SHORT COMMUNICATION

Sokoto Journal of Veterinary Sciences

(P-ISSN 1595-093X: E-ISSN 2315-6201)

http://dx.doi.org/10.4314/sokjvs.v21i4.9

Onminyi *et al.*/*Sokoto Journal of Veterinary Sciences*, **21**(4): 226 - 229.

Screening of meat sold for human consumption in Benue State, Nigeria for antibiotic residues

NO Onminyi[1]*, CA Agada[1], II Luga[1], RA Ofukwu[1] & PA Onyeyeli[2]

1. *Department of Veterinary Public Health and Preventive Medicine, University of Agriculture Makurdi, Benue State, Nigeria*
2. *Department of Veterinary Pharmacology and Toxicology, University of Agriculture Makurdi Benue State, Nigeria*

*Correspondence: Tel.: +2348036531496; E-mail: onminyinaomi@gmail.com

Publication History:
Received: 24-06-2023
Revised: 02-10-2023
Accepted: 11-10-2023

Abstract

The problem of veterinary drug residues in food of animal origin is of great importance in developing countries. The concerns are mostly related to food safety and the development of antibiotic-resistant pathogens. This study was carried out during the hot dry season (March) between 2016 – 2018 to detect antibiotic presence in beef, chevon and pork sold for human consumption in abattoirs in Benue state. Thirty-nine samples each of 100-150g of kidney, liver and muscle were collected from cattle, goats and pigs making a total of 351 samples from abattoirs across the three geopolitical zones of Benue state. The samples were screened for multidrug residues using the modified agar gel diffusion method. A total of 144 were positive out of which 40.3% (58/144) were beef, while 29.2% (42/144) and 30.5% (44/144) were chevon and pork respectively. From the results of this study, it could be inferred that the meat consumed within Benue State contains residues of antibiotics possibly because of non-adherence to the withdrawal period by farmers and lack of knowledge of its consequences on the consumers.

Keywords: Abattoir, Antibiotic residues, Benue State, Meat, Offal

Introduction

Pork (pig meat), chevon and beef (goat and cattle meat respectively) are an essential part of the diet of the people of Benue State. Antibiotic use in food animals results in residues in their products when the withdrawal period of the antibiotics as recommended by the manufacturer is not adhered to. The resulting consequence is that antibiotics in food animals are a public health issue (Jafari *et al.,* 2007).

Since the dawn of the 21st century, antibiotic resistance has been recognized as one of the top health problems facing the world (Ronald & Suzhen 2018). In Africa, antibiotic resistance is under-reported, however, cases have been documented in Ethiopia (Agmas & Adugna, 2018), Ghana (Daniel, 2014), Tanzania (Mgonja *et al.,* 2017) and in Nigeria (Olatoye & Basiru 2013; Ezenduka & Ugwumba 2012); but there is no coordinated approach in handling antibiotic resistance in Africa except a few countries in Southern and Eastern Africa (WHO, 2014). The causes of antibiotic resistance have been widely accepted for some time: the overuse and inappropriate use of antibiotics in agriculture and

improper prescription in human and food animal infections (Luga *et al.*, 2007). The relationship between drug-resistant bacteria in people to antibiotic residue in food animals continues to be debated (Beyene, 2016). This study was designed to screen meat sold for human consumption in Benue State to determine the presence of antibiotic residues.

Materials and Methods

A total of 351 samples comprising 117 each of kidney, liver and muscle each were collected from at least two slaughters and/or sale points forth nightly from each of the three geopolitical zones in Benue State using the systematic sampling method whereby samples were bought from every second table with all required samples (Sayed & Ibrahim, 2017). The samples were kept in ice-packs and transported to the Veterinary Public Health laboratory of the Joseph Sarwuan Tarka University Makurdi (JOSTUM) Benue State for processing.

The samples were screened for multidrug residues using the modified agar gel diffusion method of Bauer *et al.* (1966). Three colonies of *Escherichia coli* NC101 (gram-negative organism) and *Staphylococcus aureus* CC398 (gram-positive organism) were obtained from NAFDAC zonal laboratory Agulu, Anambra State. They were picked with sterile wire loop each and emulsified in 9ml of sterile nutrient broth and incubated at 37°C for 24 hrs. After this serial dilutions of the samples were made and compared with turbidity standard equivalent to 0.5 Mc Farland standard. A sterile swab stick was dipped in each of the dilutions and spread appropriately on Mueller Hinton agar plates. Holes of 8mm were made in the centre of each Mueller Hinton agar plate using a cork borer and 0.5ml of the various test samples were introduced into the wells using a different syringe for each sample. It was allowed to stand for about 1hr undisturbed on the bench for diffusion of samples into the agar. The plates were then incubated at 37°C for 18 hours. The presence of clear zones of inhibition indicates the activity of antibiotics present in the test samples. Using a vernier calliper, the diameter of the zones was recorded. The zones of inhibition were calculated as follows: Zone (cm) x 10(to mm) – 8 (cork borer diameter) =mm. Samples which were seen to inhibit the growth of the test organisms were set aside as positive, that is, samples containing multidrug residues.

Data collected were subjected to statistical analysis using Graph Pad Prism 5.03 software. Descriptive statistics (percentages) were used to calculate the percentage resistance of the antibiotics in the meat samples. Pearson's Chi-square test was used to test for statistical significance ($P < 0.05$) between the parameters used and antibiotic resistance. All data were presented on an excel spreadsheet and charts were prepared using Excel.

Results and Discussion

One hundred and forty-four out of the 351 samples were observed to have inhibited the growth of the test organisms used. Out of the 144, beef had a prevalence of 40.3% (58/144) while chevon and pork had a prevalence of 29.2% (42/144) and 30.5% (44/144) respectively. There is no significant association between multidrug presence and meat types. χ^2 p-value = 0.0930. Figure 1.

Samples collected from zone A had multidrug resistance occurring in 37.5% (54/144) of samples, while both zones B and C had 31.3% (45/144). The association was not significant χ^2 p-value = 0.4301. Figure 2 Based on tissue types, the kidney had an occurrence of 36.1% (52/144) while the liver and muscle had an occurrence of 33.3% (48/144) and 30.6 % (44/144) respectively and were not significant χ^2 p-value = 0.6065. Figure 3. The result of this study indicates that some of the meat sold for human consumption in Benue State contains antibiotic residues. This result is comparable to that obtained by Mmbando (2004), who analyzed muscle tissues from

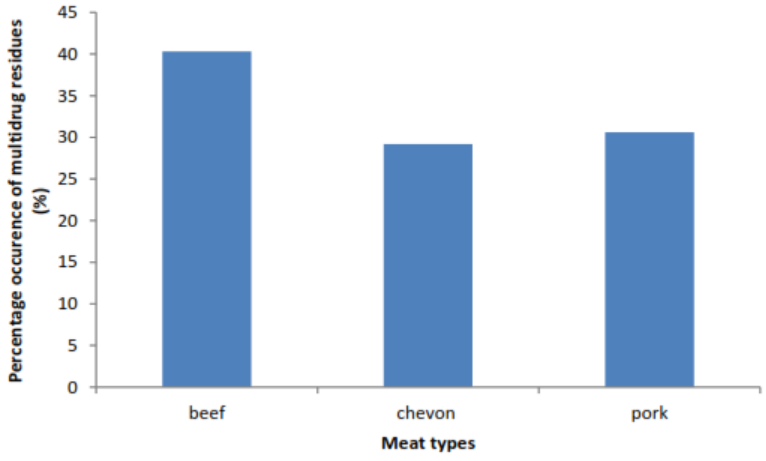

Figure **1**: Percentage occurrence of multidrug residues in beef, chevon and pork

P- value=0.0682

cattle for the presence of tetracycline in Tanzania and got a prevalence of 41.2%. Based on meat types, the result obtained for pork agrees with the work done in Madagascar by Rakotoharinome *et al.* (2013), who got a prevalence of 37.2% in pork using the premi test. Also, Ezenduka & Ugwumba (2012) observed a 30% prevalence of antibiotic residues in pork samples in South-East Nigeria. The occurrence of antibiotic residues among the three meat types was not significant (χ^2 p-value =0.1053). This may be due to the fact that the livestock farmers in zones A and C may not be aware of the dangers of consuming meat which contains drug residues; they may buy the drugs over the counter and administer them to the animals themselves without a prescription. Zone B which hosts the state capital, has the highest number of enlightened people and the least occurrence of antibiotic residues, this may be because livestock farmers engage the services of veterinarians and are aware of the associated problems. There was no significant association between the prevalence in the three geopolitical zones χ^2= 0.489.

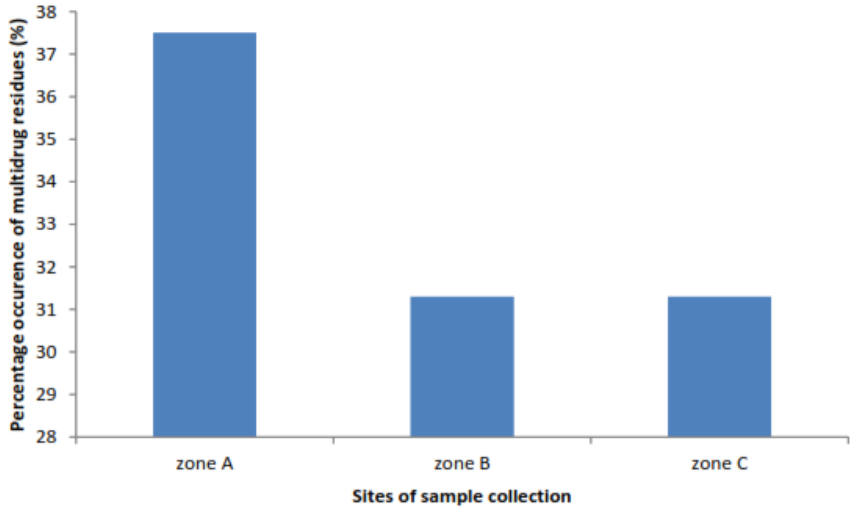

Figure 2: Percentage occurrence of multidrug residues within the tissues sampled across Zones
χ^2, p= 0.489

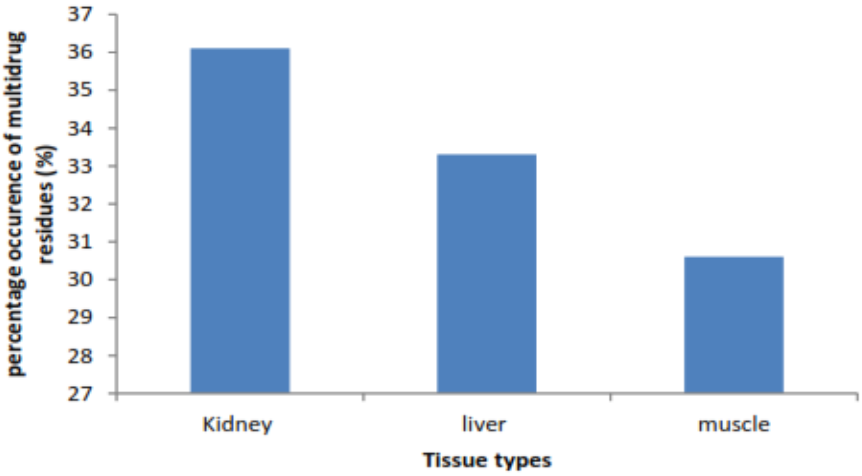

Figure 3: Percentage occurrence of multidrug residues in the various tissues
χ^2 = p= 0.489

The liver was observed to have the highest prevalence of antibiotic residues followed by kidney. This is possibly so because, the liver and kidney are organs of metabolism and excretion which makes them more susceptible to exposure to drug residues (Olatoye & Ehinmowo, 2010). This may be because most samples were taken at the time when drugs were being metabolized in the liver not yet at the stage of clearance by the kidney. Invariably, antibiotics are most often administered close to the time of slaughter which brings us back to the issue of non-observance of withdrawal periods (Karimuribo *et al.,* 2013) and extralabel use of drugs.

The month of March was specifically suggested for this work because the animals slaughtered for consumption in Benue are mostly raised through the open grazing method and March is the peak of the dry season in Benue State. According to Lamidi & Ologbose (2014), there is a reduction in the general performance of animals, increased susceptibility to diseases, overcrowding of available grazing land and increased cost of production among other factors during this time. Based on this result, further studies using quantitative and more specific methods like immunochemical methods such as immunofluorescence and radioimmunoassay and physico-chemical methods like high-performance liquid chromatography (HPLC), gas chromatography (GC) and thin layer chromatography (TLC) is required to have more reliable results. Consumer protection

can be ensured by providing a program whereby animals for slaughter are screened for drug residues before slaughter and such data forwarded to the appropriate authorities to set up legislation that will reduce to a large extent, the risk to human health. The livestock farmers and consumers should be educated on the dangers and possible consequences of consuming meat that contains residues through awareness campaigns and the media.

Funding
No funding was received.

Conflict of Interest
The authors declare that there is no conflict of interest.

References

Agmas B & Adugna M (2018). Antimicrobial residue occurrence and its public health risk of beef meat in Debre Tabor and Bahir Dari North west Ethiopia. *Veterinary World*, **11** (7): 902-908.

Beyene T (2016). Veterinary Drug residues in food–animal products: Its Risk factors and Potential Effects on Public Health. *Journal of Veterinary Science and Technology,* doi.10.4172/2157-7579.1000285.

Bauer AW, Kirby W, Sherris JC & Turck M (1966). Antibiotic susceptibility testing by a standardized single disk method. *American Journal of Pathology,* **45**(1): 493-496.

Daniel AA (2014). Determination of Antibiotics Residues in Beef and Mutton from some Selected Markets in Kumasi-Ghana. Mphil Thesis. Department of Chemistry, Kwame Nkruma University of Science and Technology, Kumasi, Ghana. Pp 1-103.

Ezenduka EV & Ugwumba C (2012). Antimicrobial residue screening in pigs and goat Slaughtered in Nsukka municipal abattoir Southeast Nigeria. *African Journal of Biotechnology,* **11** (57): 12138-12140.

Jafari M, Khayamian T, Shaer V & Zarei N (2007). Determination of veterinary drug residues in chicken meat using coronal discharge ion mobility. *Analytica Chimica Acta,* **581**(1): 147-153.

Karimuribo ED, Kimbita EN, Silayo RS, Mgongo FOK, Mpanduji DG & Wambura RM (2013). Animal Health Constraints Perceived to be Important in Kilosa and Gairo districts Morogoro, Tanzania: Implications on Disease Prevention and Control. *Tanzania Veterinary Journal,* **28**(2): 6-13.

Lamidi AA & Ologbose FI (2014) Dry season feeds and feeding: a threat to sustainable ruminant animal production in Nigeria. *Journal of Agriculture and Social Research,* **14**(1): 17-30.

Luga II, Akodu I, Mhomga I, Allam L, Ajogi I, Umoh VJ & Kwaga JK (2007). Antimicrobial resistance of shigatoxin producing *Escherichia coli* 0157: NM isolates from water fed to cattle in Northern Nigeria. *Asian Journal of Animal and Veterinary Advances*, **2**(4): 205-210.

Mgonja F, Mosha R, Mabiki F & Choongo K (2017) Oxytetetracycline residue levels in beef in Dodoma region, Tanzania. *African Journal of Food Science,* **11**(2): 40-43.

Mmbando LMG (2004). Investigation of Oxytetracycline Use and Abuse; Determination of its Residues in Meat Consumed in Dodoma and Morogoro Munincipal, MSc Dissertation, Department of Veterinary Physiology, Pharmacology, Biochemistry and Toxicology, Sokoine University of Agriculture. Tanzania. Pp 1-140.

Olatoye I & Basiru A (2013). Antibiotic usage and oxytetracycline residue in African catfish (*Clarias geriepinus*) in Ibadan Nigeria. *World Journal of Fish and Marine Sciences,* **5**(3): 302-309.

Olatoye IO & Ehinmowo AA (2010). Oxytetracyclin residues in edible Tissues of cattle slaughtered in Akure, Nigeria. *Nigerian Veterinary Journal,* **31**(2): 93-102.

Rakotoharinome V, Pognon D, Randriamparany T, Chane M, Idoumbin J, Cardinale E & Porphyre V (2013). Prevalence of antimicrobial residues in pork meat in Madagascar. *Tropical Animal Health and Production,* **46**(1): 110-111.

Ronald RM & Suzhen L, (2018) Antimirobial resistance in Livestock: Advances and alternative to antibiotics. *Journal of Animal Frontiers,* **8**(2): 30-37.

Sayed AM & Ibrahim AA (2017). Recent Developments in systematic sampling: A review. *Journal of Statistical Theory and Practice,* **12**(3): 290-310.

World Health Organization (2014). WHO's global report on surveillance of Antimicrobial Resistance. SEAR/PR/1574. *www.who.int*, retrieved 30-04-2014.