“Review Multi-Sectoral Action Plan AMR”

Reviewing Workshop on the implementation of NAP and advancing collaborations in AMR/AMU surveillance/data sharing – Supported by Fleming Fund

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25-27 March 2025, Kampot, Cambodia

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- Possible sources of AMR in Cambodia and current knowledge
- Trend AMU in agriculture
- Multisectoral action plan for AMR 2019-2023
- MAFF responses to AMR
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From Global Perspective to National Action Plan

Five Objectives of the WHO Global Action Plan on AMR, 2015-19

- Strengthen Knowledge & Evidence Base
- Optimize Use of Antimicrobials
- Reduce the Incidence of Infection
- Improve Awareness and Understanding of AMR
- Make Economic Case for Investment

Possible causes of AMR in Cambodia

WHO, 2014 Stated that

- Over-prescribing antimicrobial
- Patients not finishing their treatment
- Overuse of antimicrobial in livestock and fish farming
- Poor infection control in hospital and clinics
- Lack of hygiene and poor sanitation
- Lack of new antibiotic being developed

It is not difficult to make microbes resistant to penicillin in the laboratory, and the same has occasionally happened in the body.

Alexander Fleming, 1945 (Nobel Prize Acceptance Speech)

General

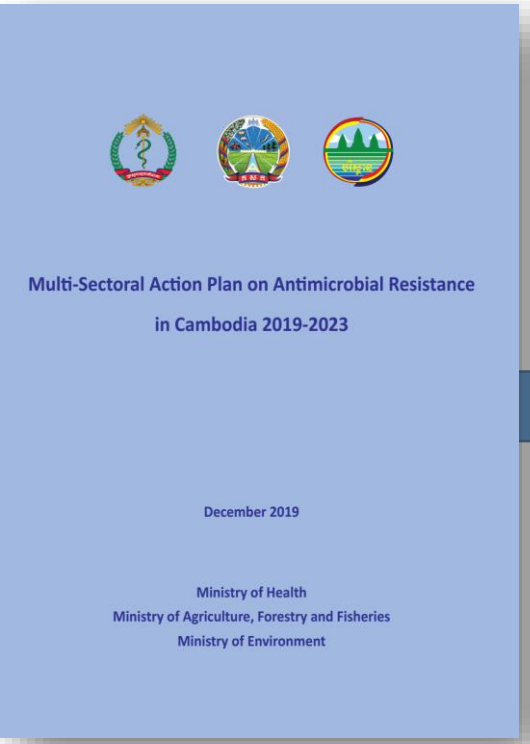
- Antibiotics can be purchased from any drug stores
- Discriminate use of antibiotics
  - Dose
  - Course of treatment
  - No proper prescription

Agriculture

- Use antibiotics as growth promoter and disease prevention
- This practice is commonly used in poultry and pig production, and in aquaculture
  - Dose may vary between producers
- Also use in crops

Consume meat with antibiotic residues or Use antibiotics without prescription?

Multi-sectoral Action Plan for AMR 2019-2023



Key Strategic objectives

1. Governance and coordination to reduce antimicrobial resistance
2. Evidence generation through surveillance and laboratories (Human and Animal)
3. Rational use of antimicrobial medicines
4. Containing AMR through good practices
5. Increasing public awareness
6. Building human capacity for antimicrobial resistance
7. Research and innovation for antimicrobial resistance

1.1 Strengthen technical and political coordination at local, national and international levels
1.2 Strengthen policy and legislative frameworks to support AMR initiatives
1.3 Resource mobilization to support MSAP implementation
1.4 M&E plan, indicators and regular evaluation
2.1 Establish/strengthen surveillance and laboratory activities and systems to support AMR
2.2 Strengthening human capacity for laboratory, information sharing, surveillance and outbreak response
2.3 Strengthen equipment and supply systems in laboratories for microbiology and surveillance
3.1 Guidance for and implementation of rational use of antimicrobial medicines
3.2 Regulation at different levels to support rational use
3.3 Establish supply chain management for antimicrobials to ensure equitable and universal access for all citizens
4.1 Guidance for and implementation of good practices
4.2 Ensure available technologies and supplies to implement protocols and guidelines
4.3 Monitoring water, food safety and waste management
5.1 Increase public awareness through traditional and social media
5.2 Integrate AMR communications in programmes and activities
6.1 Integrate AMR, microbiology, rational drug use and other areas into pre-service training curriculum and resources
6.2 Develop training resources and build capacity on AMR, microbiology, rational medicines use and related areas for in-service training and capacity building
6.3 Collaboration with professional societies and academics to integrate AMR and related issues for capacity building, advocacy, research and education
7.1 Identifying AMR research gaps and priorities in natural sciences, applied sciences, social sciences, economics and management
7.2 Training and capacity building of national staff for AMR and related research
7.3 Implementation and dissemination of AMR research

Current Activities of MAFF related to AMR

Governance

- Certificate for GAHP, GAP, GAqP (on going to adapt)
- Legislation
  - Procedure and Technical Requirement for Registration of Animal Feed, Ingredient and Additive (2018)
  - Procedure and Technical Requirement for Registration of Veterinary Drug (2018)
  - Procedure for Issuing Permit and Masnaging Animal Feed, Ingredient and Additive subjected for trade, production and preparing (2020)
  - Procedure for Managing Vet Drug and Biological Material subjected for trade and preparing (2020)

Practices

- Vaccination campaign by provincial vet, district and VAHW
- Sslaughterhouse inspection, animal movement & quarantine
- Cambodia Applied Veterinary Epidemiology Training (CAVET)
- Promote organic farming system
- Creation and management of village animal health worker
- Refreshing training for VAHW

Awareness

- Antibiotic Awareness Week,
- NAHPRI-GDAHP Newsletter (include AMR), OIE & FAO leaflet (translation)
- Integrate AMR to Veterinary curriculum in Royal University of Agriculture
- Integrate AMR to provincial officer training, CAVET,
- AMR Aware among private sectors, drug and feed company
- Meeting, national workshops (collaboration with OIE, FAO, WHO, …)

Research

- Evident base on national surveillance on AMR on animal pathogen, foodborne bacteria, …
- Standardized and harmonized surveillance methods for AMR
- Teaching & support sub-national microbiology lab, universities
- National AMR conference
- KAP on AMR
- KAP on vaccination

Institutions under MAFF for AMR work

- General Directorate of Animal Health and Production
- Fisheries Administration
- General Directorate of Agriculture
- Royal University of Agriculture




Multi-sectoral Action Plan for AMR 2019-2023

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Major achievements

- Strengthen technical and political coordination at local, national and international levels:
  - MAFF AMR TWG and their ToR have been established
  - Conducted regularly meeting (quarterly)
  - Joined AMR monthly meeting with MoH
  - Attended the regional WS/Training on MAR/AMU
- Strengthen policy and legislative frameworks to support AMR initiati ves:
  - Reviewed the policy and legislative frameworks to support AMR by FAO
  - Developed prakas/regulations to support AMR
- Resource mobilization to support MSAP implementation:
  - Existed Veterinary inspectors for veterinary drugs management
  - Existed gov. programs included the AMR activities
  - Resource from MPTF
- M&E plan, indicators and regular evaluation:
  - M&E tool developed;
  - M&E focal point;
  - Conducted AMR M&E follow up in sector
  - Regular inspected Vet drug retail shops by Provincial Offices of Animal Health and Production
  - Good coordination with private sector for AMU and AMR data sharing

Major challenges

- Time constrain with other commitment activity
- Needs more legislation to support AMR/AMU
- Limited Human resources
- Adequate knowledge on AMR
- Lack of budget.

Lessons learnt and priorities

- Enforcement of implementing the regulations
- Strong collaboration with development partner and private sectors
- Support from WOAH and FAO (both technical and financial)
- Reviewing the legislation frameworks for AMR in MAFF by FAO.

List of enacted laws and legislations

1. Pharmaceuticals (1996, amended 2007)
2. Sub-Decree on Agricultural Standard and Materials No. 69 (1998) and a Circular No. 345 (2002)
3. Sub-Decree No.17 ANKr-BK on the Organization and Functioning of the Ministry of Agriculture, Forestry and Fisheries (2000)
4. Sub-Decree No.26 ANKr-BK on the Creation and Management of Village Animal Health Agents (2001)
5. Sub-Decree 16 on the Sanitary Inspection of Animal and Animal Products (2003)
6. Law on Fisheries (2006)
7. Sub-decree No.108 on the Management of Slaughterhouse and Inspection of the Animal Sanitation, Meat and Products (2007), and the Control of Hygiene (2007)
8. Anukret No. 209 List of Prohibited and Restricted Goods in Exportation and Importation in accordance with AHTN 2012 (2007)
9. Sub-Decree No. 108 on the Management of Slaughterhouse and Control of Hygiene (2007)
10. Joint Prakas No. 363 on Management of Production, Import, Export and Trade of Veterinary Medicines (2007)
11. Prakas No. 225 (MAFF) on Technical Standards for Constructing Slaughterhouses (2008)
12. Prakas No. 227 (MAFF) on the Formalities of Inspecting Animal Sanitation and Products Derived from Domestic Animals (2008)
13. Sub-Decree No. 14/ANK on the Inspection of Animal Sanitary and Animal Originated Products
14. Prakas No. 131 on the Procedure of Inspecting Slaughterhouses Sanitation, Animal Meat Sanitation and Meat Products Produced from Animals (2010)
15. Prakas No. 99 on Imposing the Method Using of Good Agricultural Implementation of Fruit and Fresh Vegetable Production (2010)
16. Law on Pesticides and Fertilizers (2012)
17. Royal Kram No NS/ RKM/ 0112/ 005 on Promulgation of Law on Management of Pesticide and Agricultural Fertilizer (2012).
18. Prakas No. 415 on Procedure and Standard Requirement for Registration of Agricultural Fertilizer (2012)
19. Prakas No. 456 on Procedure and Standard Requirement for Pesticide Registration (2012).
20. Prakas No. 119 on Procedure of Management of Agricultural Fertilizer for Business (2013), and Prakas No. 120 on Procedure of Management of Pesticide for Business (2013).
21. **Law on Animal Health and Production (2016)**
22. **Decision of Established of AMR Technical Working Group of MAFF, 2017**
23. **Prakas No. 51 on Procedure and Technical Requirement for Registration of Animal Feed, Ingredient and Additive (2018)**
24. **Prakas No. 208 on Procedure and Technical Requirement for Registration of Veterinary Drug (2018)**
25. **Prakas No. 228 on Procedure for Issuing Permit and Masnaging Animal Feed, Ingredient and Additive subjected for trade, production and preparing (2020)**
26. **Prakas No. 384 on Procedure for Managing Vet Drug and Biological Material subjected for trade and preparing (2020)**

List of enacted laws and legislations

Prohibited drugs

- Chloramphenicol and its salts and derivatives
- Clenbuterol and its salts and derivatives
- Diethylstilbestrol or other stilbene compounds (DES)
- Fluoroquinolones
- Glycopeptides, Vancomycin
- Nitroimidazoles, Dimetridazole, Ipronidazole, Metronidazole and others
- Nitrofuran compound.
- Sulfonamide
- Other Codex Alimentarius prohibited antibiotics

Restricted drugs

- Sulfonamide drugs (cannot use during lactation)
- Phenylbutazone (cannot use in heifer over 20 months old)
- Cephalosporins (not including cephapirin) (only for treatment)
- Nonmedicinal grade Dimethylsulfoxide (DMSO) (not in dairy farm)
- Dipyrone (not in dairy farm)
- Colloidal Silver (not in dairy farm)
- Use of Fenthion, Famphur and Xylene, Phosmet, Levamisole and all ivermectin and avermectin required advance permission
- Substances in schedule I (lack of accepted safety for use under medical supervision, and a high potential for abuse)

Multi-sectoral Action Plan for AMR 2019-2023

Key Strategic objectives

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Major achievements

- AMR surveillance in agriculture developed and implemented
  - AMR surveillance on E.coli and Salmonella in pork and beef from slaughterhouses;
  - AMR surveillance on E. coli and Salmonella in chicken at the markets in 5 provinces;
  - AMR surveillance in pigs from slaughterhouses in three provinces;
  - AMR in smallholder pig production in Cambodia;
  - Bacterial food safety hazards and risks in Cambodian meat value chain, with special emphasis on AMR;
  - Assessing the link between the circulation of antimicrobial-resistant organisms in animals and human health in Cambodia; and
  - Antimicrobial use and resistance of A. hydrophilia in striped catfish in Cambodian aquaculture farms.

Major challenges

- Budget for AMR surveillance
- AMU data
- Report
- Supportive legislation

Lessons learnt and priorities

- AMR in aquaculture
- AMR in smallholder livestock producers

AMR Surveillance under the National Action Plan

Planned activities

- Strengthen laboratory capacity through involvement in the Assessment Tool for Laboratory and Antimicrobial Resistance (ATLASS) and training on priority protocols
- Participate in proficiency tests conducted by external institutions to provide external quality assurance for laboratories involved in AMR surveillance
- Build capacity for drug residue monitoring in food, agriculture and environment laboratories
- Continue and increase identification of antimicrobial resistance in food, agricultural products and the environment
- Implement drug residue monitoring in food, agriculture and environment systems
- Establish AMR surveillance and response systems in agriculture and environment labs

Stakeholders

- MFAFF: GDAHP, FiA, GDA, DAI, RUA, PNIA, KNIA
- MOE: GDEP, GDEIK
- Partners: FAO, OIE, MOE's partners and others

Current state of AMR surveillance in food and agriculture

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Cambodia AMR Surveillance Program in the Animal Health Sector (CASP-AH)

Objectives

1. Monitor trends of antimicrobial resistance in priority animal pathogens from which treatment guidelines can be developed from.
2. Monitor trends in the prevalence of resistance to antimicrobial agents in target bacteria from food animals and animal products, for risk assessment and development of evidence-based policies.

Coordinated AMR Animal and Human surveillance result by AMR TWG

Current state of AMR surveillance in food and agriculture

Cambodia AMR Surveillance Program in the Animal Health Sector (CASP-AH)

Objectives

1. Monitor trends of antimicrobial resistance in priority animal pathogens from which treatment guidelines can be developed from.
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AMR surveillance implemented and coordinated by NAHPRI/GDAHP

Involvement of subnational vet. authorities and private sectors

Some objectives influenced by funding agencies

- Government budgets
- Development Partners
- Research partners Universities..

	Objective	Responsible institution	Year to commence
Objective 1	Determine resistance patterns in animal pathogens from clinically diseased livestock	GDAHP	2023-2028
Objective 2	Determine resistance patterns in animal pathogens in healthy food-borne bacteria in food animals intended for consumption	GDAHP	2023-2028
Objective 3	Determine resistance patterns in pathogens from clinically diseased aquatic animals	FIA + GDAHP	2023-2028
Objective 4	Determine resistance patterns in pathogens from healthy aquatic animals	FIA + GDAHP	2023-2028
Objective 5	AMR prevalence in bacterial isolates from manure and slurry in farm settings will also be targeted	GDAHP + MoE	2023-2028

safetynet

Reducing microbial contamination of meat at slaughterhouses in Ca

Sothyra Tum

Background

Food-borne diseases, in particular those related to meat and meat products, have recently become a matter of great public concern as they can transmit infections and diseases either through handling or ingestion by humans. There are number of potential contamination sources along the food processing chain resulting in a significant cause of morbidity and mortality in both the developed and developing countries (Schlundt et al., 2004). Seeing the important of foodborne disease and in response to an increasing demand for food safety and rising consumer concerns, the department of animal health and production (DAHP) focuses its attention on development of appropriate regulation over the processing of livestock and consumer protection policy that the Veterinary Public Health Office (VPHO) has been given the mandate.

Important to the problem

Foodborne diseases continue to be a significant burden on both human and animal health, and slow down our ability to provide safe food. A common strategy to prevent foodborne zoonotic infections in human is meat inspection.

Figure 1: Common slaughtering pra
Cambodia

However, this procedure will not
presence of zoonotic agents
infections may present without
of illness and with no apparent m
lesions and other micr
contaminated during the processi
where the general sanitary cor
slaughterhouses are poor.

Sanitary conditions in slaughterh
meat retailers in Phnom Penh are
methods of handling and sl
followed traditional ways. Lack
principles of hygiene, particularl
of slaughtering process; lack of
hygiene as workmen do not pay a
protecting the products and/or t
operations are taken place on
resulting in high level of contamir

Meat collected from slaughterh
meat retailers were contamin
Salmonella spp. (35%), faecal
(32%), total aerobes at 30°C (26
reducing anaerobes (5%
Staphylococcus aureus (2%) (Figu

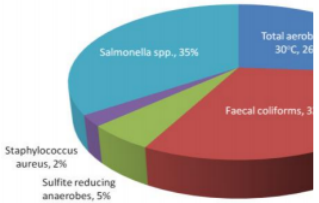

Figure 1: Proportion of microbial conta
meat collected from slaughterhouses
retailers

High multiple antimicrobial
profiles for Salmonella spp. to a
(8.3–90.0%), nalidixic acid (16
sulfonamide (8.5–75.0%) and t

FULL PAPER *Bacteriology*

Prevalence, Numbers and Antimicrobial Susceptibilities of *Salmonella* Serov *Campylobacter* spp. in Retail Poultry in Phnom Penh, Cambodia

Kruy Sun LAY[1)]*, Yith VUTHY[1)], Ping SONG[1)], Khem PHOL[1)] and Jean Louis SARTHOU[1)]

[1)]*Food Microbiology Laboratory, Institut Pasteur du Cambodge, Phnom Penh, Cambodia*

(Received 30 August 2010/Accepted 19 October 2010/Published online in J-STAGE 2 November 2010)

ABSTRACT. *Salmonella* and *Campylobacter* are common bacterial pathogens associated with human gastro-enteritis; and considered to be an important source of these bacteria. To evaluate whether the *Salmonella* serovars and *Campylobacte* could be monitored for the purpose of microbial presence, enumeration and antimicrobial resistance in raw poultry, 152 po were randomly selected from 10 markets in retail outlets of Phnom Penh during March 2006 to February 2007. The majo samples was contaminated by *Salmonella* serovars (88.2%) and *Campylobacter* spp. (80.9%). A very high contamination was found at 3–4 $\log_{10}$ CFU/g for 22.4% of samples and of *Campylobacter* at 7–8 $\log_{10}$ CFU/g for 1.3% of samples. Fifty *Salmonella* serovars contaminated 134 poultry carcasses; five most prevalent serovars covered 29.1% of serovars isolates (*J* imurium, Corvallis, Stanley and Enteritidis). Three *Campylobacter* species contaminating 123 raw poultry were *Campyl* (50.0%), *Campylobacter coli* (29.0%) and *Campylobacter lari* (21.0%). High antibiotic resistance percentages were fou *monella* serovars and *Campylobacter* spp. isolates. This study revealed that raw poultry at the retail outlets in Phnom Pe contaminated with high prevalences of food-borne pathogens, and communicating the importance of minimizing this ri human infections.

KEY WORDS: antimicrobial susceptibility, *Campylobacter*, poultry, prevalence, *Salmonella*.

J. Vet. Med. Sci. 73(3):

Salmonella and *Campylobacter* are both the most important food-borne diseases and cause substantial medical and economic burdens worldwide. In developing countries, investigations have shown that infection caused by *Campylobacter* spp. may be as serious as those by *Salmonella* serovars, both in frequency and severity symptoms [3]. Poultry is one of the principal reservoirs of non typhoid human *Salmonella* infection and causes potential of food-poisoning hazards [5, 14]. *Campylobacter jejuni* and *Campylobacter coli* infecting also poultry carcasses are major causes of gastroenteritidis in human [7, 17]. To prevent poultry carcass contaminations, it is crucial to control *Salmonella* serovars and *Campylobacter* spp. infections along the food production chain. But in spite of improved hygiene at the farm and slaughterhouse levels, numerous poultry carcasses remain infected in retail outlets [3]. Because of this, a number of actions have been taken to reduce the prevalence of *Salmonella* and *Campylobacter* with public health significance in food-producing animals. Quantitative microbiology risk assessment is still hampered by the lack of quantitative data. The generation of appropriate data with high sensitivity is a challenge for microbiologists since currently used bacteriological quantitation methodologies are laborious. Furthermore, quantitative *Salmonella* data for food associated with severe outbreaks have shown that the type of food plays a major role in the severity of illness. *Salmonella* in fatty food may have an advantage during passage through the acidic environment of the stomach to the intestine, where the cells become invasive regardless the damage caused

In Cambodia, very little is known regardir
rence of food borne disease caused by enteric
this, the authors processed to evaluate preval
bers and antimicrobial susceptibilities of *Salm*
vars and *Campylobacter* spp. in retail outlets of
markets during one year period.

MATERIALS AND METHODS

Samples: Between March 2006 to Februa
poultry carcasses were collected from retail
markets in Phnom Penh city of Cambodia.
slaughtered directly in these markets sites.
three samples were selected from each fixed
within three different markets, and another wee
markets will be interested. The random was p
this along 10 markets during one year period.
poultry carcasses were selected, because the
poultry neck skin retained micro-organisms.

Isolation and identification of Salmonella:
isolation of *Salmonella* was conducted usi
method ISO 6579 as previously described [11].
well-isolated colonies with black center typica
morphology were collected from selective med
fied by using biochemical reactions. Isolates
Salmonella were confirmed to be *Salmonella* se
on detection of somatic and flagella antigens.

Enumeration of Salmonella: A semi-
approach using modified semisolid Rappapor
(MSRV) agar was applied [18] by practice suc
tions and by aspired 0.5 m*l* of aliquot (1/10)

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Microbiology and Immunology

Microbiol Immunol 2016; 60: 575–585
doi: 10.1111/1348-0421.12407

ORIGINAL ARTICLE

Occurrence and molecular characteristics of antimicrobial resistance of *Escherichia coli* from broilers, pigs and meat products in Thailand and Cambodia provinces

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ABSTRACT

Nine hundred and forty-one samples were collected in Sa Keao, Thailand ($n = 554$) and Banteay Meanchey, Cambodia ($n = 387$) from July 2014 to January 2015. A total of 667 *Escherichia coli* isolates (381 isolates from Sa Keao and 286 isolates from Banteay Meanchey) were obtained and examined for antimicrobial susceptibility, class 1 integrons, ESBL genes and horizontal transfer of resistance determinants. Prevalence of *E. coli* in pig and broiler carcass samples from slaughterhouses and fresh markets was 36–85% in Sa Keao and 11–69% in Banteay Meanchey. The majority of these isolates were multidrug resistant (75.3%). Class 1 integrons were common in both Thai (47%) and Cambodian (62%) isolates, of which four resistance gene cassette arrays including *aadA1*, *dfrA1-aadA1*, *dfrA12-aadA2* and *aadA2-linF* were identified. Class 1 integrons in two broiler isolates from Sa Keao (*dfrA12-aadA2*) and one broiler isolate from Banteay Meanchey (*dfrA1-aadA1*) were horizontally transferable. Sixteen isolates were confirmed to be ESBL-producing strains with ESBL gene $bla_{CTX-M-15}$, broad spectrum β-lactamase gene bla_{TEM-1} and the AmpC gene bla_{CMY-2} being detected. The bla_{TEM-1} gene was most prevalent and located on a conjugative plasmid.

Key words antimicrobial resistance, Cambodia, *Escherichia coli*, Thailand.

Antimicrobial resistance (AMR) is a serious concern in human and veterinary medicine. Infections with AMR bacterial pathogens have increased globally and led to the rise of medical expenses, treatment failure and increased morbidity and mortality. Surveillance of AMR in zoonotic agents and indicator bacteria of commensal flora represents an important step in developing an effective control and prevention action plan to combat AMR (1). For this reason, commensal *Escherichia coli* from healthy food animals are suggested as indicator species for AMR in Gram-negative bacteria.

It is well known that resistance genes in bacteria are often linked to mobile genetic elements, especially integrons that are capable of capturing and mobilizing genes (2). Within this group of genetic elements, class 1 integrons are the most frequent type identified in Enterobacteriae (3). Simultaneously, ESBL-producing Enterobactericeae has rapidly increased worldwide and acquisition of ESBL genes has been increasingly recognized (4). Both class 1 integrons and ESBL genes are commonly located on transferable plasmids that are potentially transferred intra- and interspecies, leading to the emergence and spread of MDR bacterial strains.

Escherichia coli are ubiquitous in the intestinal tract of humans and animals. Even though commensal *E. coli* is usually non-pathogenic, it is one of the most frequent bacteria of the Enterobacteriaceae family

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Received 6 April 2016; revised 6 July 2016; accepted 24 July 2016.

List of Abbreviations: AMR, antimicrobial resistance; ESBL, extended-spectrum β-lactamase; MDR, multidrug resistance.

Student posters

ចំណេះដឹងផ្នែក គំនិត និងការអនុវត្ត
បសុឱសថលើជ្រកនៅឃុំបខេល ស្រុ

នាង សុរិយា*, ជា ប៊ុនថុន*, ឆង់ លីដា**, ជា ប៊ុនណា, * ជា រតន
*សាកលវិទ្យាល័យភូមិន្ទកសិកម្ម, **អគ្គនាយកដ្ឋានសុខភាពសត្វ និងផលិតកម្មសត្វ, **វិទ្យាស្ថានជំរុំ

Abstract

ការសិក្សានេះធ្វើឡើងរយៈពេល ៣ខែគឺចាប់ពីខែ មីនា ដល់ខែឧសភា ឆ្នាំ២០១៧ ដែលសិក្សាទៅលើ ប្រធានប
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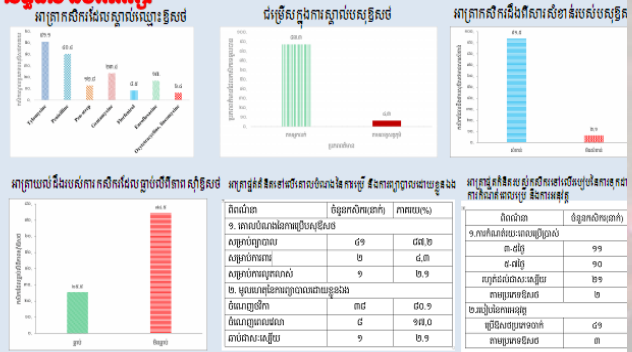
ប៉ាល់ទំនួរត្រវបានធ្វើឡើងដោយផ្ទាល់លើចំនួនបសុចំនាន់ ១ចំនួន ៤គឺ ចំនេះដឹង ផ្នត់គំនិត ការអនុវត្ត និងហានិភ័យនៃការ
ចំនួនមួយចំណែ Tylomycine, Penicilline, Pen-strep, Gentamycine និង Oxytetracycline ដែលក្នុងសិក្សាស្រាវ ។ ឱសថ
មាន ៥១.9% ហើយកសិករដែល ស្គាល់ឱសថទាំង តាមរយៈអ្នកលក់មាន ៨៧.៣% ម្ចាស់ឱ្យទៀតកសិករដែលបាន
ការអប់រំទៅលើការប្រើ ជ្រាស់ឱសថមានសារៈសំខាន់ចំពោះកសិករមាន ៨៥.9%។ កសិករភាគច្រើនព្យាបាល ដោយ ខ្
នៅលើសត្វជំ មាន ៩.៥% ហើយ ៨៨.៧% កសិក ប្រើប្រាស់ឱសថរហូតដល់សត្វជាសៈស្បើយ។ មានឱសថ ១៣ប្រ
lactams, Streptomycine និង Oxytetracycline ហើយ ៧0% កសិករ បានសម្រេចចិត្តប្រើតាមអ្នកលក់ប្រាប់ ហើយ
បង្កើនប្រសិទ្ធ ភាព។ សូបសេចក្តីមក ជាទូទៅប្រជាកសិករចិញ្ចឹមជ្រកជាលក្ខណៈគ្រួសារនៅឃុំបខេលតែងជួបប្រទៈនៅ
សថ ជាពិសេសលួកអង់ទីប៉ុទិចគ្រប់គ្រួសារ។

សេចក្តីផ្តើម

ចាប់តាំងពីមានការណែនាំដំបូងអោយប្រើប្រាស់ឱសថអង់ទីប៉ុទិចសម្រាប់ព្យាបាលជងឹក្នុង ឆ្នាំ១៩៤0 ភាព សុំឱសថអង់ទីប៉ុទិចលេចឡើង ហើយវិត្តន៍ប្រឆាំងត្រប់ថ្នាក់ទាំងអស់នៃឱ សថអង់ទីប៉ុទិច (Mazel et al., 1999)។ នាពេល បច្ចុប្បន្ន ភាពសុំាំប្រឆាំងទីក្រុប (antimicrobial resistance) ត្រូវបានបង្ហាញថាជា ការគំរាមកំបែង ដល់សុខមាលភាពសា ធារណៈទូទាំងសកលលោក និងប្រទេសកម្ពុជា (Mieghe et al., 2013) ។ ជាលទ្ធផលបសុឱ សថជាច្រើន ប្រែជាបាត់បង់ប្រសិទ្ធភា និងការស្តិតស្តេរយូរនេះ ធ្វើអោយមានការបន្លួងទៅ មនុស្សផ្សេងទៀត ។ ការគំរាមកំបែងនេះនឹងបង្កអោយមនុស្សស្លាប់ ១0 លាននាក់ក្នុងឆ្នាំ ២0៥0 (WHO, 2014) ។

ទិន្នន័យ និងវិភាគ



Conclusion

- គ្រួសារដែលប្រើប្រាស់ បសុឱសថមានស្ទើរតែទាំងអស់ នៃអ្នកដែលបាសង្កាសន៍
- គ្រួសារកសិកម្មមួយចំនួនមិនបានធ្វើពាក់សាំងនិងធ្វើអនាម័យ
- ប្រើប្រាស់ឱសថក្នុងការព្យាបាល ដែលជា បញ្ហាធ្វើអោយមានភាពសុំាឱសថប្រសិនប្រើមិនត្រូវតាម បច្ចេកទេសអោយបានត្រឹមត្រូវ។
- ចំណេះការសួរបសុឱសថមាន ៩៣.៦ភាគរយ
- ហើយកសិករស្គាល់តាមរយៈ អ្នកលក់មាន ៨៧.៣ភាគរយខ្ពស់ជាងការស្គាល់តាមពេទ្យសត្វ ៦.៨ ភាគរយ បំណ្លេះ។
- ចំណេះដឹងទៅលើសារ សំខាន់នៃការប្រើឱសថសំរាប់ព្យាបាលមាន ៨៧.៦ភាគរយ
- ចំណេះដឹងទៅលើការសុំាឱសថអ្នកដែល មិនស្គាល់មានរហ័ស ៣៩.៩ភាគរយ
- ផ្នត់គំនិតកសិករទៅលើការព្យាបាលគឺពុកគាត់ព្យាបាលដោយខ្លួនដោយមើលឃើញទៅតា ចំណេញប្រាក់

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Mazel, D. A
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ANTIMICROBIAL RESISTANCE PROFILES IN COMMENSAL *ESCHERICHIA COLI* ISOLATED FRO
ENVIRONMENT OF THE FACULTY OF VETERINARY MEDICINE-RUA

Thong Sokneng[1,*], Chea Rortana[2,*], Chea Bunthon[1], Kong Lida[3], Ly Sreynet[1], Seng Sarim[1], Por Ravuth[1], Seng Rithy[1] and Sum Samuth[1], Yann Sovankongkea[2], Venn Vutey[
[1]Royal University of Agriculture; [2]General Directorate of Animal Health and Production and [3]Pasteur Institute of Cambodia, Phnom Penh, Cambodia, *author equality contri

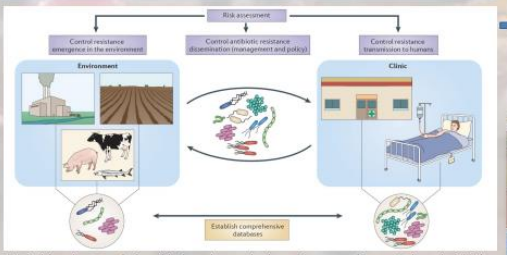
Abstract

The aim of the study was to isolate the commensal *E. coli* from chicken farm environment of Faculty Veterinary Medicine, Royal University Agriculture and test for their resistance profiles to antimicrobial agents. The specimens were swapped from floor (n=4), drinking water container (n=4) and feed container (n=4). All the isolates (n=16) were tested for the susceptibility profiles to ciprofloxacin, tetracycline, gentamycin, ceftazidime, cefoxitin using CLSI-VET01-A4. The result of susceptibility showed that the isolates resistance to ciprofloxacin at 31.25%, tetracycline 68.75%, gentamycin 62.5% and cefoxitin 12.5%. The result suggested for monitoring and surveillance on AMR resistance profiles in environmental bacteria which could be a basic input for making policy to reduce AMR.

Keyword: Antimicrobial resistance, commensal bacteria and chicken farm environment

Introduction

AMR cause various impacts on human and animals by prolonging disease recovery times, consuming therapeutic resources, or eventually leading to treatment failure. The commensal bacteria in chicken farm are consume for health because those bacteria can cause disease, but carried AMR gone to spread somewhere else (Berendonk et al., 2015).



Minimizing the spread of antibiotic resistance in the environment (Berendonk et al., 2015)

Results and Discussion

AMR cause various impacts on human and animals by prolonging disease recovery times, consuming therapeutic resources, or eventually leading to treatment failure. The commensal bacteria in chicken farm are consume for health because those bacteria can cause disease, but carried AMR gone to spread somewhere else (Berendonk et al., 2015). The isolate of Ecoli was found in every specimen (Table 1) and AMR profile is in Table 2.

Table 1. Result of bacteria isolation from each specimen type.

Block ID	Position of Specimen	Bacteria species
BR2.F	Feed tank	*Escherichia coli*
BR2.L	Floor	*Escherichia coli*
CO2.L	Floor	*Escherichia coli*
CO2.W	Water tank	*Escherichia coli*
CT1.L	Floor	*Escherichia coli*
CT1.R	Floor	*Escherichia coli*
CT2.L	Floor	*Escherichia coli*
CT4.W	Feed tank	*Escherichia coli*
RB3.F	Feed tank	*Escherichia coli*
RB3.L	Floor	*Escherichia coli*
RB3.R	Floor	*Escherichia coli*
RB3.W	Water tank	*Escherichia coli*
RT4.F	Feed tank	*Escherichia coli*
RT4.L	Floor	*Escherichia coli*
RT4.R	Floor	*Escherichia coli*
RT4.W	Water tank	*Escherichia coli*

Acknowledgment: This study is a part of full thesis of Mr. Thong Sokneng, FVM-RUA, 2017

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Methods

- Bacteria species isolated in Chicken Farm of FVM-RUA in Ap
- *Escherichia coli* identification: Markey et al., 2013
- Antimicrobial susceptibility: disk diffusion using CLSI standa

E.coli species identification (Markey et al., 2013)

Disk Diffusion method

Table 2. Susceptibility profiles of 5 antimicrobial agents to

Antimicrobial Agents	Isolates	Susceptible		Inte
		n	%	n
Ciprofloxacin	16	11	68.7	0
Tetracyccline	16	3	18.7	2
Gentamicin	16	6	37.5	0
Cefoxitin	16	12	75.0	4
Ceftazidime	16	14	87.7	0

Conclusion and Recommendation

The result could be concluded as following:
- All kind of specimens were contaminated with *E.coli*
- The majority of isolates were resistant to tetracyccline an

The recommendation could be:
- Strengthening biosecurity
- Further study on AMR in other animals and correlation wi

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តាពស៊ាំនឹងឱសថប្រឆាំងមេរោគ នៅក្នុងបាក់តេរីញែកចេញពី ពោះវៀនមាន់ នៅឃុំ សន្លុង ស្រុកខ្សាច់កណ្តាល ខេត្តកណ្តាល

ANTIMICROBIAL RESISTENCE PROFILE IN BACTERIA IN HY-LINE BROWN GUT AT SANLUNG COMMUNE, KHSACH KANDAL DISTRICT, KANDAL PROVINCE

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*សាកលវិទ្យាល័យភូមិន្ទកសិកម្ម, **អគ្គនាយកដ្ឋានសុខភាពសត្វ និងផលិតកម្មសត្វ, *វិទ្យាស្ថានជំរុំ*ពេញ ព្រះរាជាណាចក្រកម្ពុជា

សេចក្តីសង្ខេប

ភាពស៊ាំនឹងឱសថប្រឆាំងមេរោគកើតឡើងដោយបាក់តេរីដែលមានភាពធន់នឹងឱសថប្រឆាំងមេរោគ ដែលកើមុខមកពីការមិនមានអនុវិជ្ជន៍។ ការធ្វើអោយមានព្រោះថ្នាក់យ៉ាងធ្ងន់ធ្ងរដល់សុខភាពមនុស្ស និងសត្វ ដោយសារការប្រើប្រាស់ឱសថប្រឆាំងមេរោគលែងមានប្រសិទ្ធភាពព្យាបាលជំងឺ។ ចំពោះសំណាកដែលបានយកមកសិក្សាគឺក្រពេះ:យកចេញពីមាន់ដែលពិលាងយកសាច់ ចំនួន ២២ ក្បាល ហើយបានរៈយកថ្លែងថ្លែងពោះវៀន (Caecum) ដើម្បីយកមកធ្វើការស្ទែងរកប្រភេទបាក់តេរី និងភាពស៊ាំបាក់តេរីនឹងឱសថប្រឆាំងមេរោគ។ បាក់តេរីដែលបានរកឃើញមាន *Escherichia coli* ១៨ សំណាក (៦៥%) និង បាក់តេរីដែលមិនបានវិភាគប្រភេទ ក្នុងគ្រួសារ Enterobacteriaceae មានចំនួន ៦ (២៧%) សំណាក ដែលបានយកមកពិនិត្យរ៉ៃ ប្រសិទ្ធភាពឱសថប្រឆាំងមេរោគ តាមវិធីសាស្ត្រ Disk diffusion ដែលបានវែងនៅក្នុង CLSI-01S និង បកស្រាយលទ្ធផលតាម CLSI VET01-A4 និង CLSI-M100- S26 ។ យោងតាមទន្ទឹមនឹង ការសិក្សានៅសហរដ្ឋអាមេរិចក្នុងប៉ុណ្ណោះ non-toxigenic *E.coli* ដែលញែកពីមាន់ភាពស៊ាំជាមួយ tetracycline (៥៩%) streptomycin (៨៨%) sulfamethoxazole (៨៨%) cephalothin (៣៩%) និង ampicillin (៣៩%)។

តារាងទី១. លទ្ធផល វត្តមានបាក់តេរីនៅក្នុងពោះវៀន និងភាពស៊ាំនឹងឱសថប្រឆាំងមេរោគ

ឈ្មោះឱសថ	ប្រសិទ្ធភាពឱសថ	ឈ្មោះបាក់តេរី	
		E.coli (n = ១៨)	Enterobacteriaceae (n = ៦)
Ampicillin	R	១៨(១00%)	៦(១00%)
	I	0(0%)	0(0%)
	S	0(0%)	0(0%)
Oxytetracycline	R	១១(៦៥%)	៦(១00%)
	I	២(១៨%)	0(0%)
	S	៥(៧%)	0(0%)
Enrofloxacin	R	១0(៥៦%)	៦(१00%)
	I	0(0%)	0(0%)
	S	៨(४४%)	0(0%)
Erythomycin	R	១៣(៧៣%)	៥(८३%)
	I	១(៧%)	९(९0%)
	S	0(0%)	0(0%)
Trimethoprim-sulfamethoxazole	R	៩(५८%)	६(१00%)
	I	0(0%)	0(0%)
	S	៥(२८%)	0(0%)

Introduction

Antimicrobial គឺជាឱសថប្រើប្រាស់សម្រាប់សម្លាប់ ឬការពារការលូតលាស់នៃពពួកមីក្រុសារពាង្គកាយ។ Antimicrobial បានរកឃើញនៅក្នុងឆ្នាំ ១៩៣0 នៅសហរដ្ឋអាមេរិច។ ភាពស៊ាំនៅក្នុងបាក់តេរីទល់នឹងឱសថប្រឆាំងមេរោគ (antimicrobial resistance) គឺមានការកើតឡើងជ្រេរៗគ្នា ដែលមានការព្រួយបារម្ភយ៉ាងខ្លាំងចំពោះសុខភាពមនុស្ស និងសត្វដែលធ្វើអោយការបង្កជំងឺកាន់តែឈ្លា ដោយសារតែការព្យាបាលមិនត្រឹមត្រូវតាមការកំណត់ ឬក៏ដោយសារការខកខានខ្លួនមានការព្យាបាល (Davies & Davies, 2010)។

វិធីសាស្ត្រស្រាវជ្រាវ

ការពិសោធន៍ធ្វើឡើងតាមវិធីសាស្ត្រដូចតទៅ ៖

- វិធីសាស្ត្របណ្តុះបាក់តេរី ៖ សំណាកពោះវៀនមាន់ចំនួន ២២ ដែលបានយកមកធ្វើការញែកអត្តមាននៃបាក់តេរី *E coli* (Markey et al., 2013)។
- វិធីសាស្ត្រកំណត់ស៊ាំនឹងឱសថប្រឆាំងមេរោគ ៖ Disk diffusion method (Ampicillin, Oxytetracycline, Enrofloxacin, Erythromycin and Trimethoprim-Sulfamethoxazol)។ *E.coli* ATCC 25922 ត្រូវបានយកមកធ្វើការបណ្តុះសម្រាប់ត្រប់ត្រង់សំណាក។ (CLSI, 2014) ។

លទ្ធផល និងវិភាគ

បាក់តេរីដែលបានរកឃើញពីការញែកបាក់តេរីនៅក្នុងការសិក្សានេះរួមមាន *E.coli* ២៤% (១៨/២២ សំណាក) និង Enterobactericeae ២៧% (៦/២២ សំណាក) និងការសាយនៃភាពស៊ាំបាក់តេរីទល់នឹងឱសថប្រឆាំងមេរោគមានដូចជា ៖ Ampicillin (१00%), Oxytetracycline (८८%), Enrofloxacin (८0%), Erythromycin (८0%) និង Sulfamethoxazole-Trimethoprim (४८%)។ យោងតាមការសិក្សារបស់ Zhao et al.(2001) បានរាយការណ៍ថា ៣८.४% នៃការកត្តាកាន់ *E.coli* នៅក្នុងសាច់មាន់ដែលសិក្សានៅក្នុងទីក្រុង Washington D.C., USA។ Voravuthikunchai et al. (2002) បានអោយដឹងថា ४% នៃ *E.coli* O157 និង ८.६% នៃ *E.coli* ផ្សេងទៀតនៅក្នុងសំណាកមួយអាហារនៅក្នុងប្រទេសថៃភាគខាងក្បែង។ យោងតាមការសិក្សានៅសហរដ្ឋអាមេរិចក្នុងបំណោ non-toxigenic *E.coli* ដែលញែកពីមាន់ភាពស៊ាំជាមួយ tetracycline (५८%) streptomycin (८८%) sulfamethoxazole (८८%) cephalothin (८८%) និង ampicillin (८८%)។

តារាងទី១. លទ្ធផល វត្តមានបាក់តេរីនៅក្នុងពោះវៀន និងភាពស៊ាំនឹងឱសថប្រឆាំងមេរោគ

ឈ្មោះឱសថ	ប្រសិទ្ធភាពឱសថ	ឈ្មោះបាក់តេរី	
		E.coli (n = ९८)	Enterobacteriaceae (n = ६)
Ampicillin	R	९८(१00%)	६(१00%)
	I	0(0%)	0(0%)
	S	0(0%)	0(0%)
Oxytetracycline	R	११(४८%)	६(१00%)
	I	६(९८%)	0(0%)
	S	९(४%)	0(0%)
Enrofloxacin	R	१0(४१%)	६(१00%)
	I	0(0%)	0(0%)
	S	८(६८%)	0(0%)
Erythomycin	R	१३(८८%)	५(८३%)
	I	९(४%)	९(९0%)
	S	0(0%)	0(0%)
Trimethoprim-sulfamethoxazole	R	८(६८%)	६(१00%)
	I	0(0%)	0(0%)
	S	५(८३%)	0(0%)

សន្និដ្ឋាន និងអនុសាសន៍

- ភាគីមានវត្តមាននៅក្នុងការពិសោធន៍នេះ
- ភាពស៊ាំបាក់តេរីទល់នឹងឱសថប្រឆាំងមេរោគក្នុងការពិសោធន៍នេះគឺមានកម្រិតខ្ពស់ បើប្រៀបធៀបជាមួយនឹងប្រទេសផ្សេងទៀត
- ដូច្នេះយើងត្រូវមានការប្រុងប្រយ័ត្ន និងយកចិត្តទុកដាក់ទៅលើអនាម័យចំពោះមនុស្ស សត្វ ក៏ដូចជាចំពោះមួយអាហារ ជាពិសេសចំពោះការព្យាបាលសត្វជង្ងឹដែរ
- ធ្វើការសម្លាប់មេរោគចំពោះថ្នែងសម្រាប់ជាក់សត្វចិញ្ចឹម
- ពង្រឹង ប្រព័ន្ធជីវៈសុវត្ថិភាព ជាងការប្រើប្រាស់ឱសថ
- ត្រូវប្រើប្រាស់ឱសថប្រឆាំងមេរោគ ក្នុងការណែនាំពីមន្ទីរពិសោធន៍
- គួរប្រើប្រាស់ឱសថប្រឆាំងមេរោគតាមបច្ចេកទេស ឬតាមការណែនាំពីមន្ទីរពិសោធន៍

ការដទ្ធលស្គាល់

អគ្គមូស្រាវជ្រាវនេះ: ជាវិទ្យានិពន្ធសម្រាប់ការបញ្ចប់ការសិក្សារបស់ និស្សិត ឈួន ភូមិរ៉ា ដែលនឹងបញ្ចប់ការសិក្សានៅឆ្នាំ ២0១៧។

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Multi-sectoral Action Plan for AMR 2019-2023

Key Strategic objectives

1. Governance and coordination to reduce antimicrobial resistance
2. Evidence generation through surveillance and laboratories (Human and Animal)
3. **Rational use of antimicrobial medicines**
4. Containing AMR through good practices
5. Increasing public awareness
6. Building human capacity for antimicrobial resistance
7. Research and innovation for antimicrobial resistance

Major achievements

- **Guidance for and implementation of rational use of antimicrobial medicines**
  - Guidelines on prudent/responsible use of antimicrobials is under developing (by FAO);
- **Regulation at different levels to support rational use**
  - Some Prakas to support rational use are developed (vet drug and feed management, farm registration, vet drug importation and distribution…);
- **Establish supply chain management for antimicrobials to ensure equitable and universal access for all citizens**
  - The vet drug supply chain actors were identified and regulated to ensure equitable and universal (Vet drug supply chains).
  - Preliminary scoping work on prudent antimicrobial use in the swine industry, collation of information on local initiatives that provide evidence-based interventions that can support good animal husbandry practices and conducting national forum on antimicrobial stewardship

Major challenges

- Lack AMU data keeping at retail shops and farm level;
- Limited implementation of regulation to support rational use;
- Adequate Human resource and capacity;
- Budget.

Lessons learnt and priorities

- Regular follow up on antimicrobials distribution at national and subnational level;
- Capacity building on prudent/responsible use of antimicrobials for VAHWs;
- Responsible use of antimicrobials in commercial farms under supervision of vet professionals;
- AMU data keeping within commercial farms (cooperated farms).

Multi-sectoral Action Plan for AMR 2019-2023

Key Strategic objectives

1. Governance and coordination to reduce antimicrobial resistance
2. Evidence generation through surveillance and laboratories (Human and Animal)
3. Rational use of antimicrobial medicines
4. **Containing AMR through good practices**
5. Increasing public awareness
6. Building human capacity for antimicrobial resistance
7. Research and innovation for antimicrobial resistance

Major achievements

- Guidance for and implementation of good practices
  - Developed the guidelines on good farming practices (by FAO)
  - Piloted training on implementing the guideline (for farmers, VAHWs and retail shops)
- Ensure available technologies and supplies to implement protocols and guidelines
  - Conducted the workshops on AMR containment with private sectors, farmers and VAHWs
  - Accessible guideline and training tools in GDAHP pages
- Monitoring water, food safety and waste management
  - Well applied waste management by commercial farms (drug waste collected back by companies and manure-biodigester)
  - Regularly follow up the farms by both veterinary agency and companies.

Major challenges

- Poor practices for backyard farmers;
- Lack of knowledge and human resource to capacitate the farmers at community levels;
- Poor follow up on good farming practices.

Lessons learnt and priorities

- Collaboration with private sectors to develop and support good farming practices;
- Conduct training on good farming practices;
- Regular follow up on good farming practices at farm level

Multi-sectoral Action Plan for AMR 2019-2023

Key Strategic objectives

1. Governance and coordination to reduce antimicrobial resistance
2. Evidence generation through surveillance and laboratories (Human and Animal)
3. Rational use of antimicrobial medicines
4. Containing AMR through good practices
5. **Increasing public awareness**
6. Building human capacity for antimicrobial resistance
7. Research and innovation for antimicrobial resistance

Major achievements

- **Increase public awareness through traditional and social media**
  - Developed AMR awareness materials (leaflets, poster, videos…) supported by WOAH (Materials);
  - Conducted WAAW at national and subnational levels, communities and academia institutions (Reports);
  - Established page/social medias for sharing AMR/AMU information with public (*FB page of Antibiotic Resistance in Cambodia (access though WHO Cambodia and MOH), UN FB page and other social media in Cambodia (access through FAO), FB page of MOH, MAFF, MOE , FB page of RUA, Faculty of Veterinary Medicine of RUA, CambOHUN, UHS).*
- **Integrate AMR communications in program and activities**
  - Drafted multisectoral AMR communication strategy;
  - Developed AMR/AMU data/report platform;
  - Drafted multisectoral AMR awareness materials (WOAH).

Major challenges

- Adequate knowledge on designing/developing IEC materials;
- Human resource;
- Lack of facility for development IEC materials;
- Budget

Lessons learnt and priorities

- Coordination with MoH, MAFF and MoE for AMR awareness preparation;
- Good participation of young professionals in AMR awareness raising;
- Collaboration with private sector for increasing AMR awareness raising.

Multi-sectoral Action Plan for AMR 2019-2023

Key Strategic objectives

1. Governance and coordination to reduce antimicrobial resistance
2. Evidence generation through surveillance and laboratories (Human and Animal)
3. Rational use of antimicrobial medicines
4. Containing AMR through good practices
5. Increasing public awareness
6. **Building human capacity for antimicrobial resistance**
7. Research and innovation for antimicrobial resistance

Major achievements

- **Attended the regional WS/Training on AMR surveillance, AMU data collecting, analyzing and reporting**
- **Capacity development through the qualifying the workforce for AMR surveillance (QWArS) program**
  - Epidemiology
  - Laboratory

Major challenges

- Limited technical support
- Human resource
- Budget

Lessons learnt and priorities

- Technical support from WOAH, FAO and other research institutions
- Sharing the experience between NAHPRI and FiA lab

Multi-sectoral Action Plan for AMR 2019-2023

Key Strategic objectives

1. Governance and coordination to reduce antimicrobial resistance
2. Evidence generation through surveillance and laboratories (Human and Animal)
3. Rational use of antimicrobial medicines
4. Containing AMR through good practices
5. Increasing public awareness
6. Building human capacity for antimicrobial resistance
7. **Research and innovation for antimicrobial resistance**

Major achievements

- Some publications on AMR
  - Detection of mcr-mediated colistin resistance in Escherichia coli isolates from pigs in small-scale farms in Cambodia
- KAP in smallholder pig producers
- Mini-KAP in aquaculture farmers

Major challenges

- Budget
- Supportive legislation
- No join research and research agenda

Lessons learnt and priorities

- KAP on AMU and vaccination
- GAHP or organic farm certification
  - Biosecurity
  - Vaccination
  - Treatment
- Pilot intervention
- Develop system framework for AMR monitoring
- Identify cost effective measure

AMR related activities

Activities	Institution	Fund
Preliminary scoping work on prudent antimicrobial use in the swine industry, collation of information on local initiatives that provide evidence-based interventions that can support good animal husbandry practices and conducting national forum on antimicrobial stewardship	GDAHP	Fleming
Assessing the link between the circulation of antimicrobial-resistant organisms in animals and human health in Cambodia	GDAHP-NIPH	NUS
AMR in pig from smallholder farms and slaughterhouses	GDAHP	Fleming
AMR in pork, beef and chicken in wet markets	GDAHP	Government
Antimicrobial use and resistance of Aeromonas hydrophilia in striped catfish in aquaculture farms	GDAHP-FiA	Fleming-Korea
Implementation of Codex standards to support containment and reduction of foodborne antimicrobial resistance (AMR Codex Text- ACT)	GDAHP	Korea
Farmer field school (native chicken broiler)	GDAHP	Fleming-USAID
One Health for Cambodia	MAFF-MOH-MOE	KFW

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KFW
Bank aus Verantwortung

The
Fleming
Fund

USAID
FROM THE AMERICAN PEOPLE

Evolution of AMR from a single to multi-sector and to ONE HEALTH

2016

- Engagement of Agriculture sector in AMR- TWG MOH
- 03 national multi-stakeholder workshops on AMR by Agri. Sector to consolidate OH NAP supported by Tripartite.
- OH joint AMU/AMR roadmap 2017 to 2021
- AMR Inter-ministerial declaration/commitment

2017

- High Level Tripartite Meeting to initiate the development of Multi-sectoral Action Plan (MSAP) to Combat AMR
- National multi stakeholder workshop on AMR to outline the development of a OH NAP (MASP)

2018

- Multi Sectoral AMR situation Analysis
- National Consultative workshop to discuss the structure, contents and finalization of MSAP

2019

- Endorsement and launch of MSAP by MAFF, MOE and MOH at Minister lever and head of tripartite agencies

2020

- Endorsement the tripartite proposal for the AMR-MPTF project by MAFF, MOE and MOH
- Successfully AMR MPTF awarded

2021

- Draft Inter-Ministerial Coordination Committee (IMCC) & TOR on AMR
- Consultation on M&E Framework of MSAP
- Workshop on implementation plan of the MSAP
- Development of AMR Communication Strategy

2022

- Draft OH Joint Plan of Action for the Future of Cambodia - Aligning Human, Animal, and Environmental Health
- AMR Progressive Management Pathway (PMP) with full involvement of all sectors

2023-4

- Review and revise MSAP