Study on trend of antibiotic resistance of indicator bacteria *E. coli* during production cycle in Vietnam's chicken farms

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Introduction

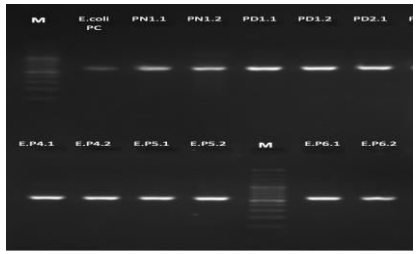
Antimicrobial resistance (AMR) in livestock, particularly in poultry is a serious public health problem in Asian countries. In Vietnam, a Nation Action Plan on Antimicrobial on AMU/AMR monitoring program in Agriculture (2021- 2025) was implemented after Circular No. 3690/BNN-TY, signed by the Ministry of Agriculture and Rural Development (MARD) was issued on August 2021. The objective of the program is to minimize drug-resistant bacteria severity. This study aimed to get evidence of AMR in colour broiler chicken farms during the production cycle

Methodology

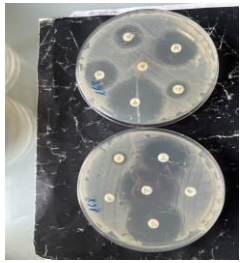
- Sixty colour broiler farms (2000-5000 broilers/farms) in two Northern provinces in Vietnam were randomly selected.
-Four sampling times (STs) during the production cycle (7-12, 30-40, 90-100 days old and on the day before sale) were conducted to collected total of 237 cloacal swab samples of healthy chickens (one sample/farm/sampling time).
- *E. coli* were isolated on MacConkey agar and confirmed by PCR using *adk* gene
- AST was done by disk diffusion method for 13 antimicrobials, by broth microdilution method for colistin.

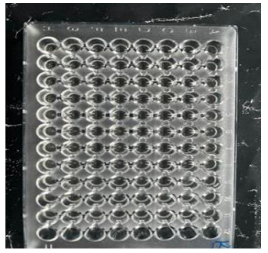
Study Results

*** *E.* coli were detected in 232 out of 237 samples (97.9 %) and 54/232 (23.3%) *E. coli* isolates/farm level were resistant to colistin (MIC from 4-16 µg/ml)**



Detect a*dk* gene by PCR

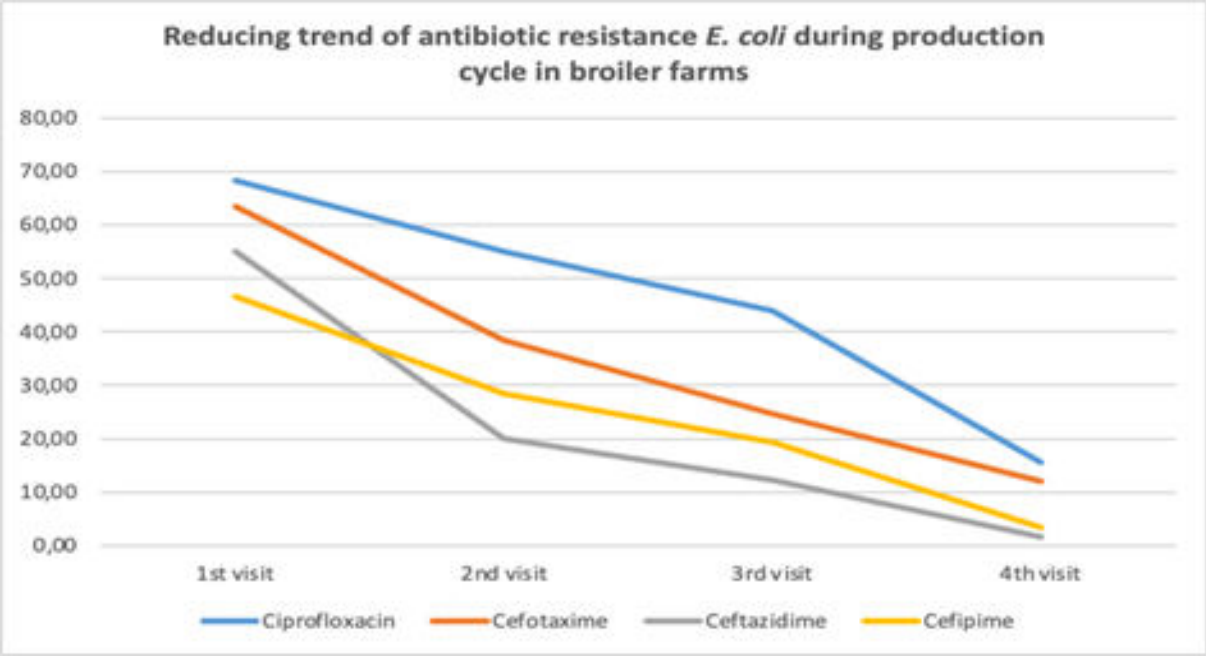




AST by disc fussion method and MIC method

Antimicrobial	The first visit S1 n (%)	The second visit S2 n (%)	The third visit S3 n (%)	The last visit S4 n (%)	P - value
Ampicillin (10µg)	57 (95,0)	56 (93,3)	56 (98,3)	55 (94,9)	0,3
Ampicillin/sulbactam (10/10 µg)	9 (15,0)	3 (5,0)	8 (14,0)	9 (15,5)	0,45
Sulfonamides (300 µg)	56 (93,3)	57 (95,0)	53 (93,0)	48 (82,8)	0,32
Gentamycin (10µg)	37 (61,7)	34 (56,7)	29 (50,9)	18 (31,0)	
Streptomycin (10µg)	44 (73,3)	40 (66,7)	42 (73,4)	31 (53,4)	0,09
Tetracycline (30µg)	59 (98,3)	56 (93,3)	57 (100,0)	54 (93,1)	
Chloramphenicol (30µg)	57 (95,0)	53 (88,3)	56 (98,2)	50 (86,2)	
Colistin	18 (30,0)	14 (23,3)	15 (26,3)	7 (12,1)	0,2

* No carbapenem (imipenem, meropenem) resistance *E.coli* was found in our study. High prevalence of resistance with other of antimicrobials were found during chicken life cycle 54 out of 232 (23.3%). Co-resistant to colistin and a 3rd/4th generation cephalosporine *E. coli* was found in in 21 farms (15 farms at ST1, 7 farms at ST2, 6 farms at ST3).



* Interestingly, we found that resistance prevalence of the 3rd/4th generation cephalosporine and ciprofloxacin (a fluoroquinolone) had a significant decrease ($p<0.05$) during the production cycle in the study farms (figure 1). In detail, prevalence of ciprofloxacin resistant of *E. coli* at the 1nd, 2nd, 3th, and 4th ST were 41/60 (68.33%), 33/60 (55%), 25/57 (43,9%), and 9/58 (15.5%), respectively; prevalence of cefotaxime resistant were 63.3%, 38.3%, 24.6%, and 12.1%, respectively; prevalence of ceftazidime-resistant were 55%, 20%, 12.3%, and 1.8%, respectively; and cefipime resistant gradually decreased following 46.7%, 28.3%, 19.3%, and 3.4%, respectively during production cycle.

Conclusions

High level of antimicrobial resistance with a number of ABs was found during production cycle in broiler chicken farms, e.g. Sulfonamides (82,8-95%), Tetracycline (93,1-100%), Chloramphenicol (86,2-95%), and Ampicillin (93,3-98,3%). The level of resistance to priority critical important antimicrobials such as colistin, 3rd/4th cephalosporines, ciprofloxacin was high in early stage of the production cycle but continuing gradually decreased until 12,1% (Cefotaxime), 1,7% (Ceftazidime), and 3,5% (Cefepime) in the end of production cycle. The co-resistance colistin and 3rd/4th cephalosporin was found in three sampling times (1nd, 2nd, and 3th) at one farm and other 20 farms at ST1, 6 farms at ST2, and 5 farms at ST3.

Recommendations

It is necessary to implement more research to evaluate the effectiveness in stages of the strategy to reduce antibiotic use in livestock production. Indeed, strict monitoring of AMU/AMR particularly with important antibiotic groups mentioned by WOAH and WHO is needed to ensure the strategy of MARD on exporting livestock production.

Acknowledgement

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