CRPS Current Research in **Poultry Science**

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# Antibiotic Residues in Poultry Eggs Sold in Wukari, Taraba State, Nigeria

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## ABSTRACT

**Background and Objective:** The use of antibiotics usually in poultry feeds has been adopted in virtually all poultry farms mostly for medications and as growth enhancers for poultry. Continuous use of these antibiotics over time may leave deposits of antibiotics which may become resident in the body tissues of these birds in the form of antibiotic residues. Consuming poultry of this kind or their eggs may pose certain health challenges to consumers. This study is aimed at investigating the number of antibiotic residues that may be present in poultry eggs sold in Wukari, Taraba State, Nigeria. **Materials and Methods:** A total of nine egg samples were collected and worked upon. Three samples imported from Jos (Plateau), three samples imported from Enugu and three samples obtained from Wukari (Taraba), were worked on in triplicates. They were boiled for about 10 min, pieced, air-dried, milled and properly packaged for laboratory analysis. The following antibiotics were assayed for Tetracycline, chlortetracycline, oxytetracycline and colistin using High-Performance Liquid Chromatography (HPLC). **Results:** The results obtained in this study revealed chlortetracycline to be the most abundant in the egg samples. In the order of egg samples imported from Jos, Enugu and those bred in Wukari, results for antibiotic levels present in the obtained egg samples are as follows: Was the highest and none even close of all the four tested (13.17, 9.92, 11.30) µg/100g, Tetracycline: (3.63, 2.72, 3.11) µg/100g, Oxytetracycline: (5.36, 4.02, 4.58) µg/100g, colistin: (2.80, 4.15, 1.62) µg/100g. The results were arranged in order of the eggs imported from Jos (Plateau), eggs collected from Wukari (Taraba) and eggs imported from Enugu, respectively. **Conclusion:** The possible reason for the presence of antibiotic residues in poultry products may be because of failure to observe drug withdrawal periods by poultry farmers or the ignorance of the consumers on the adverse effect and toxicity of antibiotic residues in human health such as allergic reactions among others.

## KEYWORDS

Antibiotics, antibiotic residues, antimicrobial resistance, risk assessment, eggs, poultry



ISSN: 2152-212x (Online)
ISSN: 2152-2111 (Print)
https://doi.org/10.17311/crps.2023.13.21

Received: 5 Dec. 2022
Accepted: 5 Mar. 2023
Published: 6 May 2023

## INTRODUCTION

Poultry eggs are the most commonly consumed variety of eggs, but chickens are the most easily accessed and therefore serve as food commodities in many parts of Nigeria[1]. Far back as 1957, the Egg Marketing Board successfully marketed eggs, which makes it a meal intriguing to start the day with[2]. Researchers have found that a medium-sized egg provides 78 kcal, yet contains 6.5 g protein and the fat content is 5.8 g, of which 2.3 g is monounsaturated fat. Eggs also contain a variety of important vitamins, minerals and trace elements[3]. Eggs can make a significant contribution to a healthy diet due to the presence of compounds with antimicrobial, antioxidant, anti-cancer, or anti-hypertensive properties found in them[4].

To maintain high production of eggs by poultry birds, farmers have adopted the use of antibiotics in poultry feeds to prevent poultry birds from infectious diseases such as Highly Pathogenic Avian in Uenza (HPAI), Newcastle Disease (ND), Salmonellosis, Gumboro disease, among others[5]. They also serve as growth enhancers for these birds. Antibiotics also referred to as antibacterial drugs, are medications that destroy or slow down the growth of bacteria and they include a range of effective drugs used to treat diseases caused by bacteria. They include penicillin, streptomycin, erythromycin[6], etc. Penicillin-based antibiotics such as ampicillin and penicillin G are used to treat many infections and the effect have been evident for a long time, the overuse of these antibiotics can result in the growing number of these bacterial infections becoming resistant to certain antibacterial drugs[7]. Due to a lack of knowledge and effective dairy and poultry principles, antibiotics are used indiscriminately by farmers and withdrawal periods are not being maintained. The frequent use of these antibiotics by farmers causes the occurrence of antibiotic residues in various food products of animal origin including milk, egg and meat[8-10]. According to Egg Safety Center, only a small percentage of egg-laying poultry are exposed to antibiotics, but if it is highly needful because of persistent disease, it must be under the supervision of a veterinarian[11]. Antibiotic residues can accumulate in egg white or yolk when administered therapeutically by the use of medicated feed or when the diet of hens is accidentally contaminated[12]. The appearance of antibiotics in yolk and albumen highly depends on the pharmacokinetic properties of the drug used, so the distribution and deposition pattern of residues will vary for each antibiotic agent[13,14]. For human concerns, antibiotic residues in food of animal origin produce a potential threat to direct toxicity in humans and low levels of antibiotic exposure result in the alteration of microflora and the possible development of resistance[15,16], which causes failure of antibiotic therapy in clinical situations. Health disorders caused by the accumulation of antibiotic residues might include reproductive disorders, allergy, carcinogenesis, nephropathy etc[11].

Studies in the past have reported on the presence of antibiotic-resistant bacteria in foods of animal origin, which must be put into great consideration because of the potential health risks attached[17]. Several researchers have also reported various antibiotic residue testing methods. Some of these are, rapid testing[18]. Screening tests with bioassays[19]. The ELISA (Enzyme-Linked Immunoassay) test and High-Performance Liquid Chromatography (HPLC). This research work was undertaken to detect and determine the concentration or level of antibiotic residues in poultry eggs sold in Wukari, Taraba State, Nigeria.

## MATERIALS AND METHODS

**Study area:** The study was conducted in Wukari City, one of the major local Government Areas in Taraba State, Nigeria, from January 2022 to April, 2022.

**Sample collection:** A total of nine egg samples in triplicates were collected from commercial chicken layer farmers and vendors randomly from three locations namely: Jos (Plateau State) (eggs produced and imported from Jos), Wukari (Taraba State) (eggs produced in Nwuban Poultry, Wukari) and Enugu (Enugu State) (eggs produced and imported from Enugu)-all purchased from New Market Wukari, Taraba State, Nigeria.

Proper oral questionnaires were issued to the egg vendors to obtain important information for this research work like egg-laying period, antibiotics used by the farmers and supplements subsequently used either through feed or any other means.

**Sample preparation:** Each of the nine egg samples in their separate triplicates was boiled for about 10 min, respectively, pieced and allowed to air dry for 5 days. They were then mixed and homogenized using T18 Digital Ultra Turrax Homogenizer (manufactured in North America, Chicago by Frain Industries Inc.). As 3 g of the homogenized egg sample was transferred into a polypropylene centrifuge tube (manufactured in North America, Chicago by Frain Industries Inc.) ready for extraction.

**Extraction of antibiotic residues (tetracycline, chlortetracycline, oxytetracycline and colistin)**

**Liquid-liquid extraction:** A known concentration (0.1 M) of EDTA was added into the polypropylene centrifuge tube containing 3 g of homogenized prepared egg samples, capped and shaken for 10 min on a flat-bed shaker at a speed of 300 rpm. Centrifuge tubes were uncapped and 1 mL of 0.34 M sulphuric and 7 mL of 7% sodium tungstate were added, capped and gently hand-shaken for 7 sec, centrifuged at 4000 rpm for 25-30 min at 15°C. The supernatants from the extraction were filtered by side arm flask under vacuum through Whatman No. 2 filter paper pre-wetted with McIlvaine buffer-EDTA solution in the Buchner funnel.

**Solid phase extraction:** Oasis Max Cartridge (manufactured in North America, Chicago by Frain Industries Inc.). was attached to a solid phase extraction (SPE) vacuum manifold capable of processing up to 20 solid phase extraction cartridges (SPE cartridges were not allowed to dry from pre-wash, sample addition and sample elution). Each cartridge was conditioned with 20 mL of methanol followed by 20 mL of ultra-pure distilled water. Test extracts were loaded into the SPE cartridge and vacuumed at a rate of 5 mL min$^{-1}$. Subsequently, the elution took place with 6 mL of methanoic acid in 15 mL test tubes as an eluate collection vessel. Once the flow stopped, the vacuum was increased to remove residual solvent from the cartridge, tubes were removed from the vacuum manifold and vortexed afterward. The tubes containing the methanoliceluate were placed in a Nitrogen-Evaporator with a water bath temperature of 40-50°C reduced to 0.5-1 mL under a stream of dry nitrogen. The final eluate was adjusted to 1 mL with methanol, vortexed then diluted to 2 mL with distilled water and vortexed again. As 0.5-1 mL of the final extract was poured into a 3 mL syringe and filtered through a disc filter into an HPLC autosampler vial.

**High-performance liquid chromatography:** Extracts were chromatographed on an HPLC system (manufactured in North America, Chicago by Frain Industries Inc.) equipped with a Shimadzu DGU-20A5 degasser, Shimadzu SPD-M20A Diode Array Detector, Shimadzu CBM-20A Communication System and Shimadzu LC Solution Software Version 3.50.346 (manufactured in North America, Chicago by Frain Industries Inc.). The type of column used was Thermo-Scientific, BDS Hypersil C8 (125×4) mm, Partial size 5µ, Part No. 28205-124030, SN: 10058200. Pure Acetronitrile HPLC Grade (Solvent B) and 0.005 M Oxalic acid (Solvent A) constituted the mobile phase solutions. The volume (100 µL) of various antibiotics was injected under low-pressure gradient mode of 75% A and 25% B and detected at a wavelength (λ) of 365 nm with a flow rate of 0.8 mL min$^{-1}$. The column temperature was kept at 30-45°C.

**Risk analysis**

**Estimated Daily Intake (EDI):** The Estimated Daily Intake was calculated using the equation recommended by Juan *et al.*[20] given as follows:

$$\text{EDI} = \frac{\text{Mean of mg antibiotic per kg of food} \times \text{daily intake of food}}{\text{Adult body weight (60 kg)}}$$

**Hazard Quotient (HQ):** The hazard quotient was calculated using the equation recommended by Juan *et al.*[20] given as follows:

$$HQ = \frac{\text{Dietary intake of residues through egg}}{\text{Acceptable daily intake}}$$

**Cancer risk assessment:** Cancer Risk Assessment was calculated using the equation recommended by Juan *et al.*[20] given as follows:

$$TR = \frac{Efr \times EDtot \times LI \times Mcs \times CPso \times 10^{-3}}{BWa \times ATC}$$

Where:
THQ = Target hazard quotient
Efr = Exposure frequency (350 days/years)
Edtot = Exposure duration Total (30 years)
LI = Lipstick ingestion gram per day (1 g)×1000 mg $kg^{-1}$
Mcs = Metal concentration
RfDo = Reference dose from WHO/FAO
Bwa = Adult 65 kg
CPso = Carcinogenic potency slope (1 mg/kg/Day)
ATC = Average time carcinogens (25,550 days)

**Statistical analysis:** Statistical analysis of the results was carried out using SPSS (Statistical Package for Social Sciences) statistical software (version 21). Descriptive statistics were used and the means and standard deviations were calculated. The statistical difference was considered significant at $p<0.05$.

## RESULTS

**Concentration of antibiotic residues in poultry egg samples produced in Jos, Nwuban (Taraba) and Enugu:** The results for antibiotic residues in egg samples imported from Jos, Nigeria showed that the concentration of chlortetracycline was higher than the other three residues (tetracycline, oxytetracycline and colistin). Chlortetracycline (99.2 μg $kg^{-1}$) was still observed to be the highest in egg samples produced in Nwuban poultry compared to the other residues, oxytetracycline and colistin with values of 40.22 and 41.52 μg $kg^{-1}$, respectively (Table 1). For poultry egg samples imported from Enugu, the antibiotic residue concentration is presented as, CTCS (chlortetracycline) >TCC (tetracycline) >OTC (oxytetracycline) >COL (collisitin).

**Accepted Daily Intake (ADI) for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu:** The recommended Accepted Daily Intake (ADI) values given by JEFCA[21], for chortetracycline (30.00 μg/kg/b.wt./day), oxytetracycline (30.00 μg/kg/b.wt./day), tetracycline (30.00 μg/kg/b.wt./day) and colistin (7.00 μg/kg/b.wt./day) as shown in Table 2.

**Estimated Daily Intake (EDI) for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu:** The Estimated Daily Intake (EDI) for chlortetracycline in poultry egg samples produced in Jos, Nwuban (Taraba) and Enugu (7.35, 5.53 and 6.31, respectively) was observed to be the highest compared to the EDI of other antibiotics residues (Table 3). Colistin recorded the least EDI for poultry egg samples produced in Jos, Nwuban (Taraba) and Enugu (1.56, 2.31 and 0.90, respectively).

**Hazard Quotient (HQ) for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu:** The Hazard Quotient levels for Chlortetracycline, tetracycline, oxytetracycline and colistin. The least HQ value was

Table 1: Antibiotic residues in poultry egg samples produced in Jos, Nwuban (Taraba) and Enugu

| Parameter | Poultry eggs produced in Jos (μg kg$^{-1}$) | Poultry eggs produced in Nwuban (Taraba) (μg kg$^{-1}$) | Poultry eggs produced in Enugu (μg kg$^{-1}$) |
|---|---|---|---|
| CTCS | 131.7±1.18$^{a}$ | 99.2±2.98$^{a}$ | 113.0±1.09$^{a}$ |
| TCC | 36.3±0.33$^{a}$ | 27.2±0.83$^{a}$ | 31.1±0.31$^{a}$ |
| OTC | 53.6±0.49$^{a}$ | 40.2±1.23$^{a}$ | 45.8±0.45$^{a}$ |
| COL | 28.0±1.63$^{ab}$ | 41.5±0.73$^{b}$ | 16.2±0.10$^{a}$ |

Results are expressed in mean±standard deviation of triplicate determination, values with the same alphabet superscript are not significantly different between groups while values with varying alphabet superscripts significantly differ between groups ($p<0.05$), CTCS: Chlortetracycline, TCC: Tetracycline, OTC: Oxytetracycline and COL: Colistin

Table 2: Accepted Daily Intake (ADI) for eggs produced in Jos, Nwuban (Taraba) and Enugu

| Parameter | ADI for poultry eggs produced in Jos (μg/kg/b.wt./day) | ADI for poultry eggs produced in Nwuban (Taraba) (μg/kg/b.wt./day) | ADI for poultry eggs produced in Enugu (μg/kg/b.wt./day) | References |
|---|---|---|---|---|
| CTCS | 30.00 | 30.00 | 30.00 | Ezenduka *et al.*[21] |
| TCC | 30.00 | 30.00 | 30.00 | Ezenduka *et al.*[21] |
| OTC | 30.00 | 30.00 | 30.00 | Ezenduka *et al.*[21] |
| COL | 7.00 | 7.00 | 7.00 | Ezenduka *et al.*[21] |

ADI: Acceptable Daily Intake, CTCS: Chlortetracycline, TCC: Tetracycline, OTC: Oxytetracycline and COL: Colistin

Table 3: Estimated Daily Intake (EDI) for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu

| Parameter | EDI for poultry eggs produced in Jos (μg/kg/b.wt./day) | EDI for poultry eggs produced in Nwuban (Taraba) (μg/kg/b.wt./day) | EDI for poultry eggs produced in Enugu (μg/kg/b.wt./day) |
|---|---|---|---|
| CTCS | 7.35 | 5.53 | 6.31 |
| TCC | 2.03 | 1.52 | 1.74 |
| OTC | 2.99 | 2.24 | 2.56 |
| COL | 1.56 | 2.31 | 0.90 |

WHO accepted limit is $\leq$10.00[21], EDI: Estimated daily intake, CTCS: Chlortetracycline, TCC: Tetracycline, OTC: Oxytetracycline and COL: Colistin

Table 4: Hazard Quotient (HQ) for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu

| Parameter | HQ for poultry eggs produced in Jos | HQ for poultry eggs produced in Nwuban (Taraba) | HQ for poultry eggs produced in Enugu |
|---|---|---|---|
| CTCS | 0.25 | 0.18 | 0.21 |
| TCC | 0.07 | 0.05 | 0.06 |
| OTC | 0.09 | 0.07 | 0.09 |
| COL | 0.22 | 0.33 | 0.13 |

WHO accepted limit is $\leq$0.2[21], HQ: Hazard Quotient, CTCS: Chlortetracycline, TCC: Tetracycline, OTC: Oxytetracycline and COL: Colistin

Table 5: Cancer risk assessment for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu

| Parameter | Cancer risk for poultry eggs produced in Jos (Plateau) | Cancer risk for poultry eggs produced in Nwuban (Taraba) | Cancer risk for poultry eggs produced in Enugu |
|---|---|---|---|
| CTCS | $8.32\times10^{-8}$ | $6.3\times10^{-8}$ | $7.1\times10^{-8}$ |
| TCC | $2.3\times10^{-8}$ | $1.7\times10^{-8}$ | $1.9\times10^{-8}$ |
| OTC | $3.4\times10^{-8}$ | $2.5\times10^{-8}$ | $2.9\times10^{-8}$ |
| COL | $1.8\times10^{-8}$ | $2.6\times10^{-8}$ | $1.0\times10^{-8}$ |

CTCS: Chlortetracycline, TCC: Tetracycline, OTC: Oxytetracycline and COL: Colistin

recorded for TCC in poultry eggs produced in Nwuban (Taraba) (0.05). The highest HQ value was recorded for COL in poultry eggs produced in Nwuban (Taraba) (0.33) as shown in Table 4.

**Cancer risk assessment for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu:** Cancer risk assessment for poultry eggs produced in Jos, Nwuban (Taraba) and Enugu was presented in Table 5 . The highest cancer risk was recorded for CTCS in poultry eggs produced in Jos ($8.32\times10^{-8}$) while the lowest cancer risk was recorded for COL in poultry eggs produced in Enugu ($1.0\times10^{-8}$).

## DISCUSSION

The results of this study revealed the presence of antibiotic residues in poultry egg samples produced in Jos, Taraba (Nwuban) and Enugu. Speci cally chlortetracycline, tetracycline, oxytetracycline and colistin were detected in the assayed samples. These findings suggested a risk for public health since it is possible that the owners of these birds have no knowledge regarding the use and impact of antibiotic residues or with respect to the withdrawal period[22], meaning that they can consume or sell these products without knowing the impact of their actions. This is especially vital considering from the questionnaire administered that over 70% of poultry farmers indicated giving pharmacological treatments to their chickens.

The result presented in Table 1 showed that chlortetracycline had the highest concentration in poultry eggs produced in Jos, Taraba (Nwuban) and Enugu (131.7, 99.2 and 113.0 μg $kg^{-1}$, respectively). Out of the three locations, poultry eggs produced in Jos recorded the highest concentration of chlortetracycline (131.7 μg $kg^{-1}$). This result was not in tandem with the findings of Duelge *et al.*[23] and Samanidou *et al.*[24] who recorded the following values for tetracycline, oxytetracycline and chlortetracycline, respectively (62.35, 55.42, 49.98 μg/100 g, respectively) in similar research conducted in Tanzania. The high levels of chlortetracycline residues recorded in this investigation can be linked to the high use of chlortetracyclineowing to its relatively cheap price and availability, with low withdrawal periods by poultry farmers in the three locations considered in this study. Chlortetracycline is broadly used in a variety of animal treatments. More specifically, it is used to treat infected wounds in cattle, sheep and pigs and respiratory tract infections in calves, pigs and more commonly chickens[24]. Oral questionnaires held with poultry farmers of Nwuban, Taraba State revealed that occasionally, chickens are observed to experience sniffling, sneezing and even coughing which makes them weak and may result in their death unless being treated with chlortetracycline. Apparently, the high concentration of chlortetracycline in poultry eggs produced in Taraba (Nwuban) shows that there is an outbreak of respiratory disease amongst poultry birds grown in Nwuban (Taraba). Chlortetracycline residues have been reported to have great toxicological effects, similar to streptomycin, posing symptoms like nausea and vomiting among others, in victims.

In this study, poultry eggs produced in Enugu recorded the lowest concentration of colistin (16.2 μg $kg^{-1}$) compared to colistin concentration recorded in poultry eggs samples produced in Jos and Taraba (Nwuban) (28.02 and 41.5 μg $kg^{-1}$, respectively) (Table 1). This finding is in tandem with the result obtained by Lei Tong *et al.*[25]. Colistin ingested into the human body can cause renal toxicity because the drug is primarily excreted by the kidney and elevated blood levels may further impair renal functions[25]. The major use of colistin by poultry farmers is to combat gastrointestinal bacterial infections in poultry birds[18]. Low levels of colistin in poultry eggs produced in Enugu suggest that gastrointestinal bacterial infections are not pronounced in birds grown in Enugu.

The route by which antimicrobials reached the eggs is not known. However, this may have happened by either of the two main paths mentioned or both. The first would be the direct administration of antimicrobials to birds by their owners, considering that an important number of farmers indicated giving pharmacological treatments to poultry. Another hypothesis that could explain these ndings would be the acquisition of antimicrobial residues by the environment[25]. Different studies have demonstrated the persistence of antimicrobial residues in soil amended with manure. Previously obtained results showed that the antimicrobial residues can persist for a prolonged period, which also depends on the concentrations and physical-chemical characteristics of the different compounds[26]. So, this can be a risk for the transfer of antimicrobial residues to other animals.

Risk assessment is done by comparing the estimated daily intake of antibiotic residues with their acceptable daily intake (ADI) values recommended by regulatory agencies (WHO, FAO)[20]. This study analyzed residues of tetracycline, oxytetracycline, chlortetracycline and colistin in poultry eggs sold in Wukari, Taraba State and evaluated the risk of dietary exposure to a residual quantity of them through egg consumption based on current and representative evidence on average egg consumption by adults.

The result presented in Table 2 showed the dietary intake of antimicrobial residues expressed as μg $kg^{-1}$ of body weight per day (μg/kg/b.wt./day) in comparison with ADI values recommended by JECFA i.e. 0-30 for tetracycline, oxytetracycline and chlortetracycline and 0-7 for colistin. The highest level of Acceptable Daily Intake (ADI) of four tested antibiotics established by JECFA was taken into account for risk characterization. On the basis of Estimated Dietary Intake and Acceptable Daily Intake, the HQ was found to be (0.25, 0.07, 0.09 and 0.22) ,(0.18, 0.05, 0.07 and 0.33), (0.21, 0.06, 0.09 and 0.13) for chlortetracycline, tetracycline, oxytetracycline and colistin, respectively for poultry eggs produced in Jos, produced in Taraba (Nwuban) and those produced in Enugu, respectively. This result was not consistent with the findings of Ezenduka *et al.*[21] and Pikkemaat *et al.*[26]. This suggested that the population is safe as far as dietary exposure to tetracycline, chlortetracycline, oxytetracycline and colistin residues is concerned as their values are below the stipulated maximum limit ($\leq$1.00). The ADI represents the number of residues that can safely be consumed per day over a man's lifetime without adverse effects. Taraba and Jos are well recognized in poultry farming and egg production and have good per capita availability[26]. Thus, more eggs available may lead to higher consumption and a higher probability of dietary exposure to antimicrobial residues in the long run. The HQ for antibiotic residues detected in egg samples was less than 1.00. These values assume that there were no significant adverse effects on the health of consumers associated with the consumption of the poultry egg samples linked to bioaccumulation. In some cases, Hazard Quotient levels differ from Hazard Index levels. Hazard quotient levels are said to be specifically $\leq$0.2[20] which shows that chlortetracycline and colistin may be a bit unsafe according to their respective values above.

The possible reason for the presence of antibiotic residues in poultry products sold in Wukari may be because of the failure to observe drug withdrawal periods by poultry farmers or the ignorance of the consumers on the adverse effect and toxicity of antibiotic residues in human health such as allergic reactions among others. It is recommended that farmers of poultry eggs in Wukari should observe drug withdrawal periods in order to reduce the level of antibiotic residues in poultry eggs produced and sold in Wukari for the safety of the citizens of Wukari. This research provides baseline information for this non-addressed food safety issue and demonstrates that further studies are needed. Researchers interested in this field of study who wish to extend the findings of this research should include the confirmation and quantification of the pharmacologically active substances in eggs in order to identify the antibiotics that are being used and assess the risk that this may represent to the consumers as this present study did not address this area.

## CONCLUSION

Eggs sold in Wukariare carry antibiotic residues of the four tested antibiotic families (chlortetracycline, tetracycline, oxytetracycline and colistin). Its role in antimicrobial resistance spread and the specific risk for food safety must be addressed for eggs sold in Wukari, Taraba State, focusing on the route by which antimicrobials reached the eggs. This research provides baseline information for this non-addressed food safety issue and demonstrates that further studies are needed. The next steps should include the confirmation and quantification of the pharmacologically active substances in eggs, in order to identify the antibiotics that are being used and assess the risk that this may represent to the consumers.

## SIGNIFICANCE STATEMENT

This study identified the presence of antibiotic residues in poultry eggs sold in Wukari, Taraba State, Nigeria. This research provides baseline information for this non-addressed food safety issue and demonstrates that further studies are needed. The next steps should include the confirmation and quantification of the pharmacologically active substances in eggs, to identify the antibiotics that are being used and assess the risk that this may represent to the consumers.

## ACKNOWLEDGMENT

We would like to thank all the researchers that contributed to the success of this research work.

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