

Detection of antibiotic residues in leg quarter of chickens slaughtered in accredited poultry dressing plants in Nueva Ecija, Philippines

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ABSTRACT: Antibiotic residues in consumable products pose health risks by contributing to antibiotic-resistant bacteria (ARBs), antibiotic-resistant genes (ARGs), and teratogenic and carcinogenic effects. Regular screening of livestock products allows monitoring of these residues in humans. This study aimed to determine the presence of six antibiotic class residues (beta-lactams, aminoglycosides, quinolones, sulfonamides, macrolides, and tetracycline) and multidrug residues in chicken leg quarters (CLQs) from an accredited Poultry Dressing Plant (PDP) in Nueva Ecija, Philippines. Thirty CLQs were collected from six PDPs in Nueva Ecija. Six muscle tissue specimens from each sample were screened for antibiotic residues through microbial inhibition tests at the National Meat Inspection Service (NMIS) Reserve Officers' Training Corps (ROTC) Regional III Laboratory Division, San Fernando, Pampanga. An inhibition zone ≥ 2 mm indicated a positive result. Screening showed no samples tested positive for any residue, and multi-drug residues were absent. No CLQs contained residues that exceeded the Maximum Residue Limit. CLQs from accredited PDPs in Nueva Ecija contained no antibiotic residues. These results may be due to strict antibiotic regulations, good veterinary supervision on source farms, and proper withdrawal periods.

Keywords:

antibiotic residue, antibiotic susceptibility, poultry dressing plant, multi-drug residue

■ INTRODUCTION

Antibiotics are crucial for animal feed and production, supporting intensive farming, and global protein demand. In poultry, they serve as a treatment, prophylaxis, and growth promoter. However, improper use can lead to residues in the tissues, thereby increasing consumer health risks. These residues can cause adverse reactions and promote the development of antibiotic-resistant bacteria (Okocha *et al.* 2018, Menkem *et al.* 2019, Chen *et al.* 2019). Global antimicrobial use in cattle, sheep, chickens, and pigs was 99,502 tons in 2020, projected to reach 107,473 tons by 2023, with 67% in Asia (Mulchandani *et al.* 2023). The Philippines regulates antibiotic levels in animal-derived foods, producing 1.4 million metric tons of poultry annually, with Central Luzon contributing 35.5% from January to June 2022 (USDA-FAS 2022). To address resistance concerns, comprehensive databases, improved risk assessments, and stricter regulations are required (Arsène *et al.* 2022; Muaz *et al.* 2018).

■ MATERIALS AND METHODS

Thirty chicken leg quarters were collected from six accredited Poultry Dressing Plants (PDPs) in Nueva Ecija Philippines, representing 11 farms across San Jose, Talavera, Aliaga, General Natividad, Licab, Cuyapo (Nueva Ecija),

Lapaz, Tarlac, Umingan, and Pangasinan. Five samples per PDP were stored in sterile bags, transported at 4°C, and screened within 12 h at the National Meat Inspection Service (NMIS) ROTC III Laboratory in Pampanga, Philippines. If the analysis was not immediate, samples were frozen. The study used bacterial strains *Micrococcus luteus* ATCC 9341, *Bacillus subtilis* ATCC 6633, *Bacillus cereus* var *mycoides* ATCC 1778, and *Escherichia coli* ATCC 11303, reconstituted in peptone water and incubated for 18 h at 36°C. Test agar media (pH 6.0, 7.2, and 8.0) were prepared using antibiotic discs (penicillin, streptomycin, sulphonamides, erythromycin, tetracycline, and ciprofloxacin) as controls. The Microbial Inhibition Test (MIT), following NMIS (2024) manual based on CLSI guidelines, was performed using agar disk diffusion. Six antibiotic classes (beta-lactams, aminoglycosides, quinolones, macrolides, sulfonamides, and tetracyclines) were tested in media containing the bacterial strains. Muscle tissue was used, with skin and fat removed aseptically per the food safety standard (NMIS 2024). From each sample, six slices (~0.2 mm diameter, 0.1 mm thickness) were placed on

Received: 20-01-2025 | Revised: 18-02-2025 | Accepted: 21-02-2025

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the prepared media. Plates were incubated at 36°C for 16-18 hours. Zone of inhibition was measured using a digital caliper, with ≥ 2 mm considered positive for antibiotic residues per NMIS criteria.

■ RESULTS AND DISCUSSION

None of the samples tested positive for antibiotics (Table 1). While positive controls showed clear zones of inhibition (>2 mm), no CLQ samples showed inhibitory zones (Figure 1), indicating the absence of antibiotic residues above the Maximum Residue Limit (MRL) (Table 2). This finding contrasts with previous studies. Calagui (2016) reported that 32.38% of poultry samples from commercial and backyard farms in Tuguegarao City tested positive for antibiotic residues, primarily in the skeletal muscle from commercial farms. Baldrias *et al.* (2008) found beta-lactams were most common in commercial (44%) and backyard (62.8%) farms, followed by aminoglycosides. This discrepancy may reflect improved withdrawal compliance, better regulations among accredited PDPs, or different geographic practices. Beta-lactams are widely used for their broad-spectrum efficacy against pathogens, such as *E. coli* and *Salmonella* (Gray *et al.* 2021), but none have been detected, suggesting improved residue management.

Table 1 Occurrence of antibiotic residues in Chicken Leg Quarter samples (CLQ; n=30) dressed in the accredited Poultry Dressing Plants (PDP) in Nueva Ecija, Philippines

CONTAMINATED*		NON-CONTAMINATED**
Mono-contaminated	Poly-contaminated	
0	0	30

*Contaminated-positive for antibiotic residues; Mono-contaminated-Single antibiotic residue; Poly-contaminated-multiple antibiotic residues

**Non-contaminated-negative for antibiotic residues

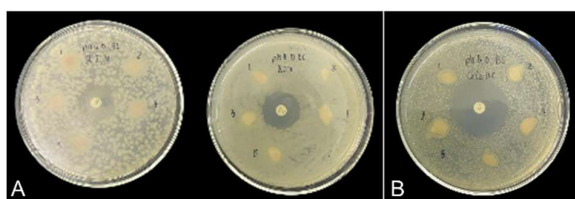


Figure 1 Zone of inhibition test. (A) TC and FQ detection in CLQ samples from a PDP source and (B) AMG detection in CLQ samples from a PDP source showing negative results (0 mm)

Table 2 Mean zone of inhibition test and frequency of multi-drug residues in Chicken Leg Quarter (CLQ) samples

	ANTIBIOTIC CLASS*						MULTI-DRUG RESIDUE
	BL	AGM	FQ	MC	SF	TC	
Control (mm)	32.5	22.8	19.2	28.5	24.7	16.6	n/a**
CLQs (mm)	0	0	0	0	0	0	n/a
No. of Positives	0	0	0	0	0	0	0
Percent (%) of Positives	0	0	0	0	0	0	0

*BL-Beta lactams; AMG-Aminoglycosides; FQ-Fluoroquinolones; MC-Macrolides; SF-Sulfonamides; TC-tetracyclines

**n/a-not applicable

■ CONCLUSION

The absence of antibiotic residues above MRL and multi-drug residues confirms that all samples meet safety and regulatory standards, indicating appropriate antibiotic usage and minimal contamination risk.

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■ ACKNOWLEDGEMENT

This study was supported by the National Meat Inspection Service (NMIS) Reserve Officers' Training Corps (RTOCS) Regional III, Philippines, which the authors gratefully acknowledge.

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