Antibiotic Residues in Food Samples Sold In Abeokuta Metropolis: A Cause for Concern

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***Abstract*- The use of antibiotic plays a major role in the emerging public health crisis of antibiotic resistance. Although, the majority of antibiotics usage occurs in animal husbandry and relatively little attention has been paid to how these antibiotics in farm animals contribute to the overall problems of antibiotics resistance in human. This research focuses on antibiotics residues in seven different most commonly consumed food samples in Abeokuta, Ogun State, Nigeria as a case study. These food samples are: Chicken, Eggs, Cow-meat, Cheese, Goat-meat, Pork-meat and Turkey-meat. The antibiotics tested were: tetracycline, penicillin and streptomycin. The result, however, gave an inhibition zone of 8mm, 5mm, 6mm in frozen Turkey; Nill, 5mm, 4mm in Cow-meat; Nill, Nill, 5mm in boiled Cheese; Nill, 4mm, 5mm in frozen Pork; 6mm, 7mm , 4mm in Eggs; 5mm, 4mm, 6mm in frozen Chicken and 4mm, Nill , 5mm in Goat-meat for Tetracycline, Penicillin and Streptomycin respectively. Most of the results obtained showed relatively high amount of antibiotics residues above the permissible limit of 2mm.**

***Keywords*- Chicken, Eggs, Cow-meat, Cheese, Goat-meat, Pork-meat, Turkey-meat, Antibiotics, Tetracycline, Penicillin, Streptomycin**

I. INTRODUCTION

An antibiotic is an agent that either kills or inhibits the growth of a microorganism (Dorland, 2010). It is also a substance produced by a microorganism that is antagonist to the growth of other microorganism in high dilution (Waksman, 1947). Antibiotics also known as anti-bacteria are types of medication that destroys or slow down the growth of bacteria. The Greek word anti means "AGAINST" and the Greek word bio means "LIFE" (Bacteria are life form). Antibiotics are used to treat infection caused by bacteria (MNT, 2003).

The primary purpose of veterinary drugs, biologics and pesticide chemicals is to safeguard the health and welfare of animal (Cannavan, 2004). Antibiotics used for these purpose can occur as resides for some time in these animal before they are excreted. A chemical residue is either the patent compound or its metabolites that may deposit, accumulate or otherwise be stored within the cells, tissues, organs, or edible products of animal following its use to pervert, control, or treat animal disease or to enhance production (Riviere & Sundlof, 2011).Drugs are the most frequently detected chemical residues, the overwhelming majority of which are antimicrobials (Sundlof, Fernandez & Paige, 2000) and, are commonly used drugs in veterinary practices.

Drugs and pesticide residue concerns are among the reason added for African's denial into European & American Livestock markets (Aliu, 2004). The palatability, aroma and quality of meat could be affected by drug residues.

Residues of animal drugs threaten human health by been acutely or cumulately allergenic, organotoxic, mutagenic, carcinogenic (Aliu, 2004). Violative residues of penicillin are the most frequently cited cause of allergic reaction in person that consumes animal products containing residues.

Many other drugs including tetracycline, Sulphonamides and aminoglycosides can also cause allergic reaction (Sundlof, Fertnandez&Paige.2000). Amino glycoside (e.g streptomycin) can cause varying degree of nephrotoxicity and ototoxicity.

Drug resistance appears to be the most important hazard of drugs residues in the country (Dipeolu & Alonge, 2002). The residues bacterial could then cause disease that is difficult to treat in humans and may also transfer the residues gene to some other human pathogens(Barton, 2000)(Doyle, 2006).

The risk of adverse effects of drug residue and the drug resistance could be higher if the trend of misuse and abuse of drug is left unchecked. Hence, the present study attempted to determine the presence of antibiotic residues in turkey, cow meat, pork meat, chicken meat, goat meat, egg and cheese which are all animal products.

Antibiotics drugs are used non-therapeutically in animals that are intended for human consumption, such as turkey, chicken, cattle, pig, fish e.t.c. (Martin, 2014). Since the last third of the 20th Century, there has been existence use of antibiotics in animal husbandry. Some of these drugs are not considered significant for use in humans (such as the use of ionospores in ruminant (Herson, 2003) or because that drug has mostly gone out of use in humans. Others however are used in animals and humans including penicillin and some forms of tetracycline.

The resistance bacteria which antibiotics exposure selects in animals can be transmitted to humans through three pathways, those being through consumption of animal products (milk, meat, egg e.t.c) from close to direct contact with animal or other humans, through the environment (Schneider & Garrett, 2009).

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In the world, antibiotics are widely used on animals. As in human medicine, antibiotics can often be brought without prescription and veterinary supervision for the use on pet, poultries and livestock's bacteria remaining in these animals are likely to be resistant to the antibiotics used, and be passed into the environment by the excretion and secretion of materials such as milk, feaces, urine saliva, semen.

In December 2013, the FDA announced the commencement of these steps to phase out the use of antibiotic for the purposes of promoting livestock growth (Tavernise, 2013) (Martin, 2014).

II. AIM

The aim of this research is to qualify and quantify antibiotic residue in poultry and animal products which are consumed daily as food by humans as the presence of antibiotics contribute a greater deal to our health and well being.

III. LITERATURE REVIEW

Antibiotics use plays a major role in the emerging public health crisis of antibiotics roesistance. Although the majority of antibiotics use occurs in agricultural setting, relatively little attention has been paid to how antibiotics use in farm animals contribution to the overall problem of antibiotics resistance.

In 1994, Food Safety Inspection Service (FSIS) did a residue-monitoring test for 9 antibiotics in food and animals sampled at slaughter plants and it all proved positive at violative concentration in 0.5% of 3,595 cattle; 0.3% of 960 sheep and goats; 0.2% of 1,298 swine; and 0.3% of 2,112 poultry. The most frequently detected antibiotics were Tetracycline (27% of total), Penicillin (27%) Gentamycin (16%), and Neomycin (20%) Vickers (1958), Zimmerman (1958), Borrie & Barrett (1961), and Wicher (1969) reported patients with dermatitis, urticaria, and sub acute eczematous eruptions after drinking milk that contained residues of Penicillin; Dewdney (1991) cast doubt on (haptenized) penicillin residues as the causative factor in development of penicillin hypersensitive.

In many factory farms chicken are routinely administered with the feed additive Roxarsone a relatively benign organ arsenic compound which partially decomposes into inorganic arsenic compounds in the flesh of chickens and in their faces which are used as fertilizers (www.fda.gov.pdf).

In 2013, The National Sanitary Veterinary and Food Safety Authority (TNSVFSA) results of the investigation on the turkey meat infested with antibiotics proved positive.

Antibiotic-resistant bacteria of animal origin have been observed in the environment surrounding livestock and poultry farming operations, on meat products available for purchase in retail food stores, and the cause of clinical infections and subclinical colonization in humans.

Residues of drugs used in food animals can enter the humans' diet directly (as compounds of edible animal tissue and product) or indirectly (from the antibiotics are: toxicity, allergenicity, and infection by drug-resistant disease causing microorganisms (Frappaolo, 1986 and Van, 1993).

IV. METHODOLOGY

AIM-TO DETERMINE TETRACYCLINE, STREPTOMYCIN & PENICILLINN RESIDUES IN frozen chicken and turkey, cow meat, pork meat, goat meat and in eggs and cheese

V. MATERIALS

Test samples, Test-Organisms, Nutrient Agar, HCI, NacI, Incubator, petri Dishes (15), universal (bijou) bottle, Autoclave, Weighing Balance, Porcelain dishes

VI. METHOD

SOURCE OF SAMPLE – KUTO MARKET, ABEOKUTA OGUN STATE, NIGERIA.

Preparation Of Sample - After the samples were gotten, they were first refrigerated to slow down the microbial growth and enzymatic activities as well as chemical reactions, it was later crushed to paste in a porcelain dish.

VII. SOURCE OF TEST ORGANISMS

Clinical organisms used in this study were obtained from the department of Medical Microbiology and Parasitology, Sacred Heart Hospital, Lantoro, Abeokuta, Ogun State Nigeria.

VIII. PREPARATION OF NUTIENT AGAR

28g of nutrient agar was weighed and dissolved in 1000ml of distilled water, according to the manufacturer's instruction, which was poured into the conical flask earlier sterilized. The conical flask was covered with a non-alcoholic gauze and aluminum foil before being packed into the autoclaved and sterilized at the temperature of 121^{o}_{c} for 15minutes. After which it was allowed to cool and poured into the petri-dishes.

IX. PREPARATION OF INOCULUMS AND MEDIA

Pure cultures of *Bacillus stearothermophilus, Staphylococcus aureus, klebsiella pneumonia, Eschericha coli, and Proteus mirabilis* in nutrient agar gotten from the Microbiology and Parasitology Laboratory, Sacred Heart Hospital, Lantoro, Abeokuta. Primary cultures were subcultured into Brain Heart Infusion broth for about 8-12 hrs before inoculating into a nutrient agar under an aseptic condition. Nutrient agar was prepared according to manufacturer's guidelines. The pH was adjusted using a pH meter (pHS-25model) by adding drops of NaOH or HCI solutions. 6mls of the adjusted media was then introduced into a universal (bijou) bottle and sterilized using an autoclave at 121°c for 15mins. The sterilized media poured onto a Petri dish and allowed to solidify. It was then incubated for 18-24 hrs at 37°c before inoculating with the test bacteria.

X. TECHNIQUE

The European Four Plate Test as described by Oboegbulem and Fedelis (1996) was employed. A piece of each sample (1 x 2.5mm) was applied to three plates of agar media, each organism was inoculated on the plate at pH6

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(plate 1) pH7 (plate 2) and pH8 (3 plates) using a sterile swab. The plates incubated at optimal temperature for growth of the test bacteria. Positive sample was indicated by a complete inhibition of growth in an annular zone not less than 2mm around the piece of food sample inoculated. Less than 2mm of inhibition zone indicated negative result.

The bacterium has known susceptibility to antibiotics. Presumptively, positive result at pH6 indicates the presence of tetracycline antibiotics, streptomycin at pH7 and penicillin at pH8. These antibiotics readily diffuse at the respective pH inhibiting bacteria growth around zone of meat. At significantly high concentration (MRL)*zone of inhibition is > 2mm.

The European FPT is essentially a multiresidue technique for screening animal products. Despite limitations the use of bacteria in dectecting residues has since been useful in the meat industry.

**Maximum Residue Limit (MRL) or violative residue is the residue above tolerance level.*
After the incubation period, the MRL was measured to the nearest mm using a transparent ruler; this indicates a positive antibacterial susceptibility.

Result table:

ZONE OF INHIBITION (MM)

	Tetracycline	***Streptomycin***	***Penicillin***
Frozen turkey	8	5	6
Pork meat	nil	4	5
Goat meat	4	nil	5
Egg	6	7	4
Chicken	5	4	6
Cow meat	nil	5	4
Cheese	nil	nil	5

Note: All in millimeters (MM)

XI. CONCLUSION AND RECOMMENDATION

The presence of antibiotic residues in meat (imported frozen turkey) is a serious problem that is yet to be addressed in developing countries like Nigeria were safety of food regarding drug residue is highly questionable. The multi antibiotic residues detected in turkey imported in Nigeria intended for sale in Abeokuta Kuto Market could be attributed to irrational use of drugs in Food animals consequent to lack of regulatory system for poultry drug use and control as observed previously (Aliu, 2004). ln addition stakeholders involved do not adhere to withdrawal period. Non adherence to withdrawal period is the major cause of chemical residues(Riviere&Sundlof,2001).

To date, there have been only few studies to determine the lowest dose of antibiotic required to perturb the normal human flora (Sundlof, Fernandez &Paige. 2000). It is therefore safer to consider any amount of drug residue significant. This necessitates that all effort including awareness creation, observance of withdrawal period, effective surveillance, monitoring and control on the use of antibiotics drugs to prevent drug residues in Poultry derived products be employed.

Since residues of antibiotics have been found in turkey consumed by humans, I thereby recommend that Poultry Stakeholders should adhere strictly to withdrawal period before the animals are been slaughtered and Nigeria Government should regulate and legalize this because antibiotics residue leads to antibiotics resistance in human.

I also recommend that biologically reared poultry animals should be eaten because any forms of drugs are not administered into them.

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