

Surveillance of antimicrobial resistance (AMR) in pig and chicken in Viet Nam



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ABSTRACT

Antimicrobial resistance (AMR) is a multi-dimensional threat to public health and to the overall sustainable economic development of the country. AMR is a growing human and economic threat in Viet Nam with the increased and uncontrolled use of antimicrobials in human health as well as in livestock and fish production aimed at growth promotion, disease prevention and control. The Government of Viet Nam's Department of Animal Health (DAH), in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and Oxford University Clinical Research Unit (OUCRU), implemented a surveillance system with the goal to provide an unbiased assessment of the levels of AMR in pig and chicken production in Viet Nam. The surveillance system focused on pig and chicken production with samples collected from abattoirs or slaughterpoints. The principles around the sampling scheme are based on randomisation of sampling in relation to each production type. OUCRU provided training to staff of the National Centre for Veterinary Hygiene and Inspection (NCVHI) on bacterial isolation and AMR testing, and to relevant NCVHI/SDAH staff on field sampling. The standard operation protocols (SOP) for laboratory testing developed based on the training and pilot surveillance in Hanoi have been approved by DAH. A total of seven pig slaughterhouse and seven chicken slaughter points in Hanoi, Hai Phong, Quang Ninh, Long An and Ho Chi Minh City were selected based on average number of animals processed per day. In each slaughter house, the surveillance team collected 2 swabs from each of the 25 randomly selected animals. Isolation, identification of *E.coli*, non-typhoidal *Salmonella* (NTS) and susceptibility testing using disk diffusion assay were performed according to Protocol established by DAH – Vietnam FAO for National Antimicrobial Resistance Surveillance Program in Livestock (September 2017).

INTRODUCTION

Antimicrobial resistance (AMR) is a multi-dimensional threat to public health and to the overall sustainable economic development of the country. AMR is a growing human and economic threat in Viet Nam with the increased and uncontrolled use of antimicrobials in human health as well as in livestock and fish production aimed at growth promotion, disease prevention and control. The Government of Viet Nam's Department of Animal Health (DAH), in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and Oxford University Clinical Research Unit (OUCRU), implemented a surveillance system with the goal to provide an unbiased assessment of the levels of AMR in pig and chicken production in Viet Nam (Box 1).



- 27 December 2016, HCMC
- 36 participants from DAH, Sub-DAH, NAFIQAD, NIVR, private sectors, WHO, FAO and OUCRU
- Review the epidemiology of resistance bacteria in livestock and food production systems in Viet Nam
- Develop surveillance plan
 - ✓ surveillance objectives
 - ✓ Develop sampling plan
 - ✓ Laboratory testing
- Develop framework for AMR surveillance capacity development from 2017 to 2019

BOX 1
 Consultation workshop on the surveillance of antimicrobial resistance (AMR) in livestock and food production systems in Viet Nam

MATERIALS AND METHODS

The surveillance system focused on pig and chicken production with samples collected from abattoirs or slaughterpoints. The principles around the sampling scheme are based on randomisation of sampling in relation to each production type. OUCRU provided training to staff of the National Centre for Veterinary Hygiene and Inspection (NCVHI) on bacterial isolation and AMR testing, and to relevant NCVHI/SDAH staff on field sampling (Box 2). The standard operation protocols (SOP) for laboratory testing developed based on the training and pilot surveillance in Hanoi have been approved by DAH.

- 22 – 27 May 2017, NCVHI No.1
- Sampling, isolation and identification of non-typhoidal *Salmonella* (NTS) and *Escherichia coli* from chickens and pigs
- Antimicrobial susceptibility testing of isolates using the Kirby-Bauer disk diffusion test and E-test
- Data recording and analysis
- Develop Standard Operating Procedures (SOP) for Surveillance programme



BOX 2
 Training on sampling, isolation, identification and antimicrobial susceptibility testing of *Escherichia coli* and non-typhoidal *Salmonella* from pigs and chickens at slaughterhouses and slaughter-points

A total of 40 samples were collected from two pig slaughterhouses and 80 samples were collected from chicken slaughter points in Hanoi during the training and tested by National Center for Hygiene and Inspection No.1 in Ha Noi (Figure 2).

A total of seven pig and seven chicken slaughterhouses or slaughter points in Hanoi, Hai Phong, Quang Ninh, Long An and Ho Chi Minh City were selected based on average number of animals processed per day (Table 1). In each slaughter house, the surveillance team collected 2 swabs from each of the 25 randomly selected animals. Isolation, identification of *E.coli*, non-typhoidal *Salmonella* (NTS) and susceptibility testing using disk diffusion assay were performed according to Protocol established by DAH – Vietnam FAO for National Antimicrobial Resistance Surveillance Program in Livestock (September 2017). All laboratory tests are performed at the National Center for Hygiene and Inspection No.1.

TABLE 1. Sampling Plan

Activities	Hà Nội	Hải Phòng	Quảng Ninh	Ho Chi Minh City	Long An	Total
No of animal/slaughter house	25	25	25	25	25	
No of Pig slaughterhouse	1	1	1	2	2	
No of chicken slaughterhouse	2	1	0	1	3	
Total No of pig samples	50	50	50	100	100	350
Total number of chicken sample	100	50	0	50	150	350
Total sample No.	150	100	50	150	250	700



1. Pig Slaughterpoints
 2. Laboratory testing at NCVHI No. 1

RESULTS

Based on the pilot surveillance conducted in Ha Noi

- All samples were positive for *E.coli*
- 2/80 (2.5%) of chicken samples and 6/40 (15%) of pig samples were positive for NTS
- All 11 NTS isolates were investigated by Multilocus Sequence Typing (MLST) to establish its serovar identity based on seven MLST loci (*aroC*, *dnaN*, *hemD*, *hisD*, *purE*, *sucA* and *thrA*). Five different serovars were identified: Give (5), Kentucky (2), Anatum (2), Weltevreden (1), and Corvallis (1). A total of 2/3 (66.7%) of chicken isolates corresponded to *S. serovar* Kentucky and 5/8 (62.5%) pig isolates corresponded to *S. serovar* Give.
- Table 2 showed prevalence of phenotypic resistance in *E. coli* and NTS from chickens, pigs against 17 antimicrobials. Intermediate resistant strains were excluded. All breakpoints are based on CLSI recommendations except for TGC15 and N30, which were based on EUCAST breakpoints. Isolates with an MIC>4 against colistin were classified as resistant

TABLE 2

	E. coli (chicken, n=20)		E. coli (pig, n=20)		NTS (All, n=11)	
	No. resistant	% resistant	No. resistant	% resistant	No. resistant	% resistant
AMP10	19	95.0%	19	95.0%	6	54.5%
AMC30	14	70.0%	12	60.0%	3	27.3%
CTX30	1	5.0%	2	10.0%	0	0.0%
CAZ30	0	0.0%	0	0.0%	1	9.1%
CN10	7	35.0%	8	40.0%	1	9.1%
S10	16	80.0%	19	95.0%	7	63.6%
TE30	19	95.0%	19	95.0%	10	90.9%
C30	17	85.0%	18	90.0%	10	90.9%
NA30	9	45.0%	7	35.0%	7	63.6%
CIP5	3	15.0%	5	25.0%	3	27.3%
AZM15	8	40.0%	12	60.0%	9	81.8%
SXT25	17	85.0%	12	60.0%	3	27.3%
W5	17	85.0%	13	65.0%	1	9.1%
Colistin	1	5.0%	4	20.0%	2	18.2%
TGC15	1	2.5%	1	2.5%	0	0%
N30	4	10%	11	27.5%	1	9.1%
MEP10	0	0%	0	0%	0	0%

Key: AMP10=Ampicillin 10ug; AMC30= Amoxicillin-clavulanic acid 20/10ug; CTX30=Cefotaxime 30ug; CAZ30=Ceftazidime 30ug; CN10=Gentamicin 10ug; S10=Streptomycin 10ug; TGC15= Tigecycline 15ug; N=Neomycin 30ug; TE30=Tetracycline 30ug; C30=Chloramphenicol 30ug; NA30=Nalidixic acid 30ug; CIP5= Ciprofloxacin 5ug; AZM15=Azithromycin 15ug; SXT25=Sulphamethoxazole/trimethoprim 25ug; MEP10=Meropenem 10ug; W5=Trimethoprim 5ug

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