



Sharing Animal Health Research Information in Vietnam (SHARE)

**National sharing information workshop:
ANTIBIOTIC USE, MANAGEMENT AND POTENTIAL RISK OF
ANTIBIOTIC RESISTANCE**

20th September 2016

National Institute of Veterinary Research, Hanoi, Vietnam



BACKGROUND: The Sharing Animal Health Research Information in Vietnam (SHARE) initiative

Many research initiatives and projects are currently on going in Vietnam on animal health and zoonotic disease research field. However, in many instance, only limited exchanges of research information is happening between the different groups involved in various projects but tackling similar issues. There is a need to strengthen the research information sharing process in Vietnam to promote transparency and brainstorming, in order to ensure more efficient and complementary research. It is also necessary to promote transfer of research findings into policy by supporting the development of policy interventions based on integrated science and scientific consensus.

The National Institute of Veterinary Research (NIVR) is involved in national and international projects tackling priority issues in animal health and zoonotic diseases in Vietnam. Moreover, NIVR is a core member of the GREASE (Management of emerging risks in Southeast Asia)¹ regional research network and will take the presidency for the next 2 years. This network aims at improving the management of emerging risks in Southeast Asia by strengthening synergies and skills sharing among the core members.

With the support of the GREASE network, the NIVR launched an initiative, named Sharing Animal Health Research Information in Vietnam (SHARE). It consists in organising bi-annual expert meetings, aiming at (i) sharing research information among national, regional and international institutions and promote knowledge and synergies across activities, (ii) create links between researchers and decision makers to develop appropriate policy interventions based on scientific-based information.

Antibiotic resistance is recognised as a major threat to public health, with the potential to affect anyone, of any age, in any country. In the EU an estimated 25,000 deaths occur annually consecutively to multi-drug resistant infections. WHO reports a very high proportion of resistance observed in bacteria that cause common infections (eg urinary tract infection, pneumonia) in all regions. In Vietnam, where resistance prevalence is among the highest in Asia, the challenge is particularly serious and urgent. Vietnam experiencing the highest prevalence of *Streptococcus pneumoniae* resistant to penicillin (74.1%) and erythromycin (92.1%). 75% of *pneumococci* are resistant to many classes of antibiotics. In Hanoi in 2000-2001, 57% of samples taken *Haemophilus influenzae* in children were resistant to ampicillin. However only limited information is available as no specific organised surveillance system is in place, neither in public nor animal health.

Consequently, the first SHARE meeting was dedicated to ANTIBIOTIC USE, MANAGEMENT AND POTENTIAL RISK OF ANTIBIOTIC RESISTANCE. The objective was to favour information exchanges on current initiatives in the different sectors and to discuss gaps, needs and challenges regarding the development of efficient one health initiatives to address antimicrobial resistance issue. We hope this workshop will lead to further information sharing on the major issue of AMR. As mention above, another meeting will be organized in the next 6 months and we welcome all suggestions for the topic to be addressed.

¹ www.grease-network.org

REPORT: Workshop on ANTIBIOTIC USE, MANAGEMENT AND POTENTIAL RISK OF ANTIBIOTIC RESISTANCE

The meeting took place on September 20th and was hosted by the NIVR. It gathered participants working for national governmental bodies (Ministry of Agriculture and Rural Development - MADR, Administration of Medical Services of Ministry of Health - MOH), research institutes (NIVR, National Institute of Hygiene and Epidemiology - NIHE), universities (Vietnam One Health Universities Network - VOHUN, Vietnam University of Agriculture - VNUA, Vinh Medical University - VMU, Bac Giang Agriculture and Forestry University - BAFU) and national veterinarian practitioners association, and for international organisations (Food and Agriculture Organisation - FAO, World Health Organisation - WHO) and research institutes (Oxford University Clinical Research Unit - OUCRU, French agricultural research and international cooperation organization – CIRAD, International Livestock Research Institute – ILRI). The list of participants is enclosed in Annex 1 for reference.

The meeting was officially opened by Dr Pham Thi Ngoc, Deputy Director of NIVR and by Associate Professor Nguyen Viet Khong, Deputy Director of NIVR.

They both emphasized the need to get a better understanding of the different stakeholders involved in the fight against AMR and to improve collaboration across sectors and disciplines in order to. They also underlined the difficulty to use scientific evidence to inform appropriately policy-makers and to turn research findings into policy interventions. This might be improved by increasing the involvement of policy makers in the discussions.

The opening session was followed by several presentations given by speakers coming from international and national institutions, and by an overall discussion, comment session chaired by Associate Professor Nguyen Viet Khong. All participants had the opportunity to present other ongoing initiatives. The workshop agenda is enclosed in Annex 2.

Key highlights from the presentations and discussions are summarized below:

- In Vietnam, there are many ongoing initiatives, driven by research institutes or national/international governmental organisations, addressing AMR issue through different disciplines (epidemiology, bacteriology, social sciences, etc...); nevertheless many questions are still not answered (proportion of resistance in the different compartments, mechanisms of spread and transmission of resistance genes between the different compartments, AM consumption in the animal productions etc...). See Table1 for the description of some initiatives conducted in Vietnam.
- In Vietnam, many factors favours the high consumption of AM, as well as the emergence and spread of AMR: lack of legal framework for AMU and for AMR monitoring, high infectious diseases incidence, intensification of production systems, easy access to a vast range of AM over the counter, high proportion of medicated feed available on the market, easy access to a vast range of AM over the counter, lack of awareness of the users and prescribers, etc.
- There is a need to harmonize methods for data collection and for antimicrobial susceptibility testing (AST) in order to be able to compare data collected in the different sectors.

Associate Professor Nguyen Viet Khong concluded the meeting and emphasized that AMR is an issue requiring inter-sectoral collaboration and interdisciplinary research, in order to provide comprehensive and reliable data to decision makers. This meeting highlights that there are many efforts in Vietnam to fight against the rising of AMR but at the moment, the full picture of all the planned or ongoing activities is not available. It is so proposed to develop a database of these initiatives in order to get a global vision of the situation, to favor collaborations, to avoid duplications and to identify potential gaps for efficiently fight against AMR.

Table 1. List of initiatives in Vietnam (non exhaustive).

Initiative name/acronym	Objectives	Leader	Main partners	Time period	Funding(s)	Contacts
Integrated surveillance system for AMR in Vietnam	1) Develop tools and methods to optimize AMR surveillance at the human-animal interface 2) Develop specific tools for the evaluation of integrated surveillance systems	CIRAD-AGIRs	NIVR NIHE	2016-2019	CIRAD/ANSES French Ministry of Agriculture	Marion Bordier Flavie Goutard
Addressing AMU in Asia's livestock production industry (FAO regional project)	1) Develop the national action plan for AMU and AMR in livestock production, 2) Enhance awareness amongst target groups of AMR impacts and AMU best practices, 3) Strengthen capacities in surveillance of AMR and antimicrobial residue in livestock/livestock product, 4) Improve understanding and documentation of AMU and AMR in the livestock production industry.	FAO, Vietnam	MADR	2016-2020 (FAO Action Plan AMR)	USAID	Pawin Padungtod Vo Ngan Giang
Situation of ABR in <i>E. coli</i> and <i>K. pneumoniae</i> causing urinary infections in pediatric patients in Hanoi	Estimate prevalence of ESBL producing bacteria in UTI isolates	NIHE	University of Antwerp	2015	VLIR – UOS	Pham Dieu Quynh Hoang Thi Thu Ha
Emergence of New Delhi Metallo-beta-lactamase 1 and other carbapenemase-producing <i>Acinetobacter calcoaceticus-baumannii</i> complex among patients in hospitals in Hanoi, Vietnam	Estimate prevalence of carbapenemase and NDM-1 producing <i>A. baumannii</i>	NIHE	OUCRU, Radboud UMC	August 2010 December 2014	NAFOSTED, Wellcome Trust, Ministry of Health Japan	Tran Huy Hoang
Prevalence of cephalosporin resistant and Extended-spectrum β -lactamase producing <i>Escherichia coli</i> isolated from chicken and pig in Vietnam	Estimate prevalence of cephalosporin resistant and ESBL producing <i>E. coli</i> in residents and in pork and chicken	NIN		2014-2015		
Prevalence of cephalosporin resistant and Extended-spectrum β -lactamase producing <i>Escherichia coli</i> isolated from pig	1) Estimate prevalence of cephalosporin resistant and ESBL producing <i>E. coli</i> in pork (farms and slaughterhouses) and farmers 2) Survey farmers practices and knowledge regarding	NIVR		2015-2016		Son Thi Thanh Dang

Initiative name/acronym	Objectives	Leader	Main partners	Time period	Funding(s)	Contacts
	AMU					
Monitoring Antibiotic Use and Residue in Freshwater Aquaculture for Domestic Use in Vietnam	1) Estimate prevalence of AM residue in aquaculture products 2) Assess farmers' knowledge of proper antibiotics usage	OUCRU	VNUA, CART	July 2011 September 2011	Wellcome trust	Dang Kim Pham
ViParc: An intervention to reduce antimicrobial use and antimicrobial resistance in chicken production in the Mekong Delta of Vietnam	1) Reduce AMU by 33%- 50% in chicken farms, 2) Identify relationship between antimicrobial usage, farming practices, and antimicrobial resistance, 3) Advise for AMU reduction to the policy-makers 4) Improve the veterinary advisory and diagnostic capacity	OUCRU	Institute of Poultry Diseases, RVC, University of Can Tho		Wellcome Trust	Juan J. Carrique-Mas
Development of an efficient system for AMR surveillance in public health Vietnam	Build a surveillance system that accurately reflects the situation of antibiotic resistance in Vietnam and provide guidelines for the authorities, by: 1) evaluating of the AR surveillance systems and methods in the world to identify its advantages and disadvantages, 2) modeling resistance processes and analysing of risk factors related to these processes, 3) developing pilot protocols of AR surveillance; determining performance thresholds and the contribution of each risk factor to the variation in performance. 4) optimizing the relation budget-performance of the AR surveillance system in Vietnam	OUCRU	IRD, CIRAD, NHTD	2016-2019	French Embassy, CIRAD, OUCRU	Rogier Van Doorn (OUCRU); Marc Choisy (IRD); Marisa Peyre (CIRAD)

PRESENTATIONS: Workshop on ANTIBIOTIC USE, MANAGEMENT AND POTENTIAL RISK OF ANTIBIOTIC RESISTANCE

1. Surveillance of veterinary use of antimicrobials and agriculture associated antimicrobial resistance: examples from Africa.

Speaker: Fred Unger, ILRI Vietnam

2. Addressing Antimicrobial Usage in Livestock Production Industry.

Speaker: Pawin Padungtod, FAOVN, Vietnam

3. The European Action plan against the rising threats of antimicrobial resistance: monitoring of AMR in the veterinary sector.

Speaker: Marion Bordier, Cirad-AGIRs, Vietnam

4. Monitoring Antibiotic Use and Residue in Freshwater Aquaculture for Domestic Use in Vietnam.

Speaker: Do Thi Thuy Nga, OUCRU, Vietnam

5. The situation of antibiotic resistance in *Escherichia coli* and *Klebsiella pneumoniae* causing urinary tract infections in pediatric patients in Hanoi, 2015.

Speaker: Pham Dieu Quynh, NIHE, Vietnam

6. Emergence of New Delhi Metallo-beta-lactamase 1 and other carbapenemase-producing *Acinetobacter calcoaceticus-baumannii* complex among patients in hospitals in Ha Noi, Viet Nam (EJCM-D-16-00760R1).

Speaker: Tran Huy Hoang, NIHE, Vietnam

7. Antibiotic use and prevalence of cephalosporin resistant and Extended-spectrum β -lactamase producing *Escherichia coli* isolated from chicken and pig in Vietnam.

Speaker: Son Thi Thanh Dang, NIVR, Vietnam

8. ViParc: An intervention to reduce antimicrobial use and antimicrobial resistance in chicken production in the Mekong Delta of Vietnam.

Speaker: Juan J. Carrique-Mas, OUCRU, Vietnam

1. Surveillance of veterinary use of antimicrobials and agriculture associated antimicrobial resistance: examples from Africa

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In developing countries, antimicrobial resistance (AMR) is commonly found in pathogens isolated from animals, animal food products and agro-food environments. The AMR infections in animals of most potential risk to human health are likely to be zoonotic foodborne pathogens. We present a review of antimicrobial use and surveillance in east African agriculture along recent case studies from free-range pig systems in Uganda; dairy in Kenya, and pastoral small ruminant systems in Ethiopia. We discuss how differing systems are associated with differing patterns of AMR.

Although the lack of comprehensive surveillance systems means there are few reliable data AM use in animals, current evidence suggests that, in east Africa, agricultural may exceed medical use; most use is probably in intensive production systems; and, agricultural use is increasing rapidly. For example, veterinary use in Kenya may have increased from around 15 tons in the year 2000 to over 5,000 tons in 2016 while medical use has been more stable at around 200 tons a year. Medical use is comparable to developed countries while veterinary use is much higher.

The issue of AMR in developing countries is complex. Livestock may be the sources or the victims of AMR, or both. While many countries have had considerable success in reducing antimicrobial use in livestock, developing countries face a dual problem of lack of access to antimicrobials among some smallholders and over-use in the intensive sector. Policies aimed to reduce use may have negative impacts on food security. Moreover, agriculture in developing countries is likely to have a higher dependency on antibiotics because of a more disease-prone environment and lower levels of biosecurity. We discuss implications.

2. Addressing antimicrobial usage in livestock production industry

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Antimicrobial resistance (AMR) has its origin in the unregulated use of antimicrobials in the human health and animal health and production sectors, exerting selection pressure on pathogen populations that encourages the development of resistance and exchange of resistance genes. Use of antimicrobials (AMU) in the livestock production industry for therapeutic, preventative, and growth promotion purposes across Asia is widespread. Weak or non-existent regulatory frameworks governing antimicrobial use, sub-optimal enforcement and compliance with existing guidelines, low levels of AMR awareness, and inadequate commitment to responsible antimicrobial stewardship are driving development of AMR. FAO is committed to support countries in the development and implementation of the national action plans to manage the risk of antimicrobial resistance (AMR) in animals and to minimize public health impact of antimicrobial use (AMU) in livestock production. The focus areas specified in the FAO global action plan to support the countries include; improving awareness, development or surveillance capacity, strengthening governance and promotion of good practice and prudent usage. In consideration of the complex and nuanced operating environment driving AMU and AMR in the livestock production industry in Viet Nam, a multi-track approach will be essential to promoting responsible AMU stewardship. FAO, with financial support from USAID, aims to promote a more prudent use of antimicrobial in the livestock production industry in Viet Nam leading to minimizing the likelihood of AMR development and spread. To achieve such objective, FAO will collaborate with Ministry of Agriculture and Rural Development to: 1) Develop the national action plan for antimicrobial use and antimicrobial resistance in livestock production; 2) Enhance awareness amongst target groups of AMR impacts and AMU best practices; 3) Strengthen capacities in surveillance of AMR and antimicrobial residue in livestock/livestock product; and 4) Improve understanding and documentation of AMU and AMR in the livestock production industry.

3. The European action plan against the rising threats of antimicrobial resistance: monitoring of AMR in the veterinary sector.

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Since 2000, the European commission has taken important actions in order to fight against the rising of antimicrobial resistance (AMR). Nevertheless, the Commission recognized that the ongoing efforts were not sufficient and that reinforced actions and new initiatives were needed, through a holistic approach. Consequently, in 2011, an action plan was launched, which included 7 areas and 12 actions. One action particularly aimed at strengthening surveillance system on AMR in animals, in order to provide better input for the risk assessment and the risk management activities. This action called for a better harmonization of the surveillance, among member states and between human and animal sectors, to allow comparison of data. In this context, the Commission has prepared a decision laying down the requirements for AMR monitoring in zoonotic and commensal bacteria (decision 2013/652/EU), based on a scientific report released by EFSA.

CIRAD (French agricultural research and international cooperation organization), in collaboration with Anses (French Agency for Food, Environmental and Occupational Health & Safety), is initiating a research project, aiming at developing new tools and methodology to optimize AMR surveillance at the human-animal interface, in terms of effectiveness and efficiency. Within the framework of the GREASE research network, the methods will be developed and tested both in France and in Vietnam in collaboration with the National Institute for Hygiene and Epidemiology (NIHE) and the National Institute for Veterinary Research (NIVR).

4. Monitoring antibiotic use and residue in freshwater aquaculture for domestic use in Vietnam

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Vietnam is an important producer of aquaculture products, and aquatic products are essential to the Vietnamese diet. However, Vietnam also has very little enforced regulation pertaining to antibiotic usage in domestic aquaculture, which raises concerns for antibiotic resistance in pathogenic bacteria. In this study, analysis was conducted on the presence of antibiotic residues in domestically sold fish and shrimp raised in freshwater farms in Vietnam, and an assessment of farmers' knowledge of proper antibiotics usage was performed. The results indicated that a quarter of tested aquaculture products were antibiotic screening test positive, and there is a general lack of knowledge about the purpose and proper usage of antibiotics by aquaculture producers. Farmers' decision-making processes about antimicrobial use are influenced by biased sources of information, such as drug manufacturers and sellers, and by financial incentives. Keywords: antibiotics, resistance, aquaculture, Vietnam, residue

Keywords: antibiotics, resistance, aquaculture, Vietnam, residue

5. The situation of antibiotic resistance in *Escherichia coli* and *Klebsiella pneumoniae* causing urinary tract infections in pediatric patients in Hanoi, 2015

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Urinary Tract Infections (UTIs) prevalence in children ranks the third position following to respiratory and digestion infections. Currently, there is a rapid rise in the number of bacteria strains causing UTIs and simultaneously producing extended-spectrum β -lactamases (ESBLs), which are enzymes with the ability to inactivate β -lactam class of antibiotics, especially carbapenem – one of the novel generation of extended-spectrum antibiotics. In this study, we collected clinical samples from pediatric patients at three hospitals in Hanoi in 2015 and have studied mainly on the most common bacteria strains causing UTIs and resisting to carbapenem which are *Escherichia coli* (*E. coli*) and *Klebsiella pneumoniae* (*K. pneumoniae*). The percentages of UTIs isolates, ESBLs producing, phenotype and genotype of antibiotic resistance (ABR) have been showed in our results of isolation, identification, antimicrobial susceptibility testing and molecular experiments. Our results confirmed that *E. coli* and *K. pneumoniae* have been leading the roots of UTIs and produced ESBLs. The alarmingly high numbers in the resistance to the group of cephalosporins were showed at estimatedly 100%. In particular, a number of UTI strains was marked as ABR strains to carbapenem with 2.74% (4/146), 3.42% (5/146) and 4.11% (6/146) for ertapenem, imipenem and meropenem, respectively. The findings in phenotype of UTI isolates, with 3/5 cases (60%) in *E. coli* and 1/1 case (100%) in *K. pneumoniae* resisting to all three types of carbapenem antibiotic, suppose an association of resisting to carbapenem antibiotics. In addition, we calculated 94.63% (141/149) *E. coli* and 78.57% (11/14) *K. pneumoniae* harbouring CTX-M gene, which is in agreement with the theory in some recent reports that CTX-M has partly replaced TEM and SHV enzymes as the prevalent ESBL type.

Keywords: *E. coli*, *K. pneumoniae*, UTIs, pediatrics, ESBLs, carbapenem, Hanoi

6. Emergence of New Delhi Metallo-beta-lactamase 1 and other carbapenemase-producing *Acinetobacter calcoaceticus-baumannii* complex among patients in hospitals in Ha Noi, Viet Nam (EJCM-D-16-00760R1)

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Acinetobacter baumannii is an important cause of multidrug-resistant hospital acquired infections in the world. Here, we investigate the presence of NDM-1 and other carbapenemases among carbapenem-resistant *A. baumannii* isolated between August 2010 and December 2014 from three large hospitals in Hanoi, Vietnam. We identified 23/582 (4%) isolates (11 from hospital A, 5 from hospital B, and 7 from hospital C) that were NDM-1 positive and among them 18 carried additional carbapenemase genes, including 7 isolates carrying NDM-1, IMP-1 and OXA-58 with high MICs for carbapenems. Genotyping indicated that NDM-1 carrying *A. baumannii* has expanded clonally in these hospitals. Five new STs (ST1135, ST1136, ST1137, ST1138 and ST1139) were identified. One isolate carried NDM-1 on a plasmid belonging to the N-repA replicon type; No NDM-1 positive plasmids were identified in the other isolates. We have shown the extent of the carbapenem resistance and the local clonal spread of *A. baumannii* carrying NDM-1 in these hospitals, coexistence of NDM-1 and IMP-1 is reported for the first time from Vietnam here and this will further seriously limit future therapeutic options.

Key words: Carbapenem, resistance; NDM-1, IMP-1, OXA-58, *Acinetobacter baumannii*, clonal spread, Vietnam

7. Antibiotic use and prevalence of cephalosporin resistant and extended-spectrum β -lactamase producing *Escherichia coli* isolated from chicken and pig in Vietnam

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Antimicrobial-use and antimicrobial resistant bacteria are not well managed in Vietnam. Regarding to the report of Animal Health Department (2015), there were 9531 kinds of permitted antimicrobials. Out of them, 6357 were domestic products and 3147 were imported. Prohibited drugs (e.g. enrofloxacin, ofloxacin, cefprozil, chloramphenicol) were sold at 20/51 visited Vet drug-shops and restricted drugs (Tylosin photphat, avoparcin, spiramycin,..) were sold at 29/51 visited Vet.drug-shops (AHD, 2015). The National Institute of Nutrition (NIN) also reported that beta-lactam and colistin antibiotics are supplied for treatment for human and chicken. Prevalence of ESBL- producing *E.coli* isolated from pork (80%) and chicken (70%) in Nha Trang and Ho Chi Minh city was higher than in Hanoi (57% in chicken and 58,3% in pork). Moreover, more than 60% of the residents are colonized with ESBL- producing bacteria, more than 50% of the livestock and aquatic food products are contaminated with ESBL- producing bacteria. Most of ESBL- producing bacteria are multi-drug resistant (NIN, 2015). The Hygiene department of National Institute of Veterinary Research also conducted a study on ESBL- producing *E.coli* in pig manure. The study was conducted in Soc Son and Thai Binh provinces between May and September 2015. Household owners of 100 pig farms with the average scale of 15-50 pigs were selected to answer a questionnaire on current situation of antimicrobial use for pigs on their farms. A prevalence of cephalosporin resistant *E. coli* and potential ESBLs producing *Escherichia coli* was also detected in pig manure samples by a cross-sectional study. Unpublished data showed that 73% household owners bought antimicrobials for pig disease treatment as per local veterinarian's advices and 24% basing on their personal experience. Antimicrobials were added in feed as growth promotion on 12 farms (12%), of which 8 farms used semi-commercial feed and 4 farms used traditional feed. Antimicrobials were used for pig disease treatment not following prescription at 15/50 (30%) farms in Thai Binh and 36/44 (81,8%) farms in Soc Son. Particularly, antimicrobial dosages were 0.5-2 times higher than prescriptions at 13 over 15 farms in Thai Binh and higher dosages found at all 36 farms in Soc Son. The lab results showed that cefotaxime resistant *E. coli* was detected in pig feces samples at 82/100 farms (82%). Prevalence resistant to 2, 3, 4, and 5 kinds of cephalosporin were 6,8%, 19,5%, 34,1%, and 20,5 respectively. Multi-resistant prevalence (resistant to at least three kinds of antimicrobial) was 80,9%. Prevalence of ESBL producing *E. coli*/ of high potential *E. coli* test strains (resistant to at least two cephalosporin drugs, including cefotaxime) in pig manure was 83,8% in Thai Binh and 88.6% in Soc Son. The results elucidated the reality of the wide dissemination of ESBL-producing and multi-drug resistant bacteria in livestock in Vietnam. An antimicrobial resistant bacteria monitor program should be established in Vietnam to monitor the consumption of antimicrobial agents and follow up the mode of AMR.

Keywords: *Antibiotic-use, E. coli, cephalosporin resistant, ESBL producing E.coli, chicken, pig.*

8. ViParc: An intervention to reduce antimicrobial use and antimicrobial resistance in chicken production in the Mekong Delta of Vietnam

Nguyen Van Cuong, Juan J. Carrique-Mas

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In the Mekong Delta of Vietnam, as in much of the Southeast Asian region, antimicrobials are extensively used in farming and levels of antimicrobial resistance (AMR) in pathogenic and commensal bacteria are very high. The ViParc project will address one of the drivers of antimicrobial usage on farms, which is the lack of adequate support systems to farmers. The core activities of ViParc (www.viparc.org) include an intervention consisting of a locally-adapted veterinary support system to advise poultry farmers in the Dong Thap province. The study has been designed as a three year 'controlled trial' with randomization of farms to 'interventions' and a 'control group'. The aims of ViParc are: (1) to quantitatively reduce antimicrobial usage by 33%-50% in chicken farms; and (2) to elucidate the relationship between antimicrobial usage, farming practices, and antimicrobial resistance in the area. High-level aims of ViParc are: (1) to provide the Government of Vietnam with practical advice on reducing antimicrobial resistance in farming systems using the results of the trial (levels of antimicrobial usage, AMR and production parameters), and (2) to strengthen the veterinary advisory and diagnostic capacity for improved surveillance, treatment, and prevention of poultry diseases in the area by mapping diseases commonly affecting poultry flocks. A Farmer Training and a Farm Health Programme (FTHP) will be developed in collaboration with the University of Can Tho, the Institute of Poultry Diseases (Berlin) and the SDAH in Dong Thap to instruct chicken owners/workers on good farming practices and recordkeeping, as well as the prevention and control of diseases. This programme should be one key factor in achieving ViParc goals, and should convey the usefulness of proper waste management and environmentally sustainable practices.

ANNEX 1. LIST OF PARTICIPANTS

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ANNEX 2. WORKSHOP AGENDA

Time	Content	Speaker
08:30 – 09:00	Registration	
09:00 – 09:10	Opening remarks and round table	Dr. Pham Thi Ngoc Deputy Director in charge, NIVR – Vietnam
09:10 – 09:25	Addressing Antimicrobial Usage in Livestock Production Industry	Dr. Pawin Padungtod FAO Vietnam
09:25 – 09:40	The European Action plan against the rising threats of antimicrobial resistance: monitoring of AMR in the veterinary sector.	DR Marion Bordier CIRAD-AGIRs, Hanoi, Vietnam.
09:40 – 09:55	Surveillance of veterinary use of antimicrobials and agriculture associated antimicrobial resistance: examples from Africa	Dr. Fred Unger ILRI, Vietnam
09:55 – 10:10	Monitoring Antibiotic Use and Residue in Freshwater Aquaculture for Domestic Use in Vietnam.	Dr. Do Thi Thuy Nga OUCRU Vietnam
10:10 – 10:30	Break	
10:30 – 10:45	The situation of antibiotic resistance in <i>Escherichia coli</i> and <i>Klebsiella pneumonia</i> causing urinary tract infections in pediatric patients in Ha Noi, 2015.	Ms. Pham Dieu Quynh NIHE – Vietnam
10:45 – 11:00	Emergence of New Delhi Metallo-beta-lactamase 1 and other carbapenemase-producing <i>Acinetobacter calcoaceticus-baumannii</i> complex among patients in hospitals in Ha Noi, Viet Nam (EJCM-D-Ref; Ms. No.EJCM-D-16-00760R1)	Dr. Tran Huy Hoang NIHE – Vietnam
11:00 – 11:15	Antibiotic use and prevalence of cephalosporin resistant and Extended-spectrum - β -lactamase producing <i>Escherichia coli</i> isolated from chicken and pig in Vietnam	Dr. Dang Thi Thanh Son, NIVR – Vietnam
11:15 – 11:30	ViParc: An intervention to reduce antimicrobial use and antimicrobial resistance in chicken production in the Mekong Delta of Vietnam	Dr. Juan J. Carrique-Mas Zoonoses Group – OUCRU, Ho Chi Minh City, Vietnam

Time	Content	Speaker
11:30 – 11:45	NIVR engagement in AMR research and collaborative perspectives	Ass. Prof. Nguyen Viet Khong Deputy Director, NIVR – Vietnam
11:45 – 12:40	Brief presentation of other initiatives by participants Discussions	Chaired by Ass. Prof. Nguyen Viet Khong Deputy Director, NIVR – Vietnam
12:40– 12:45	Closing remarks	Dr. Pham Thi Ngoc Deputy Director in charge, NIVR – Vietnam
12:45	End of the workshop and lunch	