




Research



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Detection of antibiotic residues in camel and goat meat from markets in Mogadishu city, Somalia

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Abstract

Introduction: in veterinary medicine, antibiotics are commonly used as feed additives, growth boosters for disease prevention and treatment. In food animals, antibiotic drug residues pose a major threat to the food chain if used inappropriately if the withdrawal durations before slaughtering treated animals are not followed. This study aimed to determine the prevalence of antibiotic residue in fresh meat from camel and goat at three markets from Mogadishu city. **Methods:** a cross-sectional study was conducted from March 2021 to November 2021 to determine the antibiotic residue in meat from three main wet markets in Mogadishu city using Premi® (R-Biopharm, Germany) test Kit. Data were compiled and analyzed in Epi Info™ software, version 7.2.3.1 (Centers for Disease Control and Prevention, CDC, USA). **Results:** the result of this study showed insignificantly the higher prevalence 9/50 (18% CI: 95% 8.6 - 31.4) antibiotic residue in camel meat compared to 4/50 (8% CI: 95% 2.2 - 19.2) goat meat (OR: 2.5; $\chi^2 = 2.2$, $p = 0.152$). **Conclusion:** this result emphasizes the importance of public education on the judicial application of antimicrobial drugs in food-producing animals in order to maintain therapeutic efficacy for sustainable livestock production and protect human health. **Recommendation:** to prevent drug residues in animal products, the recommended measures may include education and sensitization of farm owners about proper antimicrobial usage and adverse effects of irrational drug use, observance of the withdrawal period, effective surveillance, monitoring, implementation of the national AMR policies/regulations, and control on the use of veterinary drugs.

Introduction

Antibiotics are used in animal feeds as growth promoters or for disease prevention and treatment [1]. The antimicrobial molecules are removed partially through kidneys or other routes after being converted into various metabolites in

the blood, liver, and muscles [2]. Consequently, these drugs and metabolites are accumulated into body cells and are known as drug residue. The drug residues can be detected in meat, egg, honey, fish products or in swine and poultry slurries [1]. Antibiotic drugs that are not used appropriately, or the withdrawal period is not followed before slaughtering treated animals, and the drug residues pose a major threat to the food chain [3], which is an emerging risk for human health. Although epidemiological data on the incidence of antibiotic residue-related adverse effects is limited, some studies suggest that diet could have a role in the evolution and spread of antimicrobial-resistant bacteria [4,5]. As non-target organisms, humans get different amounts of these medications as residue, which might cause significant alterations in their gut microbiota and the removal of some beneficial bacterial strains [6]. Generally, the number of slaughtered animals (especially red meat animals) in Somalia was estimated to be 12,047,808/year (555,452/year, 6,138,010/year, 5,067,130/year, and 287,216/year) heads of camel, goat, sheep, and cattle in 2013, respectively [7]. Goat and camel are the most common types of meat consumed in Somalia. To the best of our knowledge, no research has been conducted to establish the levels of drug residue in the meat. Therefore, the goal of this study was to employ the Premi®Test to detect the residue levels of regularly used antibiotics in goat and camel samples obtained from various sales sites in Mogadishu, Somalia.

Methods

Study area: Banadir region is one of the eighteen regions of the Federal Republic of Somalia. The region itself is coextensive with Mogadishu city, the capital of the country.

Study design: a cross-sectional study was conducted from March 2021 to November 2021 to determine the antibiotic residue in meat from three main wet markets in Mogadishu city.

Samples collection: in this study, a total of 100 meat samples which includes 50 camel meats and 50 goat meat were randomly collected from three different main markets in Mogadishu city. All meat samples were placed into separate clean plastic bags, labeled and then transferred to Abrar Biomedical Laboratory in an ice plastic container and kept at -20°C before being tested. There was no repetition in sample collection from these markets.

Screening test: for this study, the Premi[®] test (DSM, the Netherlands) was utilized to detect antibiotic residue in the meat. After removing the foil from the Premi[®] test vials, 100 mL of meat juice was dropped onto the agar in the ampoule and left to pre-distribute for 20 minutes at room temperature. The meat juice was then left on the agar, and the ampoules were then incubated at 64°C for 3 hours. At the moment the negative control changes color from purple to yellow, the color of all ampoules is read by visual. The results of the samples were examined for color changes. Positive responses were represented by blue/purple vials, whereas negative responses were represented by yellow/green vials.

Data analysis: collected data were entered into Microsoft Excel 2021 spreadsheet and later transferred to SPSS Statistics software[®] (IBM Corp, Armonk, NY, USA, version 26). Data analyses were performed with SPSS Statistics software[®] (IBM Corp, Armonk, NY, USA, version 26). A Chi-square test was used to determine the difference between species with positive antibiotic residue. Odds ratio (OR), 95% confidence interval were calculated separately for each variable using Epi Info[™] software, version 7.2.3.1 (Centers for Disease Control and Prevention, CDC, USA). Results considered significantly different when $p < 0.05$.

Ethics declaration: this study was approved by the ethical committee of Abrar University, Somalia (reference number AUUC20721).

Results

The results of this study indicated that residues of antibiotics were detected in camel and goat meat. Out of the total of 100 meat samples tested, 13/100 (13%, 95% CI: 7.1 - 21.2%) were found to be positive. Source wise comparison showed that 9 (18%, 95% CI: 8.6 - 31.4%) of meat sampled from camel had antibiotic residue, while only 4 (8% 95% CI: 2.2 - 19.2%) of meat from goats contain antibiotic residue (Table 1). Camel meat was more likely to be positive for antibiotic residue than goat meat (OR: 2.5; $\chi^2 = 2.2$, $p = 0.152$).

Discussion

Premi[™] test is an integrated antimicrobial compound detection technique that detects antimicrobial compounds at or below the maximum residue limit (MRL) in a wide range of food products, including meat. Proper use of the Premi[™] test will contribute to fewer animals showing positive concentrations of antibiotics, safer products and better consumer protection. Antibiotic residues or their metabolites in animal products have adverse implications on consumers' health. This study of antibiotic residues showed that the highest prevalence 9/50 (18%) of giving a 95% confidence interval of (8.6 - 31.4%) antimicrobial residue was in camel meat compared to 4/50 (8%) of giving a 95% confidence interval of (2.2 - 19.2%) goat meat (OR: 2.5; $\chi^2 = 2.2$, $p = 0.152$) using Premi[™] test kit. This study is in line with studies from Sudan, 17.3% [8]. The occurrence of antibiotic residues in camel and goat has revealed the misuse of antibiotics by veterinarians and owners, as well as the lack of antibiotic residue monitoring at slaughterhouses. As the finding in this study was much lower than reported in other African countries like Nigeria 54.44% [9], Ethiopia 76.4%, 93.8% [10,11], and Kenya 45.6% [12]. The disagreement could be attributed to the species and number of animals tested, geographical distribution and the local regulation of antibiotic application in animal production industry.

Conclusion

Our study indicated a problem of antibiotic misuse in camel and goat. The prevalence of antibiotic residues in camel and goat meat, as discovered in this study, is a major public health problem. To prevent drug residues in animal products, relevant measures that can be recommended include, but not only, education and sensitization of farm owners about proper antimicrobial usage and adverse effects of irrational drug use, observance of the withdrawal period, effective surveillance and monitoring, implementation of the national AMR policies/regulations, and control on the use of veterinary drugs. This will lead to therapeutic efficacy for sustainable livestock production and to safeguard human health. This finding has highlighted the existence of antibiotic residues in animals, and there is an urgent need to have funding in other to have a comprehensive study all over Somalia. Thereby, minimizing incidences and transmission of antibiotics residues in the food chain and preventing the emergence of resistant bacteria.

What is known about this topic

- *The use of antibiotics as an additive to animal feed is common in the food industry;*
- *It is of public health concern that antimicrobials are being used more frequently in animals;*
- *Among the main meats consumed in Somalia are goats and camels.*

What this study adds

- *The presence of antibiotic residues in camel and goat meat is alarming;*
- *It is possible for humans to become infected with resistant bacteria through the food chain;*
- *There is an urgent need to control the use of antibiotics in food animal production.*

Competing interests

The authors declare no competing interests.

Authors' contributions

All the authors have read and agreed to the final manuscript.

Table

Table 1: prevalence of antibiotic residue within each variable studied

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Table 1: prevalence of antibiotic residue within each variable studied

Variable		+/n	Prevalence% (95% CI)	P-value	χ^2	OR 95% CI
Species	Camel	9/50	18 (8.6 - 31.4)	0.152	2.2	2.5 (0.7 - 8.8)
	Goat	4/50	8 (2.2 - 19.2)			

+: number of positive animals; n: number of samples; CI: confidence interval; OR: odds ratio; χ^2 : Chi-square