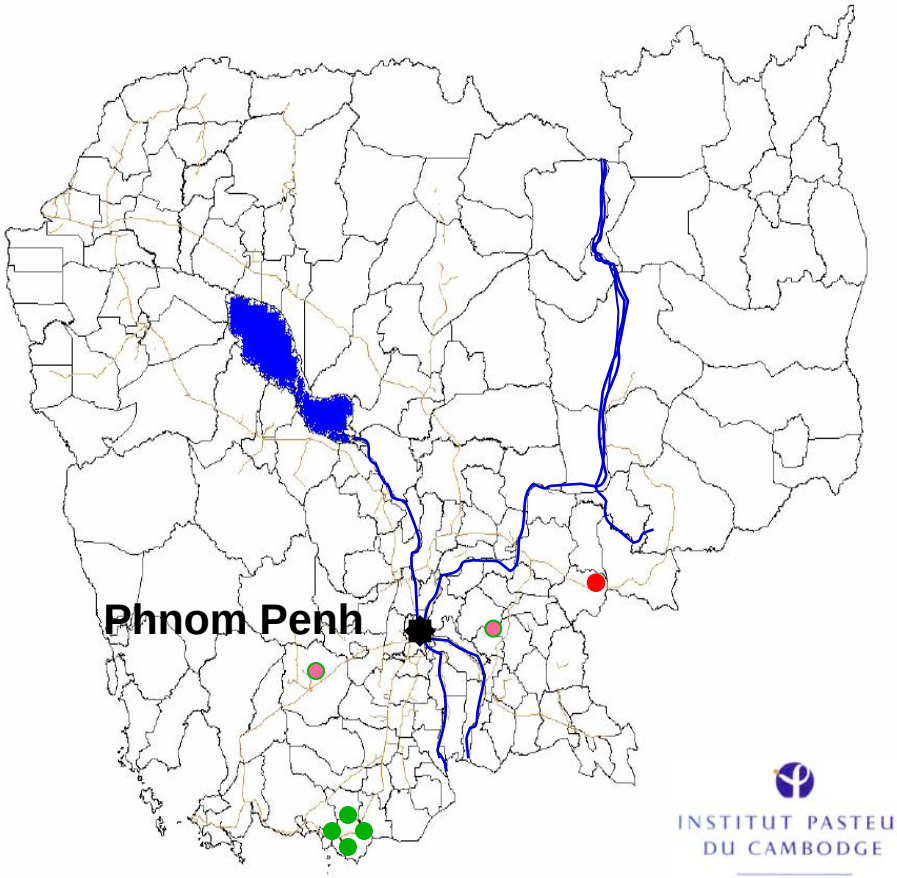
Poultry:

25 outbreaks including 15 in 2004, 3 in 2005, 6 in 2006 and 1 in 2007

Human:

7 H5N1 patients including 4 in spring 2005 2 in spring 2006, and 1 in spring 2007





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Research undertaken on AI in Cambodia since 2004

- **H5N1 Outbreak investigations** in human and poultry populations
  - Contribution to avian flu field investigations
  - Monitoring of H5N1 transmission
  - Human seroprevalence studies & case-control studies
  - Retrospective poultry mortality studies
- **KAP surveys** of backyard poultry owners, market sellers and middlemen transporting poultry
- **Hospital-based surveillance** of respiratory infections
- **Environmental** Surveys

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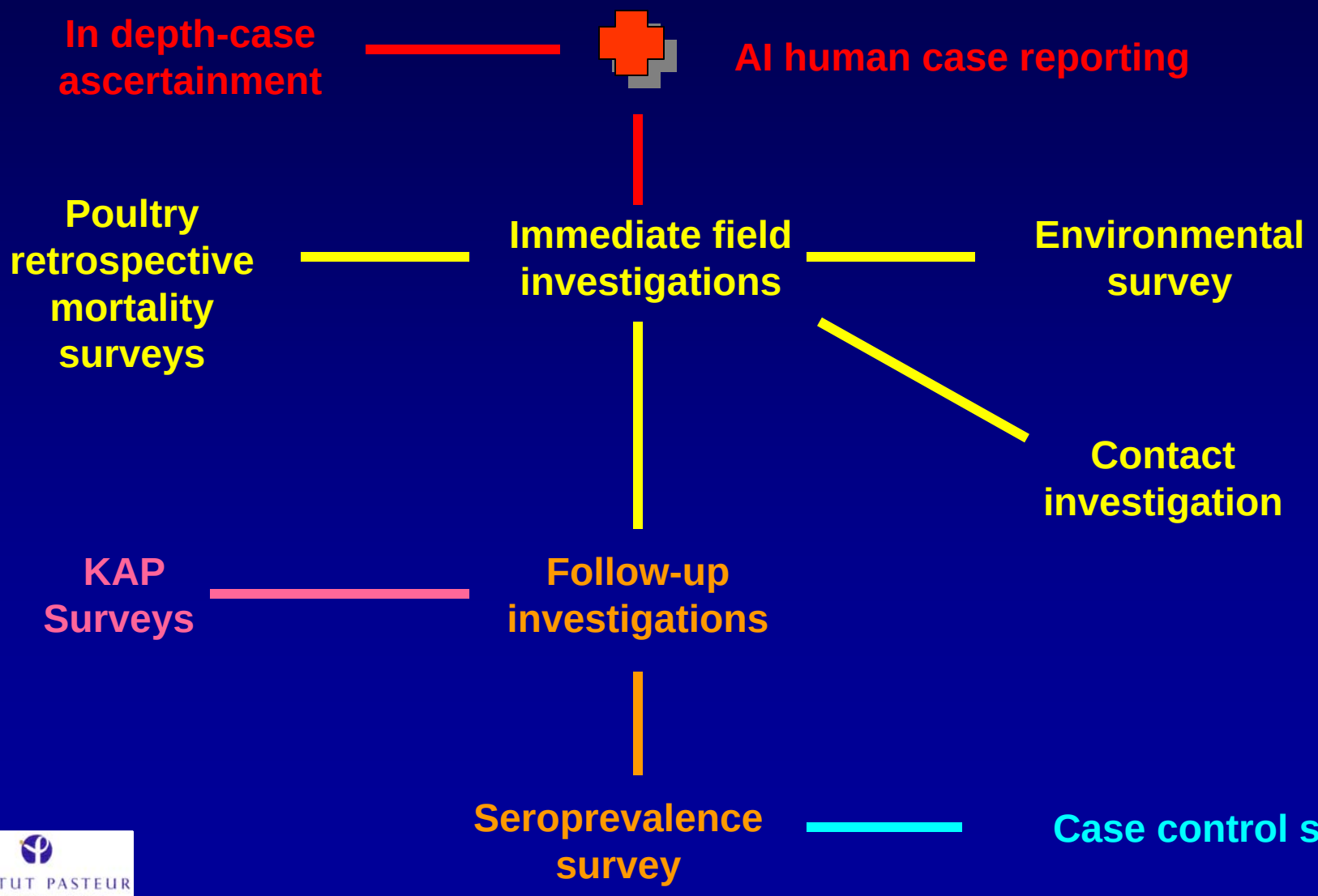
AI Investigations Flow



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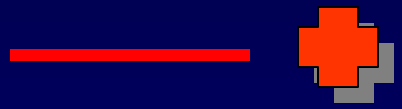
AI Investigations Flow

In-depth case ascertainment



AI human case reporting

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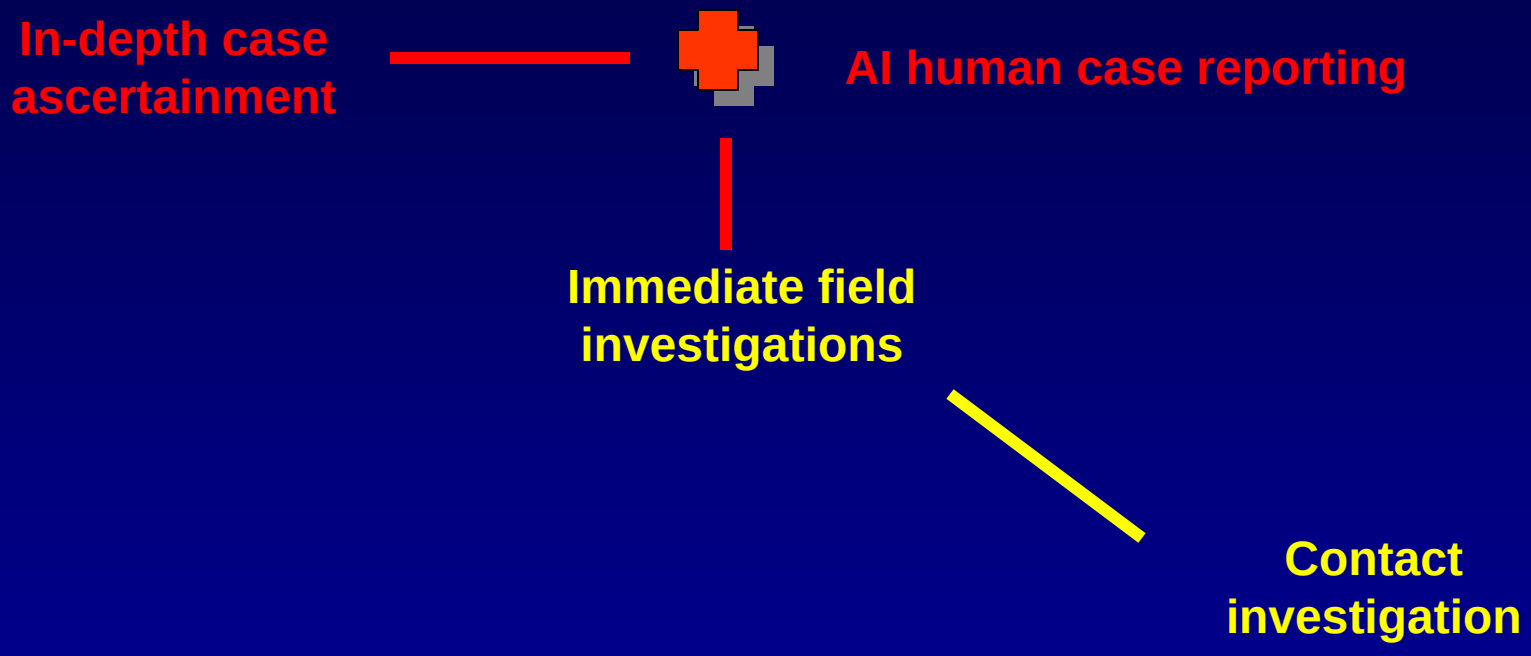
AI Investigations Flow



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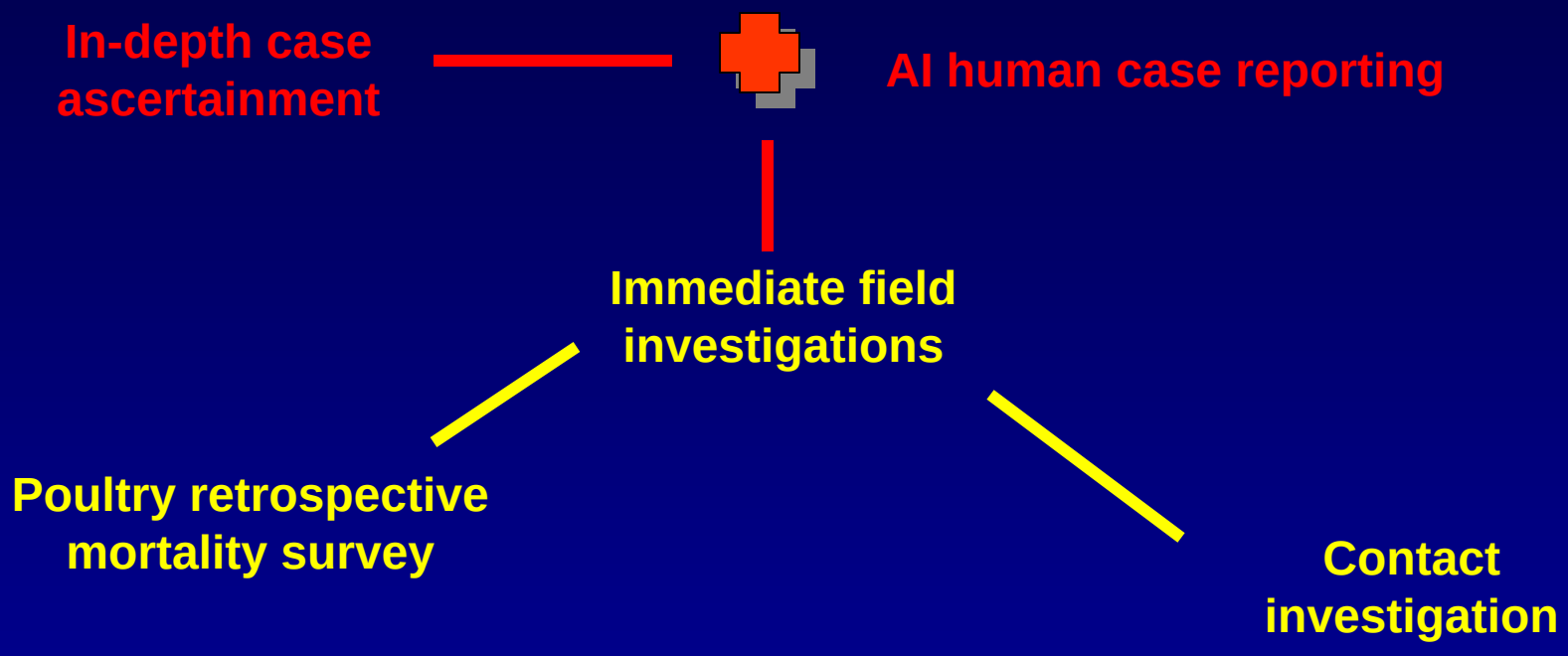
AI Investigations Flow



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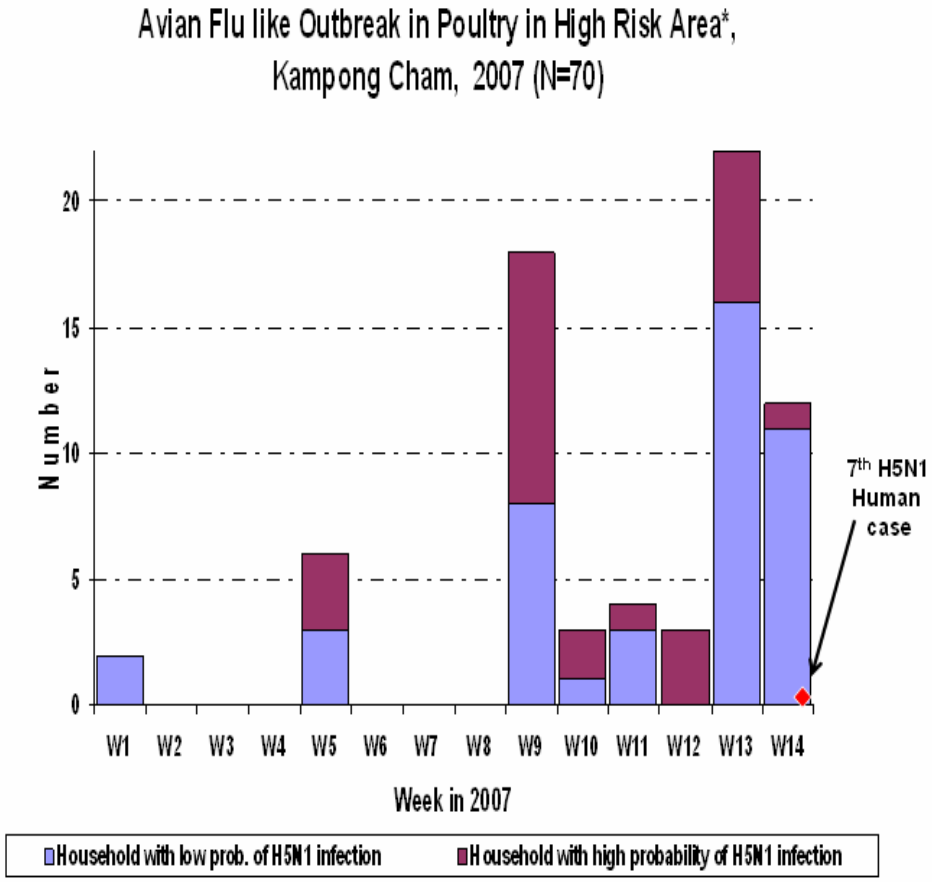
Poultry mortality survey



Methodology

- Door-to-door survey
- Questionnaire on poultry ownership, mortality experienced, flock movements
- Animal specimens (PCR)
  - **Collection of death / sick animals**
  - **Sera, tracheal / cloacal swabbing**

- **Poultry ownership >80%**

- **High mortality (>60%) within 6 weeks prior to the H5N1 patient's death**

High probability of H5N1 infection in chickens

- **Sudden death (1 day)**
- **All ages (adults and youngsters)**
- **100 % Case Fatality Rate**
- **Mortality Rate > 60 %**

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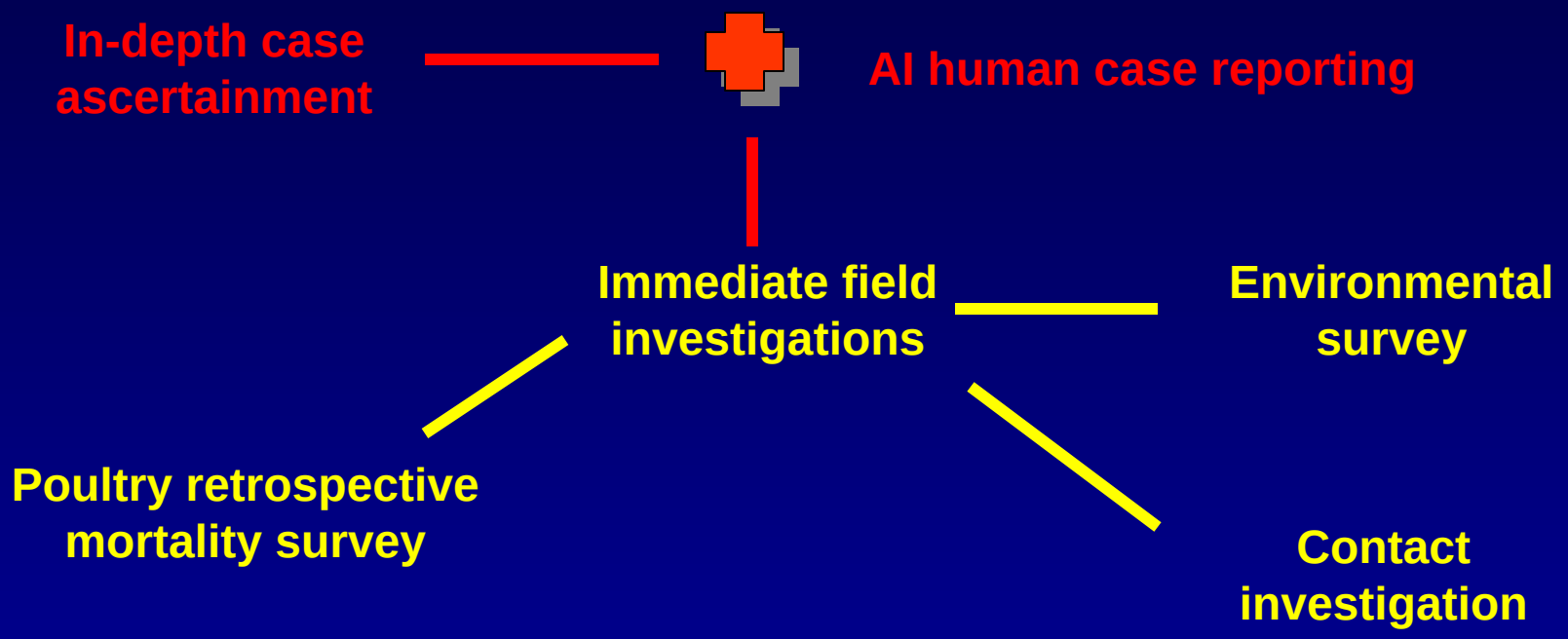
AI Investigation Flow



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Environmental Survey

Objectives

- H5N1 virus in environment? How long? Other vectors (insects…)?

Methods

- Sampling in case's household and surroundings: garden (dirt, plant, dung, mud …), pond (water, fish, shells…)

- Detection H5N1 in environment is not a routine testing and the best approach still unknown

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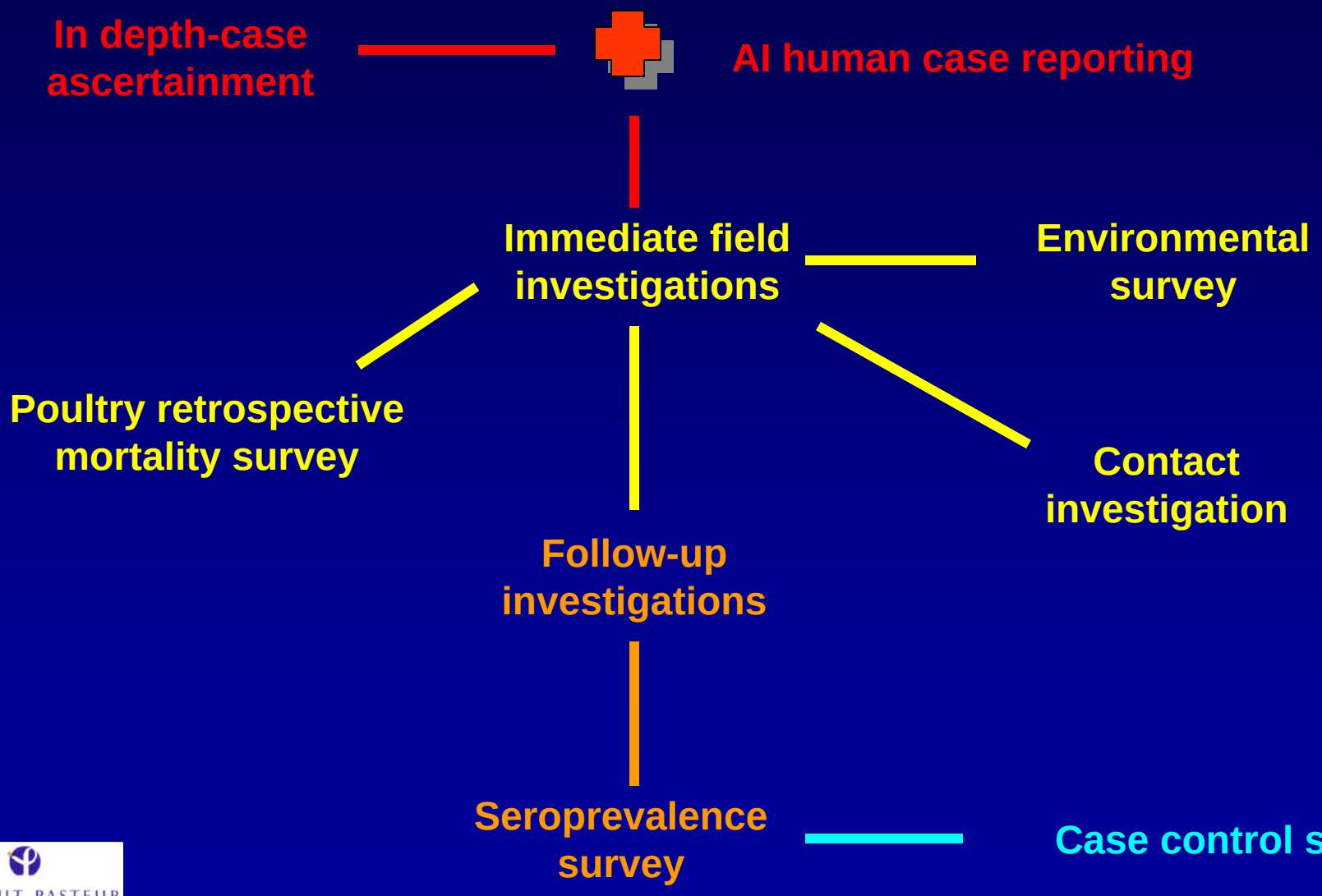
AI Investigations Flow



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Follow-up investigations

Two-steps study design

Step 1: Seroprevalence Survey

- Essential tool for monitoring H5N1 transmission
- Assess sub-clinical and asymptomatic cases

Step 2: Case-Control Study

- Based on the findings of the seroprevalence survey
  - Cases = Seropositive individuals
  - Controls = Seronegative individuals
- In-depth documentation of AI risk factors

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Seroprevalence Surveys

Design: 3 surveys in 4 villages where AI human cases have been reported

- Mar 05: H5N1 Village of H5N1 case #2†
  - Kampot province*
  - 93 households, 351 serums
  - No serologic markers of H5N1 infection

- May 06: Villages of H5N1 cases #5 and #6‡
  - Kampong Speu & Prey Veng provinces
  - 162 households; 670 serums
  - **Serologic markers in 7 individuals (seroprevalence of 1.04%)**

- Jun 07: Kampong Cham province
  - Village of H5N1 patient #7 (149 households, 708 serums)

(†) Results in Vong S et al, 2006, EID
(‡) Vong et al, manuscript in progress

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Case-Control Study*

Cases

- Subjects that were tested positive for H5N1 neutralizing antibodies during previous serosurvey (Kg Speu – Prey Veng, May 2006)

Controls

- Subject being tested negative during the serosurvey
- 3-4 controls par cases
- Matching on age, gender and village of residence

In-depth questionnaire:

Investigation of potential behavioural risks factors during outbreak period

- Environmental exposures
- Animal exposures & food handling / preparation practices
- Contact with confirmed H5N1 human case

*(*) Vong S et al, in press*

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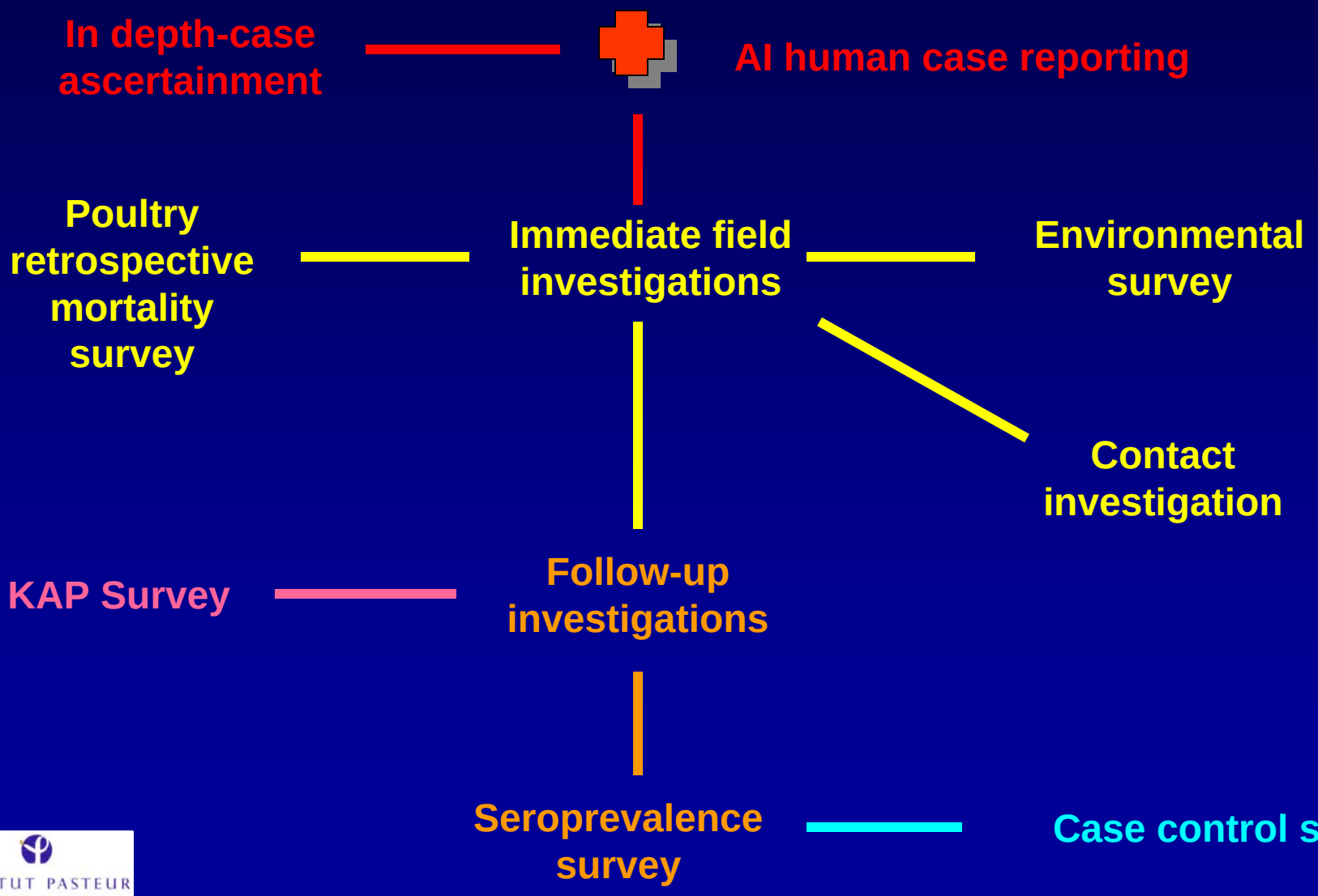

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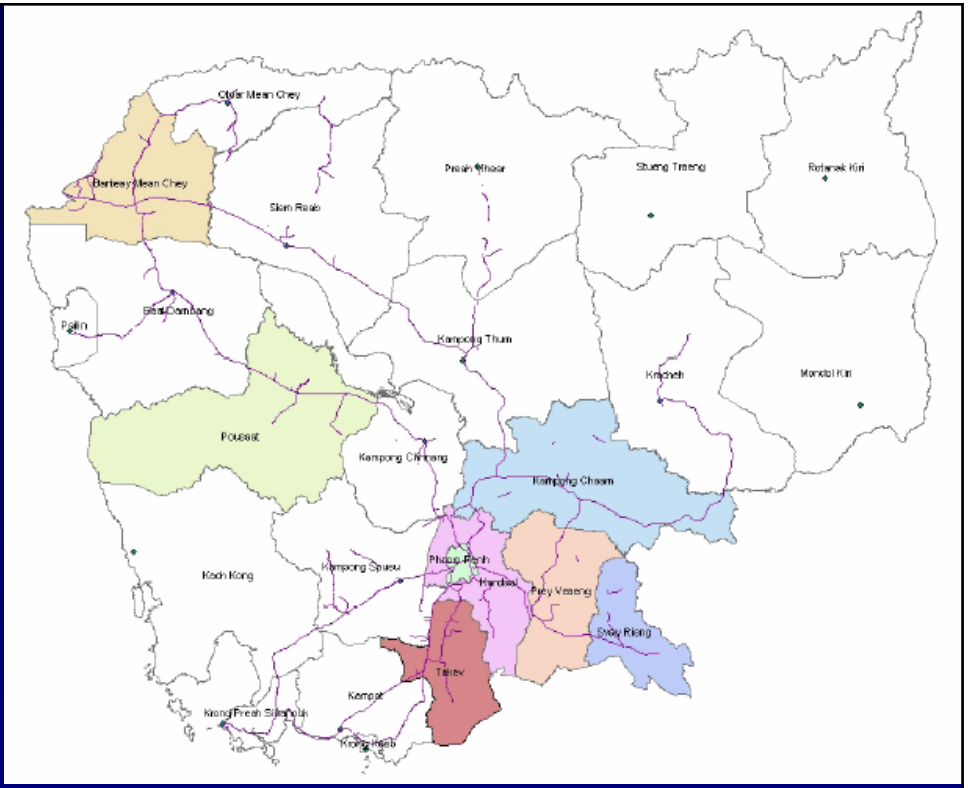
KAP Surveys:
Backyard poultry owners



- Methodology
  - Two-stages cluster sampling
- Study areas
  - PV & Kg Cham Provinces†
    - Jan 2006; 23 villages
    - 460 respondents
  - Pusat, Takeo, S Rieng, B Meanchey)‡
    - Nov – Dec 2006; 77 villages; 2,400 respondents
  - PV & Kg Cham Provinces
    - Nov – Dec 2007; 40 villages; 1,200 respondents
- Objectives
  - Evaluate the frequency and extent of exposure to poultry in backyard poultry raising settings
  - Evaluate understanding (knowledge and attitudes) of AI

(†) Results in Ly S et al, 2007, EID

(‡) Van Kerkhove et al, manuscript in progress

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Cross-sectional survey of markets and middlemen

- Snowball Sampling Methods to identify eligible subjects
- Objectives
  - ID preparation for sale practices
  - Disposal of carcasses and other waste; cleaning practices
  - Origin of purchase; middlemen use
- Study Locations
  - B. Meanchey, Pursat, S Rieng, Takeo Provinces
    - Nov – Dec 2006
  - Phnon Penh, surrounding areas around PP (Kandal Province)
    - Jan – Apr 2007
  - Kampong Cham, Prey Veng, Phnom Penh
    - Nov- Dec 2007

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What have we learned?

- H5N1 appears to be endemic in domestic poultry in Cambodia
- Approximately 90% population in Cambodia is involved in poultry raising primarily as backyard poultry raising
  - (FAO Sector 4 poultry production system)
- There are significant differences in poultry handling behaviors by gender and age of rural Cambodians
  - Risky behaviors occur despite awareness of AI
  - Use of PPE in domestic and occupational settings is minimal
  - The use of biosecurity in backyard settings is almost non-existent
- Poultry-to-human transmission has been limited thus far, but large-scale serpoprevalence studies have not been carried out

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What have we learned? *(con't)*

- Strong evidence of direct contact of villagers with poultry and poultry products
- Importance of environmental exposures in the H5N1 transmission
- H5N1 virus in his current form is not easily transmissible to human
- Genotyping of the Cambodian isolates did not show any reassortment with human influenza virus nor mutation that can facilitate human to human transmission

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Gaps in Current Knowledge

- Why do risky practices still occur despite high awareness of AI?
- How to we change awareness of AI to understanding of AI?
- How can we increase reporting of ***any & all*** poultry mortality to village chief or VAHW who are trained to distinguish normal & suspect mortality?
- What are the poultry handling practices that have a higher transmission potential?
- What role does water and other environmental factors in the village play in transmission between poultry and from poultry to human populations?
- What are background poultry mortality rates and how can we reduce poultry mortality in backyard raising settings?
  - How can we improve biosecurity?

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