

# The Tricycle Project and beyond:

## Thailand's experiences in AMR surveillance under the One Health approach

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## **Thailand**

Regional Workshop on Interpretation of AMU/AMR data to improve  
evidence-based decision-making in Asia and the Pacific

**Bangkok, 18-19 November 2025**



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# Milestones: One Health AMR Surveillance in Thailand



## 2015

### GLASS-AMR

- Department of Medical Sciences
- Department of Disease Control

### ANIMUSE

- Department of Livestock Development

## 2024

### GLASS-AMU

- Food and Drug Administration

## 2018

### Training the Tricycle Project in Utrecht

- Department of Medical Sciences
- Department of Disease Control
- Department of Livestock Development
- Department of Pollution Control
- Food and Drug Administration

## 2022

### National Integrated AMR Surveillance with the One Health Approach

- Ministry of Public Health
- Ministry of Agriculture and Cooperatives
- Ministry of Natural Resource and Environment

## 2020

### Implementing the Tricycle Project

- Department of Medical Sciences
- Department of Disease Control
- Department of Livestock Development
- Department of Pollution Control



## 2014

### Landscape of AMR situation and action in Thailand

- Human: National AMR Surveillance Center, Thailand (NARST) at the NIH (1997) → WHO CC on AMR surveillance training (2001)
- Animal: National Institute of Animal Health (NIAH)
- Environment: N/A



### Thailand's NAPs-AMR

← The 1<sup>st</sup> National Strategic Plan on AMR (2017-2022)  
The 2<sup>nd</sup> National Action Plan on AMR (2023-2027) →







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# The Tricycle Project, Thailand

- Implemented in 2020
- One province: Hospital, chicken farm, abattoir, waste water (from hospital, community and fresh market) and surface water
- Lead agencies:
  - Department of Medical Sciences
  - Department of Disease Control
  - Department of Livestock Development
  - Department of Pollution Control



กรมวิทยาศาสตร์การแพทย์  
Department of Medical Sciences



กรมควบคุมโรค  
Department of Disease Control



กรมควบคุมมลพิษ  
POLLUTION CONTROL DEPARTMENT



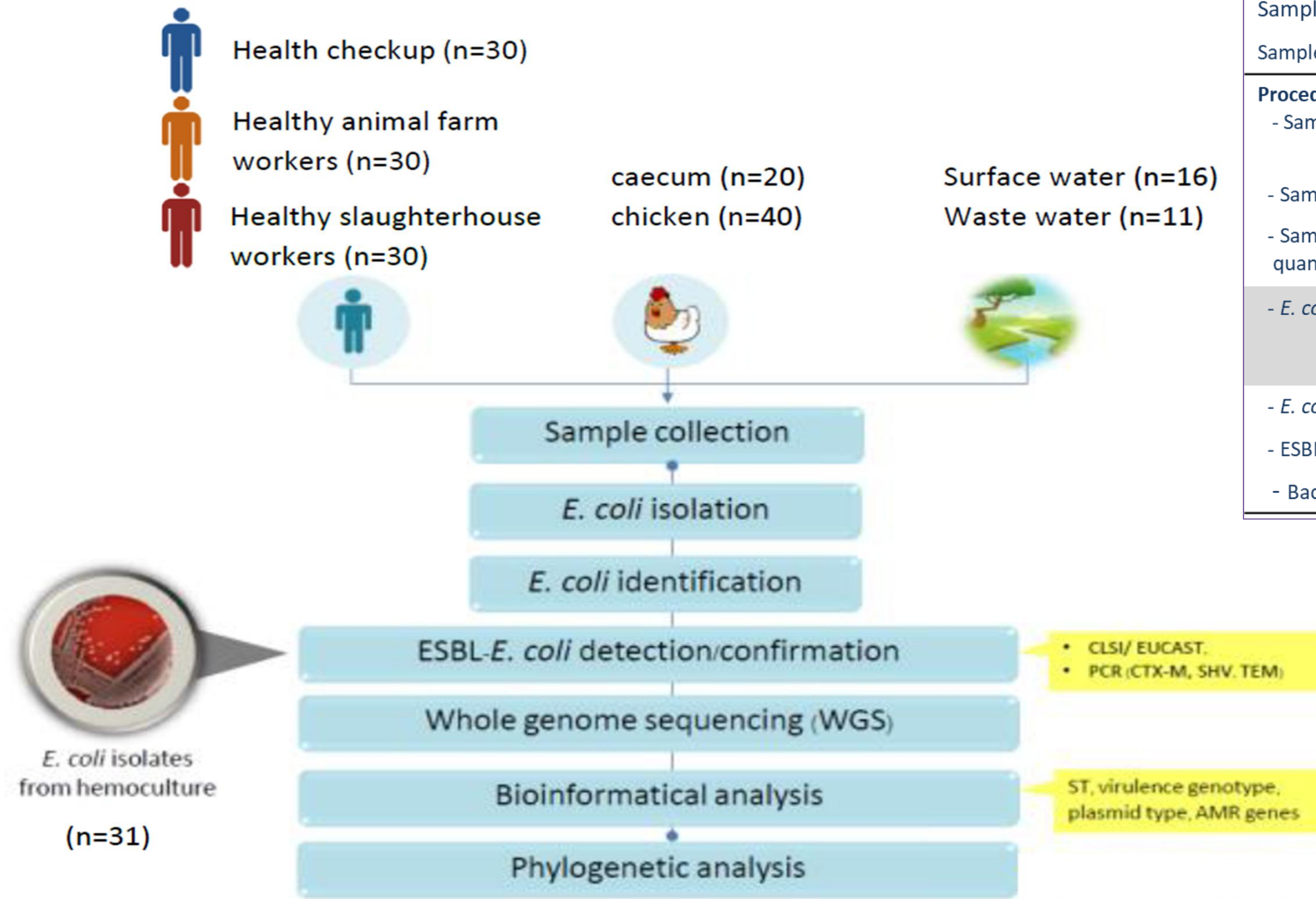





Fig. Schematic workflow for detection and characterization of ESBL-*E. coli*

| Working packages                           | ①<br>Human   | ②<br>Food chain                             | ③<br>environment  |
|--|--|---|---|
| Sample no.                                 | 121  | 60  | 27  |
| Sample collection period                   | May - July 2020                                      | July – August 2020                          | August 2020   |
| <b>Procedure</b>                           |  |   |   |
| - Sample type                              | Stool, <i>E. coli</i> isolate (positive hemoculture) | Caecal Chicken                              | Ground water<br>Waste water   |
| - Sample record                            | WHONET   | -   | -   |
| - Sample preparation/quantitative analysis | -  | -   | Membrane filtration > spread plate method   |
| - <i>E. coli</i> isolation                 | MacConkey (+cefotaxime 4 µg/ml), Blood agar          | MacConkey (+cefotaxime 4 µg/ml), Blood agar | <ul style="list-style-type: none"> <li>TBX, TBX (+cefotaxime 4 µg/ml)</li> <li>MacConkey (+cefotaxime 4 µg/ml), Blood agar</li> </ul> |
| - <i>E. coli</i> identification            | Biochemical test, Automate                           | Biochemical test, Automate                  | Biochemical test, Automate  |
| - ESBL Ec test                             | CLSI, EUCAST   | CLSI, EUCAST                                | CLSI, EUCAST  |
| - Bacterial storage                        | -70 to -80 °C  | -70 to -80 °C                               | -70 to -80 °C   |

Courtesy of Dr. Pilailuk Akkapaiboon Okada

## Prevalence of ESBL- *E. coli* (Disk diffusion)

| Sample   | Sample types                      | N          | No. of ESBL- <i>E. coli</i><br>positive samples |
|--|-----------------------------------|------------|---|
| <b>Human</b><br>         | Blood (Hemoculture)               | 31         | 15 (50%)  |
|  | Stool, Health check-up            | 30         | 22 (73%)  |
|  | Stool, Farm workers               | 30         | 21 (70%)  |
|  | Stool, Abattoir workers           | 30         | 24 (80%)  |
|  | <b>Total</b>                      | <b>121</b> | <b>82 (91%)</b>                                 |
| <b>Food chain</b><br>  | Caecum (Farm/Abattoir)            | 20         | 14 (70%)  |
|  | Chicken meat<br>(Market/Abattoir) | 40         | 1 (2.5%)  |
|  | <b>Total</b>                      | <b>60</b>  | <b>15 (25%)</b>                                 |
| <b>Environment</b><br> | Surface water                     | 16         | 8 (50%)   |
|  | Waste water<br>(Community)        | 11         | 10 (91%)  |
|  | <b>Total</b>                      | <b>27</b>  | <b>18 (67%)</b>                                 |

## A total of 72 strains of ESBL- *E. coli* (WGS)

| Source                  | <i>E. coli</i> (n = 72) |           |
|-------------------------|-------------------------|-----------|
|                         | ESBL                    | Non-ESBL  |
| Human<br>(n = 29)       | 19                      | 10        |
| Food chain<br>(n = 19)  | 15                      | 4         |
| Environment<br>(n = 24) | 18                      | 6         |
| <b>Total</b>            | <b>52</b>               | <b>20</b> |

## Total *E. coli* and Presumptive ESBL-*E. coli* in surface water and waste water

| Source of<br>water                  | <i>E. coli</i> (CFU/100 mL) |                        |                        |
|-------------------------------------|-----------------------------|------------------------|------------------------|
|                                     | Min.                        | Max.                   | Average                |
| <b>Surface water</b>                |                             |                        |                        |
| Total <i>E. coli</i>                | 10                          | 2.4 x 10 <sup>4</sup>  | 1.67 x 10 <sup>3</sup> |
| Presumptive<br>ESBL- <i>E. coli</i> | 0                           | 1.2 x 10 <sup>4</sup>  | 7.7 x 10 <sup>2</sup>  |
| <b>Waste water</b>                  |                             |                        |                        |
| Total <i>E. coli</i>                | 10                          | 3.0 x 10 <sup>5</sup>  | 7.52 x 10 <sup>4</sup> |
| Presumptive<br>ESBL- <i>E. coli</i> | 5                           | 1.38 x 10 <sup>4</sup> | 2.05 x 10 <sup>3</sup> |

### Data analysis

- Sequence type (ST)
- Plasmid replicon types
- AMR genes



DNA



<https://www.genomicepidemiology.org/>

Total ESBL- *E. coli* and Presumptive *E. coli* were also calculated in CFU/ 100 ml for Surface Water and Waste water.

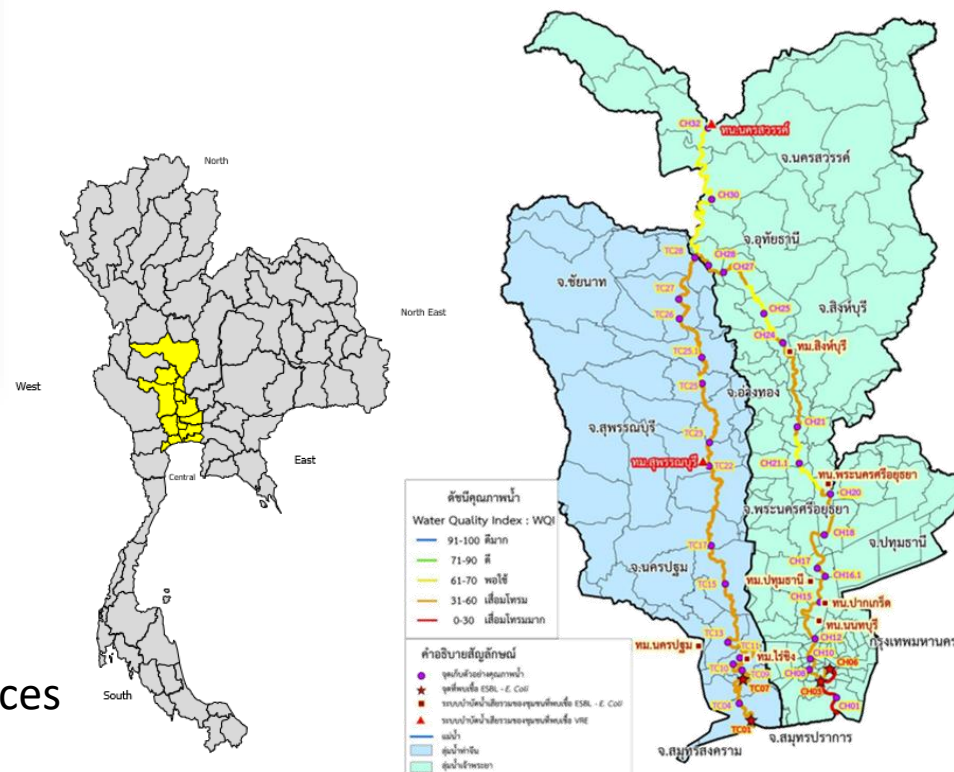
Credit: Dr. Pilailuk Akkapaiboon Okada



# Thailand's Integrated AMR Surveillance with the One Health Approach

- **Jointly planned and implemented** by three ministries: MOPH, MOAC and MONRE
- **Principle:** same place, same time, same pathogens, harmonized surveillance protocols
- **Targeted organisms:** *E. coli*, *Salmonella* spp., *Enterococcus faecalis* and *E. faecium*
- **Location:** Two river basins covering 13 provinces
- **Launched in 2022**

|                                 | Human   | Livestock   | Aquaculture   | Environment  |
|---------------------------------|---|---|---|--|
| National level / reference Lab. | - National Institute of Health, Department of Medical Sciences<br>- Department of Disease Control | - National Institute of Animal Health<br>- Bureau of Quality Control of Livestock Products, Department of Livestock Development | The Aquatic Animal Health Research and Development Division, Department of Fisheries      | - Pollution Control Department<br>- Department of Health         |
| Sub-national networks           | - Regional Medical Science Centers<br>- Hospital Laboratories                                     | - Animal Feed and Veterinary Product Control<br>- Veterinary Research and Development Centers                                   | Aquatic Animal Health and R&D Center  | - Regional Health Promotion Centers                              |
| Sample type                     | All patient specimen  | Caecum & Meat   | - Water from aquaculture pond/cage<br>- Gills (Fish, shrimp)<br>- Hepatopancreas (Shrimp) | - River water<br>- Community wastewater<br>- Hospital wastewater |
| Analysis                        | Phenotype and Genotype (WGS)  |   |   |  |



Source: Department of Medical Sciences

# Conclusions

- The Tricycle project provides a solid starting point.
- Thailand's Integrated AMR Surveillance with the One Health Approach
  - Surveillance scope expansion
  - Strong multi-sectoral AMR surveillance platform (led by MOPH, MOAC and MONRE)
  - Upcoming the first report of Thailand's Integrated AMR Surveillance with the One Health Approach
- Next step:
  - Continuing Thailand's Integrated AMR Surveillance System with the OH approach
  - Need for a global or international guideline for AMR surveillance in the environment to guide countries' implementation.



## SPECIAL THANKS TO:

The National AMR Surveillance Center Thailand (NARST), National Institute of Health (NIH), Department of Medical Sciences (DMSc), Ministry of Public Health (MOPH), for providing the slides on the Tricycle project and Thailand's integrated AMR surveillance under the One Health approach.



# One Health AMR Surveillance Network in Thailand

## Department of Medical Sciences

- National reference lab (AMR in human & food)
- AMR data coordinator

## Department of Disease Control

- Routine surveillance of healthcare-associated infection (HAI)

## Food and Drug Administration

- AMR multisectoral coordinator

## Department of Health

- AMR surveillance in hospital wastewater systems



Ministry of  
Public Health

## Pollution Control Department

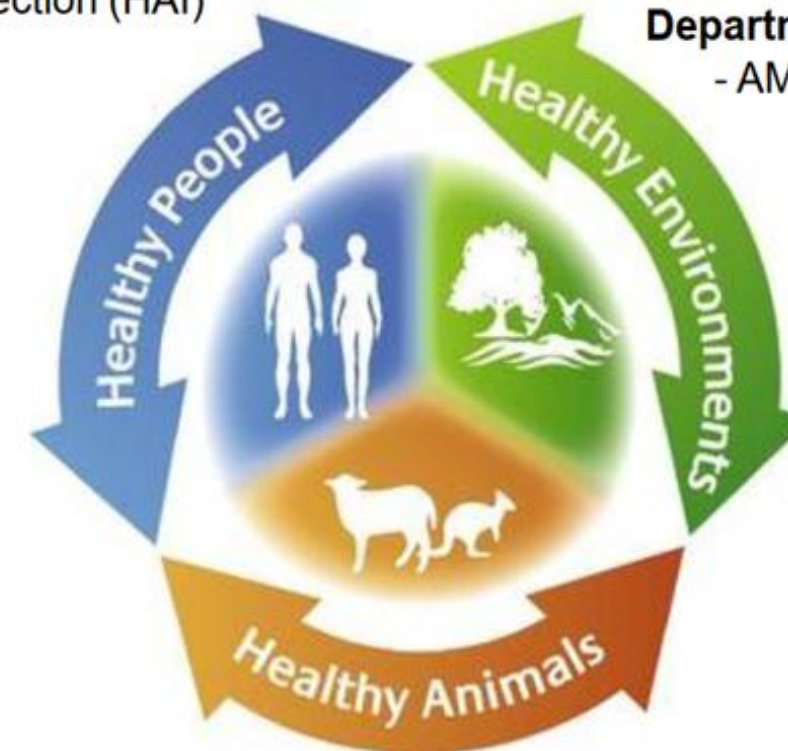
- AMR surveillance in water-related ecosystems

## Department of Health

- AMR surveillance in hospital wastewater systems



Ministry of Natural  
Resources  
and Environment



Ministry of Agriculture  
and Cooperatives



## Department of Livestock Development

- National reference lab (AMR in livestock)

## Department of Fisheries

- National reference lab (AMR in fisheries)

## Department of Agriculture

- AMR surveillance agriculture

Thank you for  
your kind attention.