



Prevalence, Antimicrobial Resistance Genes, and Antibiotic Susceptibility of Extended-Spectrum β -Lactamase-Producing *Escherichia coli* Isolated from Chicken and Pork meat in the Lower Northeastern Region of Thailand, 2022–2024

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Background

Escherichia coli is a Gram-negative bacterium commonly found in the intestinal tract of humans and animals and is widely used as an indicator of food contamination. Although most strains are harmless, some can cause severe infections, including urinary tract infections, diarrhea, and foodborne illnesses. The emergence of extended-spectrum β -lactamase (ESBL)-producing *E. coli* has become a major public health concern due to its resistance to β -lactam antibiotics and its potential for dissemination through the food chain and environment.

Methods

A total of 1,440 meat samples (681 chicken and 759 pork) were collected from slaughterhouses and retail markets in the lower northeastern region of Thailand from 2022 to 2024. Isolation and identification of *E. coli* were performed using standard microbiological methods. ESBL production was confirmed by the combination disk method. Antimicrobial susceptibility testing was conducted using the broth microdilution method according to CLSI (2025) guidelines. Resistance genes were detected by PCR. Statistical analysis was performed using Microsoft Excel and the Chi-square test, with a confidence level set at 95%.

Results and Discussions

The prevalence of *E. coli* in pork samples was 46.93% (176/375) from slaughterhouses and 39.84% (153/384) from retail markets, while in chicken samples it was 57.58% (171/297) and 32.29% (124/384), respectively. A statistically significant difference ($p \leq 0.05$) in prevalence was observed in chicken samples between sources. A total of 532 isolates contaminated with ESBL-producing *E. coli* were detected, of which 329 isolates were obtained from pork meat and 203 isolates

Results and Discussions

were obtained from chicken meat. High resistance to ampicillin was observed in both pork (88.75%) and chicken (70.94%) isolates. No resistance to ceftazidime and meropenem was detected. The most prevalent ESBL gene was *bla*CTX-M (64.13% in pork and 61.58% in chicken), followed by *bla*TEM (56.84% in pork and 51.23% in chicken), while *bla*SHV was not detected in any samples. The analysis of the relationship between genotype and phenotype revealed that *bla*CTX-M and *bla*TEM were not significantly associated with resistance to ampicillin ($p > 0.05$). However, a significant association was observed between *bla*CTX-M and resistance to cefotaxime ($p < 0.05$). In contrast, no significant association was found between ESBL genes and resistance to non- β -lactam antibiotics, including tetracycline, ciprofloxacin, gentamicin, and sulfamethoxazole/trimethoprim.

Conclusion

This study revealed a high prevalence of *E. coli* contamination in chicken and pork from the lower northeastern region of Thailand, with slaughterhouse samples showing higher positivity than retail markets. A substantial proportion of isolates were ESBL-producing, particularly those carrying *bla*CTX-M, which was significantly associated with cefotaxime resistance. In contrast, ESBL genes showed no association with resistance to ampicillin or non β -lactam antibiotics, indicating the involvement of additional resistance mechanisms. Overall, these findings highlight ongoing food safety risks and underscore the need for strengthened surveillance, improved hygiene practices, and prudent antimicrobial use to limit the spread of antimicrobial resistant bacteria to consumers.

References

- Allen HK, Donato J, Wang HH, Cloud-Hansen KA, Davies J, Handelsman J. 2010. Call of the wild: antibiotic resistance genes in natural environments. *Nature Reviews Microbiology*. 8:251–259.
- Bevan ER, Jones AM, Hawkey PM. 2017. Global epidemiology of CTX-M β -lactamases: temporal and geographical shifts in genotype. *Journal of Antimicrobial Chemotherapy*. 72: 2145–2155.
- Livermore DM. 1995. *Beta-lactamases in laboratory and clinical resistance*. *Clinical Microbiology Reviews*. 8:557–584.
- EFSA and ECDC. 2024. The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food. *EFSA Journal*. 22:e8752.

Acknowledgements

The authors thank the staff of the Regional Veterinary Research and Development Center, Department of Livestock Development, Thailand, for their technical assistance and support. We also acknowledge the cooperation of slaughterhouses and retail markets involved in this study.