Hidden Threats in Our Meat: Uncovering Antimicrobial Resistance in Slaughterhouses in Bukidnon, Philippines

J. J.. Obedencio (jmobedenciojr@cmu.edu.ph), K. C. Doysabas, V. Jimenez, J. M. Chavez, S. F. L. Garcia, C. A. Cornell, G. Torregossa, Z. L. Tortor

College of Veterinary Medicine, Central Mindanao University, Maramag, Bukidnon, Philippines

Antimicrobial resistance (AMR) is an emerging threat to food safety and public health, particularly in slaughterhouse settings where humans, animals, and the environment intersect. This study aimed to determine the antimicrobial resistance profiles of *Enterobacteriaceae* isolates and assess the knowledge, attitudes, and practices (KAP) of slaughterhouse personnel in Bukidnon, Philippines.

A cross-sectional study design was employed, integrating microbiological sampling and structured KAP surveys among slaughterhouse workers. Bacterial isolates were identified and subjected to antimicrobial susceptibility testing using the Kirby–Bauer disk diffusion method in accordance with Clinical and Laboratory Standards Institute guidelines. KAP data were collected using a pre-tested questionnaire and analyzed through descriptive and inferential statistics to examine patterns and associations.

Results revealed a high prevalence of antimicrobial resistance among *Enterobacteriaceae* isolates, including resistance to commonly used antibiotics. A considerable proportion of isolates exhibited multidrug resistance, indicating potential risks for treatment failure and transmission through the food chain. KAP assessment among personnel demonstrated gaps in knowledge and inconsistencies in the implementation of biosafety and hygiene practices. While some workers showed awareness of basic sanitation measures, adherence to standard protocols was variable. Statistical analysis further identified associations between selected demographic characteristics and KAP scores, suggesting that factors such as experience and training may influence compliance and awareness.

These findings highlight slaughterhouses as potential reservoirs and critical control points for AMR dissemination. The presence of multidrug-resistant bacteria, coupled with gaps in personnel practices, underscores the need for strengthened antimicrobial stewardship and stricter enforcement of hygiene and biosafety protocols. Capacity-building initiatives, including targeted training and continuous monitoring, are essential to improve compliance and reduce risks.

This study contributes to the growing body of evidence on AMR in food production systems and emphasizes the importance of a One Health approach in addressing antimicrobial resistance across human, animal, and environmental health sectors.

Keywords: antimicrobial resistance, Enterobacteriaceae, knowledge attitude practices, One Health, slaughterhouse.

References:

1. Abunna, F., Kaba, M., Mor, S., & Megersa, B. (2022, November 21). Assessment of food safety knowledge, attitudes, and practices among meat handlers in Bishoftu City, Ethiopia. The American journal of tropical medicine and hygiene. https://pmc.ncbi.nlm.nih.gov/articles/PMC9833094/
2. Aworh, MK, Abiodun-Adewusi, O, Mba, N, Helwigh, B, & Hendriksen, RS (2021) Prevalence and risk factors for faecal carriage of multidrug resistant Escherichia coli among slaughterhouse workers, Scientific Reports, 11(1) https://doiorg/10.1038/s41598-021-92819-3
3. Bahir, M. A., Errachidi, I., Hemlali, M., Sarhane, B., Tantane, A., Mohammed, A., Belkadi, B., & Filali-Maltouf, A. (2022, March 24). Knowledge, attitude, and practices (KAP) regarding meat safety and sanitation among carcass handlers operating and assessment of bacteriological quality of meat contact surfaces at the Marrakech Slaughterhouse, Morocco. International journal of food science. https://pmc.ncbi.nlm.nih.gov/articles/PMC8970798/
4. Clinical and Laboratory Standards Institute (2024) Performance Standards for Antimicrobial Susceptability Testing (34th ed, Vol 44) https://www.darvashco.com/wp-content/uploads/2024/07/CLSI-2024_compressed-1.pdf
5. Cong, X, Krolla, P, Khan, UZ, Savin, M, & Schwartz, T (2023) Antibiotic resistances from slaughterhouse effluents and enhanced antimicrobial blue light technology for wastewater decontamionation,

Environmental Science and Pollution Research, 30(50), 109315–109330 https://doiorg/101007/s11356-023-29972-x

6. Costa, M, Cardo, M, D'Anjo, MC, & Leite, A (2022) Assessing antimicrobial resistance occurrence in the Portuguese food system: Poultry, pigs and derived food, 2014–2018 Zoonoses and Public Health, 69(4), 312–324 https://doiorg/101111/zph12920
7. Hasan, M. A., Uddin, M. B., & Ahmed, S. S. U. (2024, November 1). Knowledge, attitudes and practices of meat hygiene among slaughterhouse workers and Retail Meat Sellers in Bangladesh. Heliyon. https://pmc.ncbi.nlm.nih.gov/articles/PMC11693912/
8. Kimindu, V. A., Kaindi, D. W. M., Njue, L. G., & Githigia, S. M. (2024, January). Meat safety knowledge, attitude and practices of slaughterhouse workers in Kajiado, Kenya. Veterinary medicine and science. https://pmc.ncbi.nlm.nih.gov/articles/PMC10766054/
9. Mohammed, O (2023) Slaughterhouse Workers' Knowledge, Attitude, and Practice towards Meat Hygiene in Al-Baha, Saudi Arabia: A Cross-Sectional Study Egyptian Academic Journal of Biological Sciences B, Zoology, 15(2), 25–34 https://doiorg/1021608/eajbsz2023313845
10. Wu, X, Suksawat, F, Angkititrakul, S, Song, C, Chai, J, Zhang, Y, Shu, X, Xing, H, & Li, W (2022) A systematic review: The source of antimicrobial resistance Pathogenic bacteria on slaughtered meat, cross-contamination or self-contamination? The Thai Journal of Veterinary Medicine, 52(3), 423–440 https://doiorg/1056808/2985-11303235