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An Evaluation of Biosecurity Practices and Antimicrobial Resistance of Escherichia coli in Small- to Medium-Scale Broiler Farms in Zimbabwe

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Background

Poultry farming is a critical source of income and food security for smallholder farmers in Zimbabwe. However, the sector is increasingly challenged by poor biosecurity practices and the misuse of antimicrobials, both of which contribute to the spread of antimicrobial resistance (AMR). AMR poses serious risks to animal productivity, public health, and trade. Despite the national recognition of AMR as a priority, there is limited data on baseline biosecurity practices and resistance patterns in broiler farms. This study was conducted to assess these factors among small- to medium-scale broiler producers participating in Farmer Field Schools (FFS) across three districts—Seke, Goromonzi, and Zvimba—in Zimbabwe. The findings aim to inform targeted interventions that promote responsible antimicrobial use and strengthen biosecurity in poultry production systems.

Methods and Materials

A cross-sectional study was conducted among 130 small- to medium-scale broiler farmers participating in six Farmer Field Schools (FFS) in Seke, Goromonzi, and Zvimba districts. Structured questionnaires were used to collect data on farm biosecurity practices, antimicrobial use, and farmer knowledge. In parallel, 206 cloacal swabs were collected from broiler chickens and transported to the Central Veterinary Laboratory (CVL) for microbiological analysis. Isolation of *Escherichia coli* was performed using standard culture techniques, and antimicrobial susceptibility testing was conducted using the Kirby-Bauer disk diffusion method against a panel of commonly used antibiotics. Both qualitative and quantitative data were analyzed using R statistical software to evaluate biosecurity and resistance patterns.

Results

Escherichia coli was isolated from 100% of the 206 cloacal swab samples collected. The isolates showed high levels of antimicrobial resistance, with 98% resistant to tetracycline, 85% to sulphamethoxazole, and 71% to ampicillin. In contrast, resistance to gentamicin and meropenem was lower, at 20% and 12% respectively. Biosecurity assessments revealed major gaps: 98% of farms lacked visitor logbooks, 81% did not have footbaths at entry points, and 93% had no handwashing stations. The biosecurity across farms was generally low, indicating deficiencies in disease prevention measures. Farms with better biosecurity practices tended to report more prudent antimicrobial use.

Figure 2. Study Districts in Zimbabwe: Seke, Goromonzi, and Zvimba

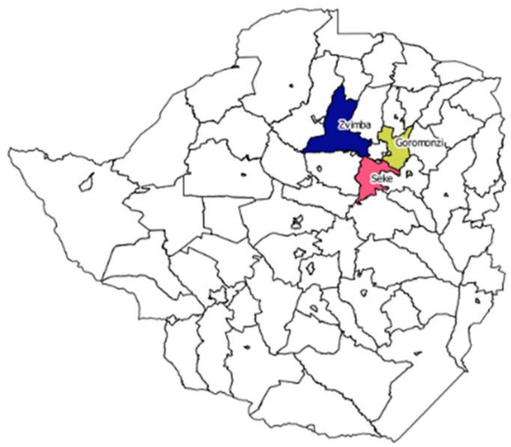
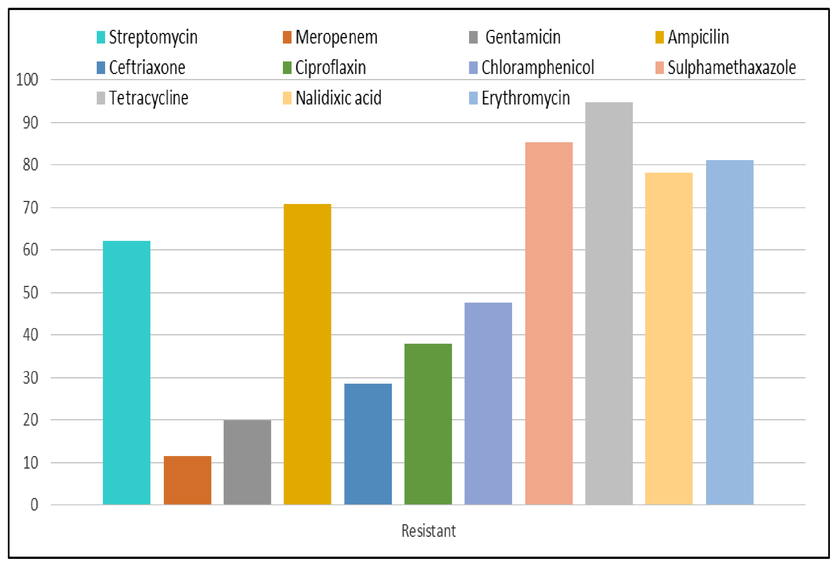


Figure 2. Figure 2: Antibiotic resistance profile of E. coli isolates from broilers in the selected three districts in Zimbabwe.



Discussion

The study highlights some weaknesses in biosecurity practices among small- to medium-scale broiler farmers in Zimbabwe. These shortcomings, such as the absence of basic hygiene facilities, create favourable conditions for the spread of infectious agents and may amplify antimicrobial resistance (AMR). The high levels of *E. coli* resistance to commonly used antibiotics such as tetracycline, sulphamethoxazole, and ampicillin suggest possible misuse or overuse of these drugs. The relatively lower resistance to critically important antibiotics like gentamicin and meropenem may reflect limited access or use. The results underscore the urgent need to strengthen farmer education, improve farm-level hygiene infrastructure, and promote responsible antimicrobial use through coordinated surveillance and extension services, particularly within Farmer Field Schools (FFS). Interventions addressing these gaps will be critical to mitigating AMR risks in poultry production and safeguarding both animal and public health.

Conclusions

This study reveals that biosecurity practices among smallholder broiler producers in Zimbabwe are inadequate and that antimicrobial resistance (AMR) in *E. coli* is quite high. The resistance to commonly used antibiotics signals the urgent need for targeted interventions. Strengthening biosecurity infrastructure, promoting responsible antimicrobial use, and expanding farmer education, particularly through Farmer Field Schools (FFS)—are critical to reducing disease burden and slowing the spread of AMR. Enhancing surveillance and integrating these findings into policy and training frameworks will be essential steps toward improving poultry health and public safety.

Public Health Implications

The detection of multidrug-resistant *Escherichia coli* in poultry poses a significant threat to food safety and public health, especially where biosecurity measures are weak and antibiotic use is poorly regulated. These resistant strains can be transmitted to humans through direct contact, contaminated food products, or the environment. Strengthening on-farm biosecurity and promoting prudent antimicrobial use are essential steps to curb the spread of resistance. Integrating AMR awareness into poultry extension programs and enforcing national surveillance and stewardship strategies will be vital for protecting both animal and human health in Zimbabwe.

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References

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