

Prevalence of *bla*_{TEM}, *bla*_{CTX-M} and *bla*_{SHV} Genes in *Escherichia coli* Isolated from Chicken Meat and Pork in Butcher Shop in Eastern Region of Thailand during 2022 – 2024

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Abstract

Background: In eastern region of Thailand, the number of pig and chicken is ranked in the top three of the most population. Then, the antimicrobial drugs may be used in high volume for treatment and ESBL producing - *E. coli* could be seriously concerned in antimicrobial resistance issue in animal, human and environmental problems (One Health). Extended-spectrum beta-lactamase (ESBL) is the hydrolysing enzyme that is produced from *bla*_{TEM}, *bla*_{CTX-M} or *bla*_{SHV} gene in plasmid of *Escherichia coli* (*E. coli*). The enzyme can be against the potential of beta-lactam antibiotics such as 3rd and 4th generation cephalosporins and monobactam with beta-lactam ring destruction. Hydrolysis of the carbonyl group of the beta-lactam ring is an important mechanism of drug resistance. As a result, the effectiveness of beta-lactamase drug is significantly decreased. Chicken meat and pork are one of the most main ingredients in daily recipes. Many studies reported that these kinds of meat can be contaminated with ESBL producing - *E. coli* from farms, slaughterhouses and butcher shops. According to the Thailand's Second National Action Plan on Antimicrobial Resistance 2023 – 2027 and the Thailand's integrated antimicrobial resistance surveillance with One Health approach guideline, monitoring of ESBL producing - *E. coli* resistance to 3rd generation cephalosporin in meat is highly recommended.

Objectives: To study the prevalence of *bla*_{TEM}, *bla*_{CTX-M} and *bla*_{SHV} genes in *E. coli* isolated from chicken meat and pork from butcher shop in each province in Eastern region of Thailand and the comparison between ESBL producing - *E. coli* in modern and local butcher shops.

Methods: A total of 276 samples of chicken meat ($n = 138$) and pork ($n = 138$) were collected from modern and local butcher shops in 9 provinces (Samutprakan, Chachoengsao, Chonburi, Prachinburi, Rayong, Sakaeo, Chanthaburi, Trat and Nakhonnayok) in eastern region of Thailand during August 2022 to July 2024. Those samples were identified with microbiological and biochemical tests. ESBL screening test was done according to the CLSI (Clinical and Laboratory Standards Institute, 2023) for Extended-spectrum beta-lactamase (ESBL) drug sensitivity test. The Polymerase Chain Reaction (PCR) was done for *bla*_{TEM}, *bla*_{CTX-M} and *bla*_{SHV} gene detection from ESBL producing- *E. coli*.

Results: The ESBL producing – *E. coli* percentage of chicken meat and pork in 2022 – 2024 was declined from 60.71%, 53.57% and 51.22%, respectively. Pork was detected more ESBL producing - *E. coli*, *bla*_{TEM}, *bla*_{CTX-M} and *bla*_{TEM} with *bla*_{CTX-M} gene than chicken meat. Almost all provinces have high prevalence (50 – 100%) of *bla*_{TEM} and *bla*_{CTX-M} genes except Samutprakarn. Interestingly, none of the provinces were found *bla*_{SHV} gene. The detection of those genes between modern and local butcher shops was not significantly different ($p = 0.199$).

Conclusion: Chicken meat and pork were most probably contaminated with ESBL producing – *E. coli* during raised on farm, slaughtering and retailing. Good Agricultural Practice (GAP), Antimicrobial-free farm, Good Hygiene Practice (GHP) and Hazzard Analysis and Critical Control Point (HACCP) should be included in each process for minimized the contamination. In addition, ESBL producing – *E. coli* and resistance gene surveillance is still necessary.

Keywords: *E. coli*, ESBL, Chicken meat, Pork, Butcher shop

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