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ORIGINAL ARTICLE

Quantification of Antibiotic Residues in Local and Imported Broiler Chicken Meat in Al-Batina Governorate using Liquid Chromatography-Mass Spectrometry

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KEYWORDS

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ABSTRACT: Antibiotics are widely used in poultry to increase meat production and prevent infections. The aim of this study is to quantitative and qualitative determination of antibiotic residue in the chicken samples. The antibiotic residues were extracted from the local and imported broiler chicken samples by applying modified established methods and quantified them by liquid chromatography-mass spectrometry (MS/Q-TOF). Both antibiotics were extracted from the meat and kidney collected from chicken using well-established methods. The extracted samples were analyzed by using the sensitive MS/Q-TOF. The experimental results showed that collected local and imported chicken samples contain five analyzed antibiotics and are within the permissible limit except for gentamicin. In the imported meat sample, the highest amount of antibiotics was, sulfanilamide, and the lowest was levofloxacin. However, in the local breast meat samples, among the analyzed antibiotics, the amount of gentamicin in both local chicken collected from Al Safwa and Waeel is too high, 0.202 m kg^{-1} and 369.87, respectively compared to the maximum residue level (MRL). Other antibiotics in the breast meat samples are within the MRL values. In kidney samples in the local broiler chicken, the amount of all analyzed antibiotics was within the MRL values. The highest concentration was sulfanilamide, followed by gentamicin > oxytetracycline > chloramphenicol > levofloxacin. In conclusion, all the imported and local broiler meat and kidney contains the five analyzed antibiotics within the MRL values, except gentamicin was available in high amounts in the local breast meat. In conclusion, the excessive amount of gentamicin in the chicken samples through diet will create significant health troubles.

INTRODUCTION

Antibiotics are medicines used to slow the growth or destruction of bacteria. But it is not used to treat viral infections. The use of antibiotics in clinical settings is one of the most important discoveries in the twentieth century. Although it has been proven effective in treating infectious diseases, it is also used in many medical procedures, such as organ transplantation and open-heart surgery. But its misuse leads to negative results, as the body becomes resistant to antimicrobials, so there is a significant increase in research on antibiotics to use and

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development properly [1-3].

The Ministry of Agriculture and Fisheries indicated that the Sultanate of Oman's production of chicken is estimated at 129 thousand tons annually, with 54% being consumed locally, as the Sultanate of Oman relies on imports from abroad to meet the population's needs for chicken meat, which amounted to 138 thousand tons in 2018. The remaining 46% is imported from various countries. Statistically, the import quantity of poultry meat in the Sultanate of Oman increased from 300 tons in 1964 to 118.050 tons in 2013, with an average annual growth rate of 17.92%. The total market for chickens, including layers and broilers chickens, is estimated at 10 million chickens. The entire poultry meat production reached 1.5 million, meaning that there has been an expansion of 10 percent for several years [4-7].

Antibiotics began to be used on the farm for animals in the 1940s to prevent diseases and help them grow faster. In early 2017, the Food and Drug Administration (USA) banned the use of antibiotics aiding to increase size and faster grow. Randall et al. [8] reported to determine what can lead to and affect humans if antibiotics are used in poultry production. One study, from 1957 until 1960, observed an increase in giving poultry food containing the antibiotic (tetracycline) in Britain. This led to increased resistance to tetracycline in the human body from 35% in 1957 to 63.2% in 1960. There was also a study in 1966 on antimicrobial resistance appeared among *Escherichia coli* isolates due to conditions that emerged, such as swine's diarrhea and diarrhea in newborns due to increased sulfonamide resistance by 17.1%. The result was that these antibiotics lead to a negative impact that affects human health [8].

Liousia et al [9] reported identifying the antibiotic residues in poultry in Greece. For the findings of the current exploratory survey, specific categories of antibiotics led to the detection of antibiotic resistances (ARs) in meat and liver tissue samples from both groups (Group A and Group B) of food animals. On the other hand, positive tests for one or more antibiotics were found in 26% of all swine samples and 33.9% of all chicken samples. Approximately every sample of chicken liver and 14% of pig liver tested positive for beta-lactams and sulphonamides. Regarding meat samples, tetracycline was found in the liver (11.1%) and kidneys (25%) of the studied pigs and 1.7% of chicken and 4% of tested pork and pigs. No quinolone residue was found in the samples analyzed. Still, there were a few macrolides (found in only 4% of pig muscles) and a few aminoglycosides (found in only 12.5% of pig kidney) [9].

Ralph et al. [10] reported that to detect antibiotic residues in a new way in the United States. Whereby a cotton swab is inserted into chicken extract, which absorbs tissue fluids, then this swab is placed in a test panel, and antibiotic medium No. 5 (BBL) is used, as well as a seed layer of bacillus subtitles and incubated overnight at 29°C. It is then monitored for evidence of inhibition around the swab. A total of 1780 tissues were analyzed. In 99.4% of the samples, no inhibition was found by standard procedures or in conformity with the screening procedure. The test has equivalent sensitivity to conventional methods in identifying tetracyclines, neomycin, erythromycin, penicillin, tylosin, and streptomycin [10].

Kabir et al [11] reported on 200 commercial eggs and 378 killed chicken feces (shit) were excluded for antibacterial medication residues. Nine antibacterial medications were also utilized on nine of the 10 farms for prevention, treatment, or both. As none of the farms noticed the drug withdrawal period, just two of 82 (21.8%) chicken eggs and 82 (21.8%) chicken droppings tested positive. As compared to layers (23.6%) and local chickens (4.8%), broilers registered a substantially higher percentage (33.1%) of antibacterial compounds after slaughter [11].

Baazize-Ammi et al. [12] reported that this aimed to screen for antibiotics resides in broiler chickens and milk. In Algeria, two hundred and twenty-one samples were collected: 71 samples of chicken breast meat, 117 samples of raw cow's milk and 33 samples of raw goat's milk. For chicken meat, 32.39% of the samples were positive, with 56.52% of these samples containing aminoglycosides, 52.17% containing sulphonamides, 30.43% containing beta-lactams and/or tetracyclines and 21.73% containing macrolides. The concentrations of amoxicillin, penicillin G, erythromycin and sulfisoxazole exceeded the maximum residue limits (MRL) laid down in European regulations in 28.57%, 85.71%, 80% and 91.66% of samples, respectively. These results indicate that chicken meat and milk contamination is due to non-compliance with administration procedures and poor use of antibiotics [12].

Charles et al [13] reported that this study aims to find group of antimicrobials can be used in poultry sectors. Not all antimicrobials can be used in Canada, Europe, and the United States, because of the resistance of the microorganisms to some of these antibiotics. Polypeptide antimicrobials are considered approved because they are not fully absorbed through the mouth of chickens. Aminoglycoside, like gentamicin and neomycin and streptoomycin are poorly absorbed. Tetracycline, is the most widely used in poultry. Quinolones, used to treat negative-Gram bacterial infections. But resistance is produced quickly against the bacterial strains, they are used to treat gram-positive and gram-negative infections [13].

Rikilt Research Institute of food safety Wageningen University, Netherlands. This food safety study aimed to avoid excess residues of antibiotics in poultry to know if they are edible. The European Union set specific standards for consumer health that farmers and traders must follow. Antibiotics scan tests test allows slaughterhouses, farmers, processors, and retailers to cost-effectively inspect products concerning antibiotic residues in poultry, meat, eggs, and fish. Antibiotics scan tests (SCAN) are very sensitive, and a large variety of antibiotic residues are detected in these products. SCAN test accreditation is based on the direct application of meat fluids (poultry, meat, or fish drip) or homogeneous egg on a microbiological plate system. The system components for each class of antibiotics (quinolones, sulfonamides, tetracyclines, macrolides/beta-lactams) were from a separate test plate. About the detection of ß-lactam and macrolides that is combined in one test [14, 15].

The use of antibiotics for poultry for various purposes, including the prevention of serious bacterial diseases and their emergence through the use of antibiotics as a growth stimulator to control intestinal microbes such as Oxytetracycline and Lincomycin. Also, the use of antibiotics by improving poultry production rates increases its efficiency and growth rate, such as Virginiamycin and Bacitracin. The excessive use of antibiotics in poultry leads to antibiotic resistance, as it loses its ability to control and combat the growth of microbes effectively, after which the disease becomes untreatable. Moreover, the repetition and excessive use of antibiotics in poultry, in turn, leads to the emergence of antibiotic-resistant microbes in humans [4-7]. Accordingly, this study aims to extract and quantify the Oxy-tetracycline group (group 1) and Ciprofloxacin group (group 2) antibiotics in the breast and kidney meat of both local broiler chickens and imported chickens which are collected from Al- Batinah Governorate.

No data is available on antibiotic residues in chickens in Oman. Therefore, this study aims to identify and quantify antibiotic residues in the poultry of Al Batinah Governorate, Sultanate of Oman. The result from experimental data from this project will determine the pattern of antibiotic residues in different types of samples were selected from local and imported chickens in Al-Batinah Governorate because the increase in the amount of antibiotic residue in chicken meat leads to many infections. Therefore, this study will help determine how healthy chicken meat is. This study's extraction, identification and estimation method will be used to standardize fingerprints and market chicken-related products. Moreover, this study, it will help the researchers to become future experts in quality control in the field of food-related products. Also, the generated experimental data will help develop related guidelines and enhance healthcare professionals' roles in the Sultanate of Oman.

MATERIALS AND METHODS

Sample collection

The chicken samples were collected from two local poultry farms Al Safwa and Waeel, Al Batinah, Oman (Figure 1) as, one local chicken from each farm, and imported chickens are from Hilal, Brazil and Argentina collected from Almazeed and Taj hypermarket. The sample chickens were immediately wrapped in sealable plastic bags, labeled and directly placed in cool boxes with dry ice cubes. The chicken samples were collected in entirely hygienic conditions before being transferred to the Health Sciences Research Laboratory (3A-Lab) at the University of Nizwa where they were kept in freezers.

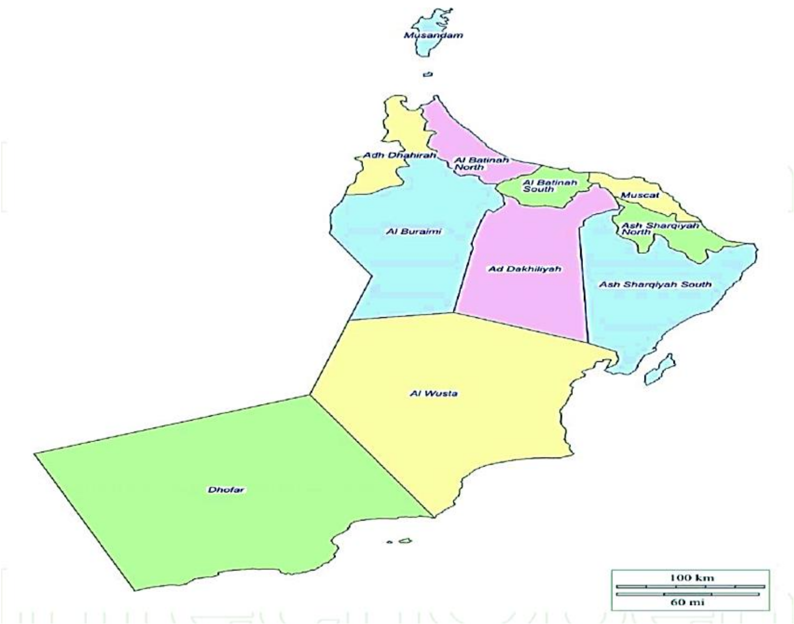

Figure 1. Sample collection location at Al Batinah Governorate, Oman *Sample processing.*

The collected poultry samples were divided into two groups. One is the oxytetracycline group (group 1), and the other is the ciprofloxacin group (group 2). For local chicken, specimens were taken from the chicken breast and kidney, while in the imported chicken; specimens were taken from the chicken breast.

Oxytetracycline group (Group 1)

Each chicken sample's breast and kidney meat (2 g) were placed in a test tube separately and homogenized for 2 minutes using a homogenizer. Then 100 m citric acid, 1 ml HNO_3 (30%), 4 ml CH_3OH, and 1 mL deionized H_2O were added to the test tube and kept in a vortex for mixing [16]. The mixture was left in an ultrasound bath for 15 minutes and then centrifuged for 10 minutes at 4000 rpm using a centrifuge machine. The supernatant part was filtered using a 0.45 µm nylon filter and then pre-concentrated using a rotary evaporator until the volume was 2 mL (Figure 2).

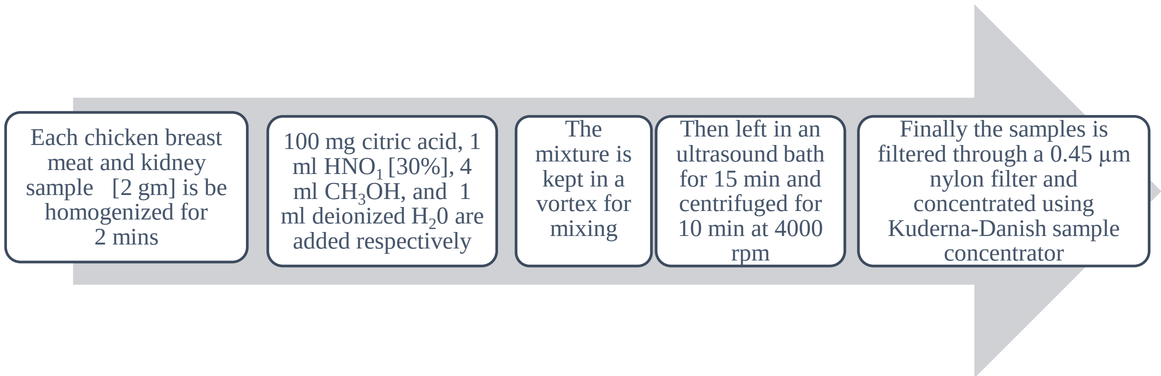

Figure 2. Systematic diagram of Oxytetracycline group (Group 1)

Ciprofloxacin group (Group 2)

Breast and kidney meat **(**2 g) of each chicken sample were placed in a 50 mL test tube, then 8 mL of 5% $C(Cl)_3COOH$ (TCA) were added. Then the tuve was kept in a vortex for mixing and sonication for 3 minutes. Then mixture sample was centrifuged at 14000 rpm for 5 minutes [17]. Finally, the sample was filtered through a 0.45 µm nylon filter and concentrated by using a rotary evaporator until the volume was 2 mL (Figure 3).

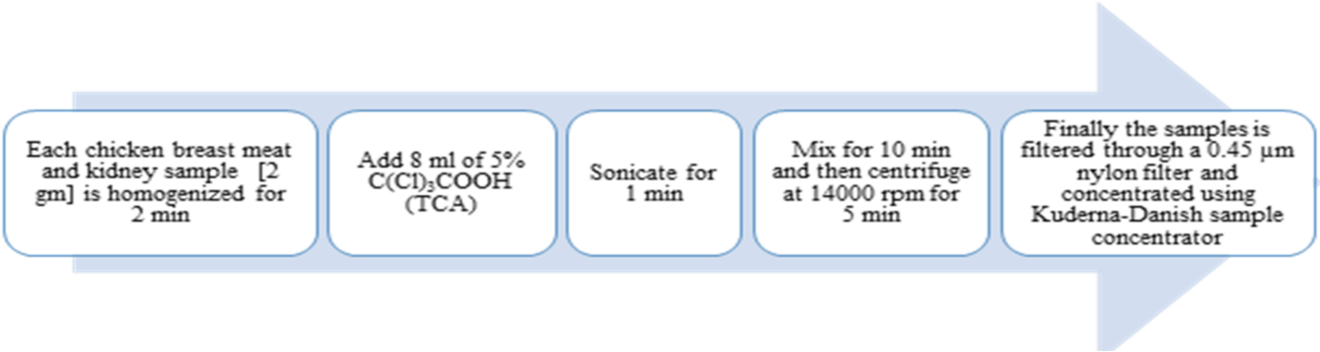

Figure 3. Systematic diagram of Ciprofloxacin group (Group 2)

LC-MS/Q-TOF

Quantification of the selected groups of antibiotics (group 1 and group 2) was determined using a sensitive Agilent 6530 Accurate Mass System (MS/Q-TOF) (Agilent, USA) with positive ionization mode. Ten microliters (10 µl) of the prepared pre-concentrate samples was injected into the MS-Q-TOF. Full-scan mass spectra obtained all data within the range of 30–2200 amu. Reverse phase C_{18} (150 x 4.6, 5 µm) and column temperature at 30^{o}C were used for sample analysis. As a mobile phase, the gradient LC elution method consisted of A) 100% H_2O + Buffer R B) 100% acetonitrile + Buffer with a ratio was 6O:40% was used with flow rate of 0.2 ml min^{-1}. UV detector with a wavelength range from 190-400 nm was used to detect the compounds [14]. The amount of antibiotics selected was determined based on the standard curve [18].

Standard preparation

The selected different antibiotics (sulfanilamide, gentamicin, oxytetracycline, chloramphenicol, and levofloxacin) were quantified in the local and imported chicken breast and kidney meat was using a standard protocol [16, 17]. One milligram of each antibiotic (Group 1 and Group 2) was weighed and dissolved in 10 ml of methanol solvent. The prepared standard solution was 100 ppm and then diluted with methanol solvent to prepare different concentrations (10, 20, 30, 40, 50, 60, 70, 80, and 90 m mL^{-1}). Plotting the peak areas against concentrations to prepare calibration curves for determining antibiotic concentration is presented in Figure 4.

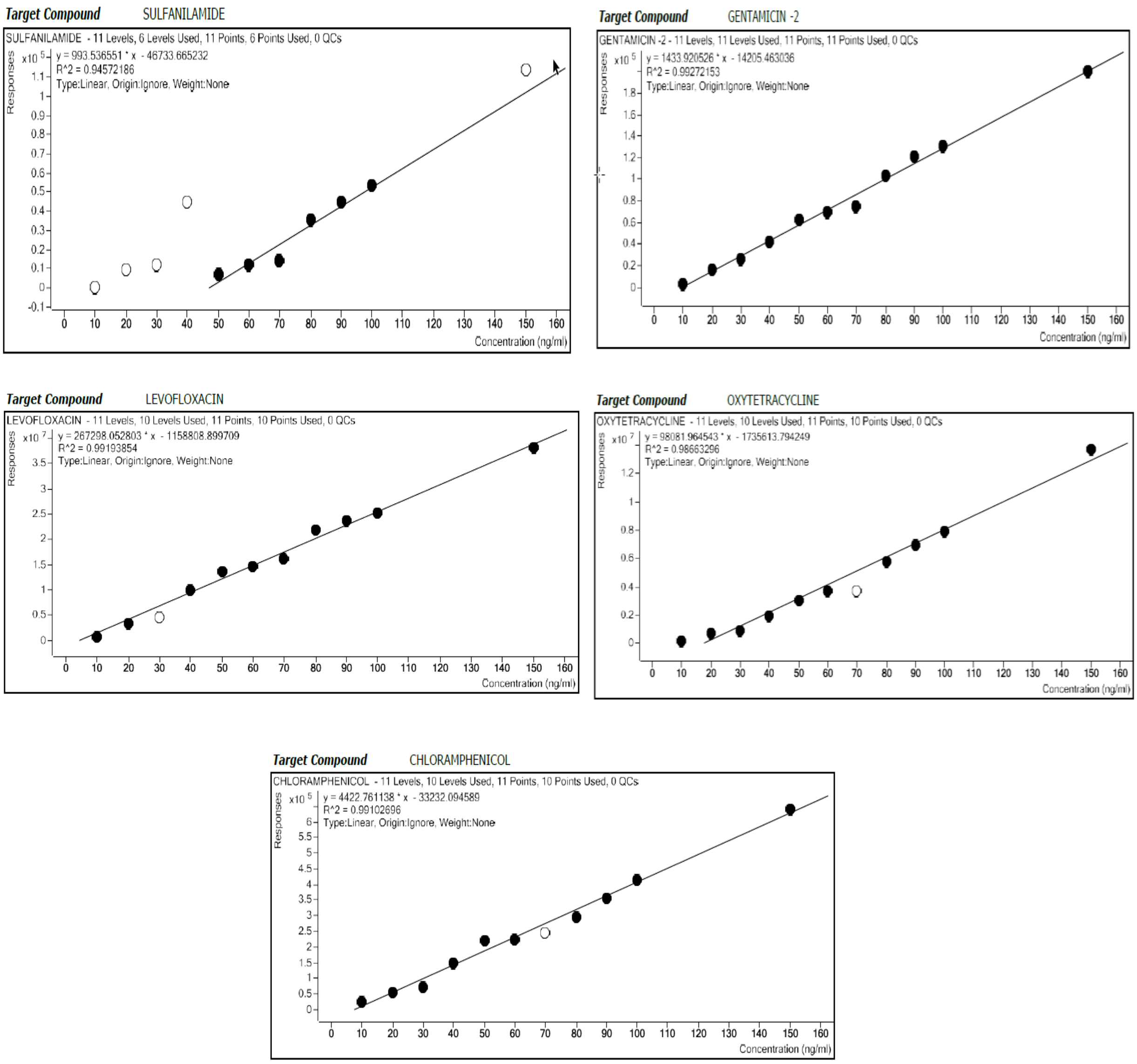

Figure 4. Calibration curves of the five antibiotics.

Validation of the method by blank sample

Each standard (1mL) at the concentration of 50 µg mL^{-1} without chicken sample was placed into a test tube and homogenized for 2 min. The citric acid (100 m), nitric acid (30%, 1 mL), methanol (4 mL), and deionized water (1 mL) were added to the test tube, and the mixture samples were sonicated for 15 min. The sonicated sample was centrifuged for 10 min at 14000 rpm and then filtered supernatant part by using 0.45 µm nylon filter paper. The pre-concentration was done by using a rotary evaporator until the volume of 2 mL. The recovery percentage of each standard in the blank samples was analyzed by using MS/Q-TOF [14, 16]. The chromatogram of the blank sample is presented in Figure 5.

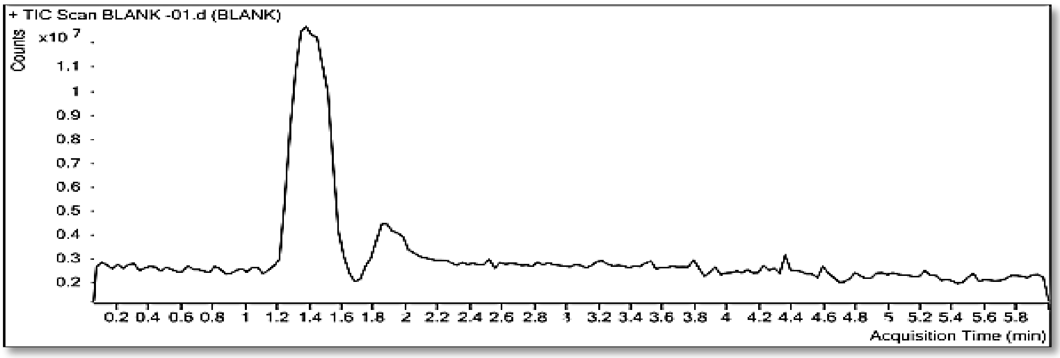

Figure 5. Chromatogram of the blank sample.

RESULTS

Currently, veterinary antibiotics are widely used by farmers to save their animals from infectious diseases. However, their inexperience made them use excessive antibiotics by injection or feed for better production. As a result, the excessive antibiotics remains in the farmers' body as a residue. These residues are transferred from animals to humans, and later adverse health problems can affect the consumer. Long-time exposure to veterinary antibiotics residues through the consumption of animal food products causes various diseases. A total of two local broiler chickens and two imported chickens were analyzed for the presence of antibiotics level. The linear equation was obtained from the sample peak areas versus the standard peak and provided the correlation coefficient for each standard. The concentration ranges were 10–100 m L^{-1} for each analyzed standard with correlation coefficients greater than 0.9457. The linear equation and correlation coefficients (r) are presented in Table 1.

Table 1. Method validation parameters for determination of antibiotics.

Analyte	Linear equation	Correlation coefficient (r)
Levofloxacin	y= 267298.052803x-1158808.899	0.9919
Chloramphenicol	y= 4422.76113x-33232.094	0.9910
Sulfanilamide	y= 993.53655x-46733.655	0.9457
Oxytetracycline	y= 98082.96454x-1735613.794	0.9866
Gentamicin sulfate	y= 119.348609x-3339.279137	0.9847

The recovery as a percentage of individual standards from the blank sample were as follows: gentamicin sulfate (60.90%), sulfanilamide (95.14%), oxytetracycline hydrochloride (71.20%), chloramphenicol (80.22%) and levofloxacin (93.89%) respectively (Figure 5).

A total sample was analyzed for the determination of antibiotics using MS/Q-TOF, and each sample chromatogram was presented in Figure 6. The concentration of antibiotics in the local broiler and imported chicken breast and kidney meat is shown in Table 2. Unfortunately, the imported chickens did not contain kidneys; therefore, we were unable to analyze the kidney sample for comparison with local kidney samples.

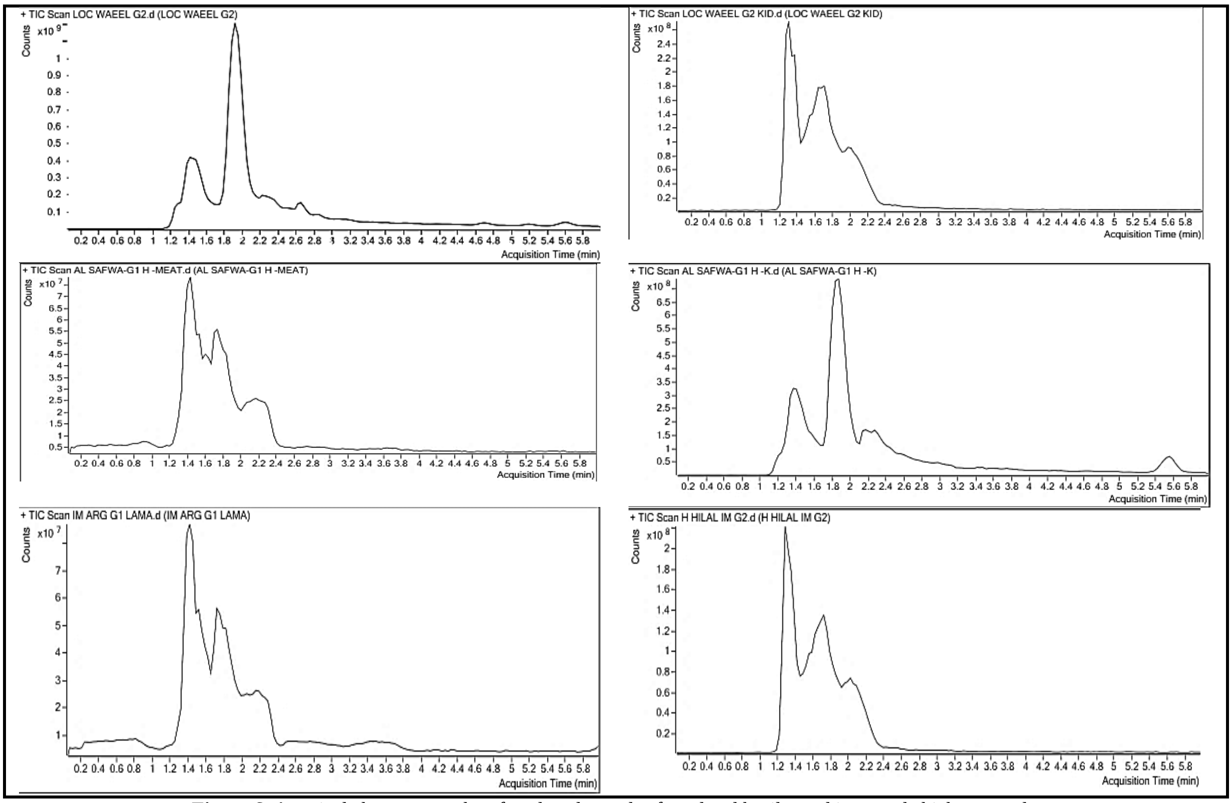

Figure 6. A typical chromatography of analyzed samples from local broiler and imported chicken samples.

Table 2. Amount of various antibiotics in the local and imported chicken sample

Sample	Analyte	Concentration (μg Kg^{-1})	MRL (μg Kg^{-1})
Imported Breast meat Hilal (Brazil)	Gentamicin	31.69±0.14	50
	Sulfanilamide	47.70±0.19	100
	Oxytetracycline	10.11±0.22	100
	Chloramphenicol	9.48±0.78	Prohibited
	Levofloxacin	4.45±0.12	100
Imported Breast meat (Argentina)	Gentamicin	40.67±0.18	50
	Sulfanilamide	50.13±0.29	100
	Oxytetracycline	16.59±0.44	100
	Chloramphenicol	8.59±0.10	Prohibited
	Levofloxacin	4.46±0.09	100
Local broiler Breast meat (AL SAFWA)	Gentamicin	202.82±0.34	50
	Sulfanilamide	51.65±0.13	100
	Oxytetracycline	22.16±0.56	100
	Chloramphenicol	7.62±0.17	Prohibited
	Levofloxacin	4.43±0.22	100
Local broiler kidney (AL SAFWA)	Gentamicin	35.98±0.71	750
	Sulfanilamide	47.69±0.16	100
	Oxytetracycline	16.93±0.10	600
	Chloramphenicol	10.57±0.21	Prohibited
	Levofloxacin	4.91±0.45	300
Local broiler	Gentamicin	369.87±0.14	50

Breast meat (WAEEL)	Sulfanilamide	47.93±0.18	100
	Oxytetracycline	21.82±0.23	100
	Chloramphenicol	12.34±0.67	Prohibited
	Levofloxacin	4.76±0.22	100
Local broiler Kidney (WAEEL)	Gentamicin	34.82±0.11	750
	Sulfanilamide	47.59±0.30	100
	Oxytetracycline	8.96±0.15	600
	Chloramphenicol	7.52±0.44	Prohibited
	Levofloxacin	4.52±0.61	300

The experimental results showed that both local and imported kidney and breast meat samples containss antibiotic residue. In the local broiler breast meat sample, the highest amount of antibiotics was gentamicin and the lowest was levofloxacin, followed by gentamicin>sulphanilamide>oxytetracycline> chloramphenicol. However, the local kidney sample has the highest amount of sulphanilamide followed by sulphanilamide>gentamicin>oxytetracycline>chloramphenicol>levofloxacin. On the other hand, for imported chicken meat, the highest amount of antibiotics was also sulfanilamide, followed by sulfanilamide> gentamicin>oxytetracycline>chloramphenicol>levofloxacin.

DISCUSSION

Antibiotics are commonly used in the production of poultry and in agriculture sectors to prevent several infectious diseases and promote rapid growth for high production [19]. Unfortunately, the abuse of antibiotics in the food animals and agriculture sectors causes serious human health problems.

Several countries have established tolerance/safe levels or maximum residue levels (MRL) of different antibiotics, below which, it is considered that the drug may be safely used without harming the consumer. To our knowledge, the details on antibiotic residues in local animal meat, milk, and eggs in the Sultanate are scarce.

Chicken is a popular and delicious protein food worldwide [20]. Chicken meat is considered a protein, and the chicken fulfils the human requirement of protein per day as a diet. Global Livestock Counts report showed that more than 19 billion broiler chickens are consumed daily worldwide [20]. In the year 2019, the USA people consumed more than 16,700 metric tons of chicken meats. In the same year, the EU countries consumed more than 11,636 metric tons of chicken meats. However, the Omani people and expats, consumed about 331 metric tons [21]. Chicken meat is comparatively safer than lamb and beef because of the low content of iron and no trans-fat. All red meats contain various metals and high trans-fat, which causes cardiovascular disease [22]. Therefore, chicken meat is healthie compared to beef and lamb meat.

The presence of excessive antibiotic residues in food related to animals, especially broiler chicken, is an issue of concern globally and in Oman. The market's poultry products fulfill about 80 to 90% of protein requirement for the global population [23]. Due to the excessive antibiotics and health concerns, we have to periodically monitor the antibiotic residues in poultry and poultry-related products before consumption. Several reports showed that excessive antibiotic residues through animal meats as a diet for a long time cause bacterial resistance to those antibiotics [24-26].

The present study was undertaken based on the human body's resistance; therefore, to fulfill the aim, both local broilers and imported chickens were collected from Al-Batinah Governorate (Poultry farms and Supermarkets). The antibiotics were extracted from the breast meat and kidney using well-established methods as mentioned previously. The breast meat and kidney extracts were filtered, concentrated, and analyzed using MS/Q-TOF [25].

The results in Table 2 and Table 3 showed that the five analyzed antibiotics contained breast meat and kidney from local broilers and imported chickens. The MRL values in the breast meat (Brazil) showed sulfanilamide at a high concentration of 47.70 μg Kg^{-1}among the analyzed five standards. The second highest was gentamicin at a concentration (of 31.69 μg Kg^{-1}) followed by oxytetracycline (10.10 μg Kg^{-1}), chloramphenicol (9.48 μg Kg^{-1}), and levofloxacin (4.45 μg Kg^{-1}) respectively (Table 2). All the analyzed antibiotics in the imported breast meat (Argentina & Brazil) are within the limit except chloramphenicol. Chloramphenicol antibiotics are a prohibited item in the agriculture sector as it has a significant adverse effect on human health (Table 3). Breast meat (Argentina) also showed similar pattern results. The highest concentration was with sulfanilamide (50.13 μg Kg^{-1}) followed by gentamicin (40.67 μg Kg^{-1}), oxytetracycline (16.60 μg Kg^{-1}), chloramphenicol (8.59 μg Kg^{-1}) and levofloxacin (4.46 μg Kg^{-1}) respectively (Table 2). All the analyzed antibiotics in the imported breast meat (Brazil) are within the limit except chloramphenicol [24-26].

Table 3. MRL values of each antibiotic [The British Standard MRL].

Antibiotics	MRL (μg Kg^{-1})
Gentamicin (Breast meat)	50
Gentamicin (Kidney)	750
Sulfanilamide (Breast meat and kidney)	100
Oxytetracycline (Breast meat)	100
Oxytetracycline (Kidney)	600
Chloramphenicol	Prohibited
Levofloxacin (Breast meat)	100
Levofloxacin (Kidney)	300

Note: Enrofloxacin, Ciprofloxacin, and Levofloxacin belong to the same pharmacological group (Fluoroquinolones), and have the same MRL.

However, breast meat (Al Safwa) showed that the highest amount was gentamicin (202.82 μg Kg^{-1}) followed by sulfanilamide (51.65 μg Kg^{-1}), oxytetracycline (22.16 μg Kg^{-1}), chloramphenicol (7.62 μg Kg^{-1}), and levofloxacin (4.43 μg Kg^{-1}). All the analyzed antibiotics found in breast meat (Al Safwa) are within the limit, except gentamicin and chloramphenicol [24 - 26].

The analytical results of kidney (Al Safwa) showed that sulfanilamide at a high concentration of 47.69 μg Kg^{-1}among the analyzed five standards. The second highest was gentamicin at a concentration of 31.69 μg Kg^{-1}followed by oxytetracycline (16.93 μg Kg^{-1}), chloramphenicol (10.57 μg Kg^{-1}), and levofloxacin (4.91 μg Kg^{-1}) respectively (Table 2). All the analyzed antibiotics in the imported breast meat (Al Safwa) are within the limit except chloramphenicol. Breast meat collected from Waeel showed that an excessive amount of gentamicin (369.87 μg Kg^{-1}) compared to the RML value (50.00 μg Kg^{-1}) and the order of sulfanilamide (47.93 μg Kg^{-1}), oxytetracycline (21.82 μg Kg^{-1}), chloramphenicol (12.34 μg Kg^{-1}) and levofloxacin (4.76 μg Kg^{-1}). All the analyzed antibiotics found in breast meat (Waeel) are within the limit, except gentamicin and chloramphenicol [24-26]. There were similar results for the kidney (Waeel) compared to the kidney (Al Safwa). Our experimental results are in line with the previously reported data (Table 2).

A study done by Baazize-Ammi et al. [12] in Algeria to detect antibiotics resides in broiler chicken and milk. In this study, the results showed a different anibiotics in chicken meat: aminoglycosides, sulfanilamide, beta-lactams or tetracyclines and macrolides within the limit of MRL. Conversely, the concentration of amoxicillin, penicillin G, erythromycin, and sulfisoxazole exceeded the maximum residue level. Compared to our results show that all antibiotics concentrations are within the limit of MRL, except gentamicin is in the highest concentration.

In northern Nigeria, a study was done by Kaulol Ahmed Saad [27] to detect which antibiotics are the highest percentage in chicken tissue. The results showed the highest rate of antibiotics was oxytetracycline, compared to our result shown in the imported meat sample, the highest rate of antibiotics was sulfanilamide, and the lowestrate was levofloxacin and in local breast meat samples, the highest rate of antibiotics was gentamicin, and the lowest was levofloxacin. In kidney samples of the local broiler chicken, the highest rate was sulfanilamide, followed by gentamicin> oxytetracycline > chloramphenicol > levofloxacin.

CONCLUSIONS

This study aims to extract and quantify the antibiotic residue in Omani local and imported broiler chicken using well-established methods using MS/Q-TOF. The results showed that all the analyzed antibiotics were present in the kidney and breast meat for local chicken and imported chicken samples. Among the five commonly used antibiotics, gentamicin is present in the local breast meat samples in a high concentration. Although chloramphenicol is hazardous to human health and prohibited from being used in food animals, it is present in all local and imported chicken samples. The amount of antibiotic residue in the local and imported kidney is within the maximum residue level (MRL) except for chloramphenicol. In conclusion, the detected gentamicin at high concentrations in the local breast meat chicken may pose significant adverse effects to humans. Therefore, actions should be taken to control the use of gentamicin antibiotics in the local chicken. In addition, all the chickens and related products should monitor for gentamicin levels before being prepared for consumption. The experimental data from the study will also help the Oman regulatory bodies develop rules and regulations for food safety.

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Conflict of interests

The authors declare that they do not have conflict of interest.

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