Article

PAMJ One Health

Letter to the editors

The resistance level shown by *E. coli* isolates originating from laying and broiler bird flocks from different farms in Nigeria

Motolani Mary Akinpelu, Adelekan Oluseyi Okunlade, Foluke Olajumoke Jemilehin, Akinlabi Oladele Ogunleye

Corresponding author: Adelekan Oluseyi Okunlade, Department of Veterinary Microbiology, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Nigeria. dr_seyi@yahoo.com

Received: 27 Jul 2023 - **Accepted:** 26 Nov 2023 - **Published:** 28 Nov 2023

Keywords: *E. coli*, layers, broilers, antibiotic resistance

Cite this article: Motolani Mary Akinpelu et al. The resistance level shown by *E. coli* isolates originating from laying and broiler bird flocks from different farms in Nigeria. PAMJ - One Health. 2023;12(16). 10.11604/pamj-oh.2023.12.16.41221

Available online at: https://www.one-health.panafrican-med-journal.com/content/article/12/16/full

The resistance level shown by *E. coli* isolates originating from laying and broiler bird flocks from different farms in Nigeria

Motolani Mary Akinpelu[1], Adelekan Oluseyi Okunlade[1,2,&], Foluke Olajumoke Jemilehin[1], Akinlabi Oladele Ogunleye[1]

[1]Department of Veterinary Microbiology, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Nigeria, [2]Department of Pathobiology, School of Veterinary Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

[&]**Corresponding author**

Adelekan Oluseyi Okunlade, Department of Veterinary Microbiology, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Nigeria

To the editors of the Pan African Medical Journal

In the scientific community, *Escherichia coli* (*E. coli*) have gained enough prominence and are considered the most studied bacteria in the world [1]. *E. coli* and the *Enterobacteriaceae* family have been included on a list of 12 bacterial families that pose major hazards to human health per the World Health Organization (WHO) classification [2]; demonstrating the organization's understanding of the gravity of antibiotic resistance. Antibiotic resistance in *E. coli* is a growing concern, and studies undertaken in a variety of settings have shed light on the problem. Distinct regional and national differences have been seen in the prevalence of ciprofloxacin-resistant *Escherichia coli* [2]. There should be great care and accountability in the use of antibiotics because of the link between antibiotic resistance and prescription overuse [3].

The usage of clinically relevant antibiotics in veterinary medicine and the declining availability of effective antimicrobial medications for the treatment of illnesses [4,5] only serve to exacerbate the situation. Historically, antibiotics have been of great significance in preserving a multitude of lives and mitigating sickness for a vast number of persons on a global scale [6]. For a variety of causes, drug-resistant forms of bacteria are more common in developing nations, reducing the efficacy of antimicrobials [7]. Chicken farmers in Nigeria and Ghana persist in the use of antibiotics in chicken feed or water for the purposes of prevention, treatment, and growth enhancement [8]. This practice has a substantial role in the development and spread of drug resistance.

This study determined the prevalence of antibiotic resistance in poultry fowl species and analyzed the pattern of resistance of *Escherichia coli* (*E. coli*) to commonly used antibiotics. A sample size of 300 avian specimens, which were deemed to be in apparent good health, was collected for the purpose of this study. The majority of the birds tested were laying birds, comprising 78.3% (235 out of 300) of the overall population. Of the total sample size of 300, the remaining 21.6% (65) were classified as broilers. The avian specimens exhibited a range of ages spanning from 16 to 22 weeks, whereas the collective sizes of the bird groups fluctuated between 300 and 600 individuals. The farms practiced an intensive management system with a deep litter option. Feeds are self-compounded with the addition of antibiotics in feed as prophylaxis. Samples were processed following standard microbiological procedures while isolates were identified using an Analytical Profile Index (API 20E kit (Biomerieux®, Inc. at 100 Rodolphe Street, Durham, North Carolina 27712, USA).

Antimicrobial susceptibility testing for a panel of 10 antibiotics was performed on the isolated organisms using the disc diffusion method. The antibiotics used in this study were septrin (25µg), chloramphenicol (30µg), sparfloxacin (5µg), ciprofloxacin (15µg), amoxicillin (30µg), augmentin (30µg), gentamicin (10µg), ofloxacin (5µg), pefloxacin (10µg) and streptomycin (30µg). The turbidity of each sample was calibrated to the 0.5 McFarland standard. The suspension of each isolate was evenly applied onto the surface of pre-prepared Mueller Hinton agar plates (Oxoid, Basingstoke, UK) using sterile swab sticks. A total of 185 *Escherichia coli* (*E. coli*) were isolated from the fecal samples of the avian specimens in the designated study areas. All of the *E. coli* isolates acquired showed resistance to many antibiotics, including ciprofloxacin (100%), pefloxacin (100%), augmentin (89%), amoxicillin (77%), streptomycin (67%), sparfloxacin (62%), gentamicin (58%) and chloramphenicol (56%). The findings indicate that 80%, 75%, and 50% of the isolates exhibited resistance to 5, 4, and 3 antibiotics, respectively (Table 1). Eighty percent (80%) of the *E. coli* bacteria studied showed resistance to several drugs, which is a major finding (Table 1).

Notably, these strains showed substantial resistance towards ciprofloxacin, pefloxacin, and

augmentin (Table 1). The research findings indicate that there is a prevalence of 78% for *E. coli* and 80% for multidrug-resistant *E. coli* in both laying and broiler chickens. This aligns with the results reported by Adebowale *et al.* [9], who observed an 80% prevalence of *E. coli* and 56% prevalence of multidrug-resistant *E. coli* in a live bird market located in Abeokuta, Nigeria. The worldwide spread of *E. coli* strains that are resistant to many antimicrobials (multidrug-resistant, extensively drug-resistant, and pan-drug-resistant) is a major cause for alarm [10].

Conclusion

The findings of this research indicate a significant level of antibiotic resistance in *E. coli* strains routinely seen in chicken populations in Nigeria. Antimicrobials are widely utilized in animals raised for human consumption as a means of reducing the prevalence of bacterial illnesses and increasing output. Numerous research studies have shown that the misuse and suboptimal utilization of antibiotics are pivotal variables contributing to the development of resistance. Limiting the use of antimicrobials in the context of animal husbandry is a long-term solution to the issue. Restricting the use of antibiotics for growth promotion via regulation is suggested, along with encouraging the use of probiotics.

Competing interests

The authors declare no competing interests.

Authors' contributions

Project conceptualization, data analysis, and result interpretation were performed by Adelekan Oluseyi Okunlade and Motolani Mary Akinpelu. Foluke Olajumoke Jemilehin and Akinlabi Oladele Ogunleye reviewed the manuscript. All the authors read and approved the final version of this manuscript.

Table

Table 1: percentage multidrug resistance to *E. coli*

References

1. Galindo-Méndez M. Antimicrobial resistance in Escherichia coli. E. coli Infections-Importance of Early Diagnosis and Efficient Treatment. IntechOpen. 2020 Jul 17: 1-20. **Google Scholar**
2. World Health Organization. Fact sheets: Detail: Antimicrobial resistance. Accessed 20th May 2022.
3. Guo W, Sun F, Liu F, Cao L, Yang J, Chen Y. Antimicrobial resistance surveillance and prediction of Gram-negative bacteria based on antimicrobial consumption in a hospital setting: A 15-year retrospective study. Medicine (Baltimore). 2019 Sep;98(37): e17157. **PubMed**| **Google Scholar**
4. Livermore DM, Canton R, Gniadkowski M, Nordmann P, Rossolini GM, Arlet G *et al*. CTX-M: changing the face of ESBLs in Europe. J Antimicrob Chemother. 2007 Feb;59(2): 165-74. **PubMed**| **Google Scholar**
5. Okunlade AO, Adekanmbi AO, Olajumoke JF, Osemuohu OA. Quinolone resistance markers in fluoroquinolone-resistant, non-ESBL-producing *Escherichia coli*isolated from non-human primates at selected zoological gardens and tourist centres. International Journal of Environmental Studies. 2023 May 4;80(3): 687-98. **Google Scholar**
6. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE *et al*. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. Lancet. 2012 Jun 9;379(9832): 2151-61. **PubMed**| **Google Scholar**

7. Jones RN, Sader HS, Fritsche TR, Pottumarthy S. Comparisons of parenteral broad-spectrum cephalosporins tested against bacterial isolates from pediatric patients: report from the SENTRY Antimicrobial Surveillance Program (1998-2004). Diagn Microbiol Infect Dis. 2007 Jan 1;57(1): 109-16. **PubMed**| **Google Scholar**
8. Manyi-Loh C, Mamphweli S, Meyer E, Okoh A. Antibiotic Use in Agriculture and Its Consequential Resistance in Environmental Sources: Potential Public Health Implications. Molecules. 2018 Mar 30;23(4): 795. **PubMed**| **Google Scholar**
9. Adebowale O, Makanjuola M, Bankole N, Olasoju M, Alamu A, Kperegbeyi E *et al*. Multi-Drug Resistant *Escherichia coli*, Biosecurity and Anti-Microbial Use in Live Bird Markets, Abeokuta, Nigeria. Antibiotics (Basel). 2022 Feb 16;11(2): 253. **PubMed**| **Google Scholar**
10. Shlaes DM, Sahm D, Opiela C, Spellberg B. The FDA reboot of antibiotic development. Antimicrob Agents Chemother. 2013 Oct;57(10): 4605-7. **PubMed**| **Google Scholar**

Table 1: percentage multidrug resistance to *E. coli*

Antibiotic number	Percentage multidrug resistance	Antibiotics
3	50	CH, PEF, AM
4	75	CN, SXT, CH, PEF
5	80	SXT, PEF, CPX, AM, AU

CH: chloramphenicol; PEF: pefloxacin; SXT: streptomycin; AM: amoxicillin; CN: gentamicin; AU: augmentin; CPX: ciprofloxacin