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Identification and Antibiogram Pattern of Escherichia Coli from Fresh Retailed Cow and Goat Meat in Maiduguri Metropolis

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Abstract
Escherichia coli (E. coli) is the most prevalent infecting organisms in the family of gram negative bacteria known as enterobactericeae (Einstein et al., 2000). Escherichia coli is a Gram negative, facultative anaerobic, rod – shaped bacterium of the genus Escherichia that is commonly found in the lower intestine of worm – blooded organism (Endothersms). Most E. coli strains are harmless, but some can cause serious food poisoning in their host, and occasionally responsible for product producing vitamin K_2, and preventing colonization of the intestine with pathogenic bacteria (Madden et al., 2001) E. coli is expelled into the environment within faecal matter. The bacterium grows massively in fresh fecal matter under aerobic condition for 3 days, but its number decline slowly after wards, this study tries to isolate and identify E. coli from retailed cow and goat meat and then compare the prevalence of the E. coli in cow and goat meat then finally determine the anti-biogram pattern of the isolates, 10 grams each of fresh cow and goat meat were aseptically collected from retailed outlets and put in a sterile container, while the surface swap of the butchers table was taken by swabbing with a sterile swab moistened with sterile normal saline, placed in a cooler box and transported immediately to the microbiology laboratory for analysisThis study revealed slightly higher isolation rate of E. coli in goat meat compared to cow meat sold at various retail outlets in Maiduguri metropolis, The result of the study indicated that there were poor personal and general hygiene measures in the retail outlets and that workers are not focused on good hygienic practice. The result of work shows high rates of antimicrobial resistance to ampicillin, ceporex, and augumentin. Peflacine, Tarivid and Ciproflax are considered appropriate for the treatment of E. coli in this study area. Periodic monitoring of antimicrobial susceptibility in the metropolis is recommended

Keywords*: Antibiogram, Escherichia, Coli, Cow, Goat, Meat*

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I. Introduction

Food is essential for survival. However, occasionally, human beings consume undesirable chemicals and toxins resulting in food borne illness. Consequently, in many countries food safely and quality is becoming a matter of increasing concern. Food safety problems are particularly becoming an increasingly serious threat to public health in developing countries. Lack of adequate regulations related to food safety as reflected in many unrecognized cases of food borne illness puts especially children and infants at high risk (Uninevehr and Hirschhorn, 2000). Biological contaminants, largely bacteria, viruses and parasites constitute the major cause of food borne disease.

Vending foods on the street is a common aspect lifecycle both in industrialized as well as countries in which there are high unemployment, low salaries and limited work opportunities (Bryan *et al.*, 1998). In spite of numerous advantages offered by street vended foods, there are also several hazards associated with this sector of the economy. Multiple line evidence revealed that foods exposed to sale on the road side may become contaminated by either spoilage or pathogenic microorganism (mogessie, 1995). Some food like meat, rice fish and fruits have been frequently identified as vehicle in out breaks of food borne diseases in countries where food – borne surveillance data are available (Davey, 1985; Bryan *et al.*, 1988). Among the most common street vended foods, meat and meat products were known to be the major in either processed or unprocessed form (WHO, 1996). Retailing unprocessed raw meat in the street or in an open air market for the public is common in Africa as well as in some parts of asia and latin America (FAO, 1995. Food vendors are unaware of the basic important of personal cleanliness, thus their products are usually vulnerable to gross contamination by flies, insects, rodents, dust and other dirt (Deriba and Mogessie, 2001).

Escherichia coli (E. coli) is the most prevalent infecting organisms in the family of gram negative bacteria known as enterobactericeae (Eisnstein *et al.,* 2000). *E. coli* bacteria were discovered in the human colon in 1885 by German bacteriologist Theodo – Escherich. Escherich also showed that certain strains of the bacterium were responsible for infant diarrhea and gastroenteritis, an important public health discovery. Escherichia coli to honour its discoverer (Peter *et al.,* 2002).

E. coli is a gram negative facultative anaerobic, rod – shaped bacterium of the genus Escherichia, that is commonly found in the lower intestine of warm blooded organisms (endotherms) (Singleton P. 1999). *E. coli* is often referred to as the best or most studied free living organisms (Eisenstein *et al.,* 2000; James, 2000). More than 700 serotypes of *E. coli* have been identified (Eisenstein, 2000 and Griffin *et al.,* 1991) the "O" and "H" antigens on the bacteria and their flagella distinguish the serotypes (Griffin *et al.,* 1991). It is important to remember that most kind of *E. coli* bacteria do not cause disease in human (Eisenstein *et al.,* 2000 and Peter et al, 2002), indeed, some *E. coli* are beneficial, while some cause infections other than gastrointestinal infections, such as urinary track infection (Eisenstein *et al.,* 2000).

The *E. coli* that are responsible for the numerous reports of contaminated foods and beverages are those that produce shiga – toxins, so called because the toxins is virtually identical to that produced by shigella dysenteria type1, the best known and also most notorious *E. coli* 0157:H7 (Eistenstein *et al.,* 2000 and Griffin *et al.,*1991).

. *coli* and other facultative anaerobes constitute about 0.1% of gut flora, and faecal – oral transmission is the major route through which pathogenic strains of the bacterium cause disease. Cells are able to survive outside the body for limited amount of time, which make them potential indicator organisms to test environmental samples for faecal contamination (capriole *et al.,*1997).A growing body of research though, has examined environmentally persistence *E. coli* which can survive for extended period outside of a host.

Virulence Factor

Virulence factors are molecule produced by pathogenic bacteria that contribute to the pathogenicity of the organism and enable them to achieve the following;(Duffy *et al.,*2001)

i. Colonization of a niche in the host (this include attachment to cells).
ii. Immunoevasion, evasion the hosts immune response
iii. Immune suppression inhibition at the hosts immune response
iv. Entry into and exit out of cells (if pathogen is an intracellular one).
v. Obtain nutrition from the host.

Risk Factor

E. coli can affect anyone who is exposed to the bacteria. But some people are more likely to develop problems that are others risk factor include:

i. Age: young children and older adults are at higher risk of experiencing illness cause by *E. coli* and more serious complications from the infection.
ii. Weakened immune system, people who have weakened immune system from AIDs or drugs to the cancer or prevent the rejection of organ transplants are more likely to become ill from ingesting *E. coli.*
iii. Eating certain type of food, risk food include under cooked hamburger. Unpasteurized milk
iv. Time of year, Although it is not clear why the majority of *E. coli* infection occurred
v. Decreased stomach acid levels stomach acid offer some protection against *E. coli.* If you take medication to reduce your level of stomach acid such as esomeprazole (Nexium) you may increase your risk on *E. coli* infection. (Gannon et;al,1997)

Pathogenesis of *E. coli*

Escherichia coli commonly abbreviated as *E. coli* is a gram – negative rod shaped bacterium that is commonly found in the lower intestine of warm – blooded organisms (endotherms).most *E. coli* strains are harmless, but some serotypes are pathogenic and can cause serious food poisoning in humans and occasionally responsible for the spoillage of meats such as cow and goat meat. The harmless strains are part of the normal flora of the gut and can benefit their hosts by producing vitamin K_2, and by preventing the establishment of pathogenic bacteria within the intestine (Mignla,1895).

E. coli and related bacteria constitute about 17% of gut flora, and faecal- oral transmission is the major route through which pathogenic strains of the bacterium causes diseases. Cells are able to survive outside the body for a limited amount of time, which makes them ideal indicator organisms to test environmental samples for faecal contamination. The bacterium can also be grown easily and inexpensively in laboratory settings, and has been intensively investigated for over 60 years. *E. coli* is the most widely studied prokaryotic model organism, and an important specie in the field of microbiology and biotechnology, where it served as the host organism for the majority of work with recombination DNA. German pediatrician and bacteriologist Theodor

Escherich discovered *E. coli* in 1885, and it is now classified as part of the enterobacteriaceae family of gammaproteobacteria.

Serotypes: Pathogenic *E. coli* strains can be categorized based on elements that can elicit an immune response in animal namely:

1) O antigen: Part of lipopolysaccharide layer
2) K antigen: capsule.
3) H antigen flagella

For example *E. coli* strain EDL933 is of the 0157: H7 group. O antigen: The outer membrane of an *E. coli* cell contains millions of lipopolysaccharide (LPS) molecules, which consist of;

1. O antigen a polymer of immunogenic repeating obligosacharide (1-40 units).
2. Core region of phospholated non repeating oligosacharide.
3. Lipid A (endotoxin).

The O antigen is used for serotyping *E. coli* and the O group designations go from 01 to 0181, with the exception of some groups which have been historically removed, namely 031, 047, 067, 072, 093 (now K84), 094 and 0122; groups 174 to 181 are provisional (0174 = 0 x 3and 0175 = 0 x 7) or are under investigation [176 to 181 are STEC/VTEC]. Additionally subtypes exist for many O groups (e.g 0128ab and 0128ac). It should be ruled through that antibodies towards several O antigens.

K antigen:

The acidic capsular polysaccharide (CPS) is a thick, mucous like, layer of polysaccharide that surrounds some pathogen *E. coli*. There are two Serotypes groups of K. antigen groups, named group I and group II (while a small in between subset (K3, K10, and K54/K96) has been classified as group III). The former (I) consist of 100KDa (large) capsular polysaccharides, while the latter (II), associated with extra intestinal disease, are under 50 KDa in size.

H Antigen

The H antigen is a major component of flagella,involve in *E. coli* movement. It is generally encoded by flic gene. There are 53 identified H antigens, numbered from H1 to H53 (H13 and H22 were not not *E. coli* antigens but from citrobacter freundii).

Epidemiology

Travel to less developed countries is associated with higher risk for traveler's diarrhea, including *E. coli* infection. ETEC is the most common pathotype that cause diarrhea among travelers returning from most regions, but other pathotypes can also cause traveler's diarrhea. Travel associated infections caused because most clinical laboratories do not use methods that can detect them. Risk of non STEC diarrhgenic *E. coli* infections (Primarily ETEC) can be divided into 3 grades, ascending to the distinction country.

- Low risk countries include the United states of America, Canada Australia, New Zealand, Japan, and countries in Northern and western Europe.
- Intermediate risk countries include those in eastern Europe's south Africa, and some of the Caribbean islands.
- High risk areas include most of Asia, the middle east, Africa, Mexico, and central and south America.

Transmission

Transmission or pathogenic *E. coli* often occurs via fecal oral transmission. And the common rules of transmission include un-hygienic food preparation, farm contamination due to manure fertilization, irrigation of crops with contaminated grey water or raw sewage, feral pigs on cropland, or direct consumption of sewage contaminated water dairy and beef cattle are primary reservoirs of *E. coli* 0157:H7, and they can carry it asymptomatically and shed it in their feaces. Food products associated with *E. coli* outbreaks include cucumber raw group beef, raw seed sproptes or spinach, raw milk, unpasteurized juice, cheese and food contaminated by infected worker via fecal – oral routes.

According to the U.S food and drug Administration, the fecal oral cycle of transmission can be disrupted by cooking food properly. Preventing cross contamination, instituting barriers such as gloves for food (cow or goat meat) workers, instituting health care policies, so food industry employees seek treatment when they are ill.

Animal Diseases

In animals, virulent strains of *E. coli* are responsible of a variety of diseases, among others septicemia and diarrhea in new born calves acute mastitis in dairy cows, colibacillosis also associated with chronic respiratory disease with mycoplasma where it causes periphatis, pericarditis, septicaemic lungs, peritonitis e.t.c in poultry, and Alabama rot in dogs.

Laboratory Diagnosis

Escherichia coli is found in the faeces and intestinal tract of all meat and poultry animals. Finding this bacterium on a slaughtered and dressed carcass is viewed as an indication that fecal contamination has occurred.

Shiga toxin – producing Escherichia coli (STEC) organisms were first associated with enteric disease in the early 1980s (Riley *et al.,* 1980) reported on the isolation of *E. coli* 0157:H7 from patients who experienced

hemorithagic colitis associated with the ingestion of undercooked hamburgers at a fast food chain. At the same time,(karmali *et al.*,1979) identified a fecal cytotoxin and fecal cytotoxin – producing *E. coli* in patients with hemolytic uremic syndrome (HUS).(Konawalchuk *et al.*,1977) had previously identified this cytotoxin produced by some strains of *E. coli* in 1977, when they reported an irreversible cytopathic effect on vero cells quite distinct from the toxin effect of *E. coli* heat labile toxin.
In countries with high incidence of the *E. coli* 0157:H7 infection, laboratory testing guidelines for the bacteria are available.

Treatment of *E. coli* Infection

In most infected individual, symptoms, of *E. coli* infection last about a week and resolved without any long – term problem. Antibiotics do not improve the illness and some medical researchers the risk of developing HVS (Wong and Farr, 2000). Therefore, apart from good supportive care such as close attention to hydration and nutrition, there is no specific therapy to halt *E. coli* symptoms. The recent finding that *E. coli* 0157:H7 initially greatly speeds blood coagulation may lead to future medical therapies that would forestall the most serious consequences (Chadler *et al.*, 2002) most individuals who do not develop HVS recover within two weeks.

Prevention and Control

Currently, measures to prevent *E. coli* 0157:H7 infection are mainly incorporated into other joint activities of CHP and centre for food safety (CFS), food and environmental Health Department (FEHD),NAFDAC to control food borne disease. There activities focus on three main aspects, namely disease surveillance and public health response, food surveillance and control and health promotion to the public and trade. In the following we examine these current ensures and discuss areas for potential enhancement.

Prior to March 2005 the *E. coli* surveillance programme in slaughter houses required the regular collection of samples from the epidemics of cattle carcasses. Since March 2005 this has been replaced by the generic *E. coli* monitoring programme in line with international trends the USA, UK and Australia. The generic *E. coli* programme is regarded as a more sensitive and effective faecal contaminant indicator to assess and monitor the hygienic practices and sanitation of slaughter houses. In addition, overseas experience shows that *E. coli* surveillance programmes are not effective in enhancing hygiene standards of the slaughter houses. Because of the low prevalence of *E. coli* besides, faecal samples from like cattle have also been collected from slaughter house for continuous monitoring of the prevalence of the bacterium since 2003.

Illness due to contamination is a wide spread health problem. Preventing the spread of *E. coli* infection requires control measures at all stages of the food chain, from agriculture production on the farm, to the preparation of foods in both commercial establishment and at home.(meat). Hygienic education is an essential step in keeping the spreads of *E. coli* to a minimum (Chandler *et al.*, 2002).

Antimicrobial Resistance

A variety of foods and environmental sources harbor bacteria that are resistant to one or more antimicrobial drugs used in medicine and agriculture. Antibiotic resistance in *E. coli* is of particular concern because it is the most common Gram-negative pathogen in humans. The overuse of antibiotics in medicine and agriculture is creating selective pressure foe bacterial resistance (Warren et al ., 2004).The indiscriminate use of antibiotics in medical, veterinary and agricultural industries results in the discharge of antibiotics into the environment. Bacterial infections are usually treated with antibiotics. However the antibiotics sensitivities of different strains of *E. coli* vary widely. As gram – negative organisms. *E. coli* are resistant to many antibiotics that are effective against Gram positive organisms. Antibiotics used to treat *E. coli* include amoxicillin, penicillins, ciprofloxaxin, nitrofurantoin etc.

. Multidrug resistant strains of *E. coli* are a matter of concern as resistance genes are easily transferable to other strains. Pathogen cycling through food is very common and might pose a potential health risk to the consumer. Therefore, in order to avoid this, good hygienic practices are necessary in the abattoirs to prevent contamination of cattle and poultry products with intestinal content as well as forbidding the use of untreated sewage in irrigating vegetables.

The transfer of drug resistance within the gastrointestinal tract is still possible; thus, if our food contains substantial numbers of resistant bacteria, it could be an important source of resistance in faecal flora. It has been suggested that resistance in bacterial populations may spread from one ecosystem to another. The wild dissemination of antimicrobial resistance among bacterial populations is an increasing problem worldwide. Antimicrobial resistance in *E. coli* has been reported worldwide. Treatment for *E. coli* infection has been increasingly complicated by the emergence of resistance to most first-line antimicrobial agents. Over the years, resistance to cephalosporins among members of enterobacteriaceae has increased mainly due to the spreading of Extended-spectrum β-Lactamases (ESBL). As commensal bacteria constitute a reservoir of resistance genes for

(potentially) pathogenic bacteria, their level of resistance is considered to be a good indicator for selection pressure by antibiotic use and for resistance problems to be expected in pathogens.

II. Methodology

Sources and Collection of Sample

10 grams each of fresh cow and goat meat were aseptically collected from retailed outlets and put in a sterile container, while the surface swap of the butchers table was taken by swabbing with a sterile swab moistened with sterile normal saline, placed in a cooler box and transported immediately to the microbiology laboratory for analysis.

Bacterial Isolation

10gm each of cow and goat meat samples were added to 25ml of peptone water (PW) for enrichment. After an overnight incubation at 37^0C for 18hrs, a loopful from the PW was plated onto deoxychocolate citrate agar (DCA) plates and incubated at 37^0C over night and observed for pinkish colonies indicating probably lactose fermenters. Pinkish colonies were picked up,restreaked onto Eosin Methylene Blue Agar (EMB) for another 24hrs at 37^0C. The plate were then observed for characteristic greenish metallic sheen colonies. Pure colonies were picked and stored on nutrient agar slant for biochemical test and sensitivity test .All media used were prepared according to the manufacturer's instructions (see appendix 1).

Gram Staining

A thin smear was made and air dried after which it was head fixed by passing through a flame. It was flooded with crystal violet for 3 minutes and rinsed with water. The smear was flooded with lugols iodine for one minute and rinsed with water. It was decolorized with 95% alcohol and rinsed immediately with water. It was then counterstained with safranin for 1 minute and rinsed with water and allowed to air dry after which it was viewed under X 100 oil immersion objectives

Biochemical Characterization

Preliminary *E. coli* isolate were identified and confirmed after conducting some conventional biochemical tests. The following biochemical tests were carried out.

Indole Test

The test organism was grown in peptone water and incubated at 37^0C for 24 hours to allow for optimum accumulation of indole. A positive result of this test gave a pink colour in the upper most layer of the tube (pink ring) when 0.5ml of Kovacts reagent was added to 5ml of peptone water culture.This test is specifically used for the identification of *E. coli*. This is because *E. coli* has the ability to degrade tryptophan into its component. One of which is indole.

Citrate Utilization Test

This test is one of several techniques used occasionally to assist in the identification of enterobacteria. The test is based on the ability of an organism to use citrate as it's only source of carbon. Slopes of the medium were prepared in bijou bottles as recommended by the manufacture (store at 2 – 8%) using a sterile straight wire loop, the slope was first streaked with a saline suspension of the test organism and then stabbed to the butt. After which it was incubated at 35^0C for 28hrs. Bright blue colouration in the medium indicated a positive test.

MRVP test

Methyl Red

Glucose-phosphate broth was prepared according to manufacturer's instruction.9ml amount of the medium was dispensed into clean test tube and tighten loosely , sterilized by autoclaving and allowed to cool, the organism was inoculated in duplicate and incubated for 24hours, few drops of methyl red reagent was added into the broth culture and observed.

Result; red colour indicates positive organism.

Voges-Proskauer (Vp)

Glucose-phosphate is prepared and sterilized according to the manufacturers instruction, allowed to cooled , the organism was inoculated and incubated for 24hours. 1ml of 40% potassium hydroxide and 3 drops of alpha-napthol was added and rocked gently, allowed to stand for 5minutes.

Result; When there is no development of red color, result is negative (*E. coli).*

Urease Test

Urea agar was prepared, about 5-10ml portion was dispensed into clean test tube to obtain in a slope of about 1 inch butt, sterilized by autoclaving and the test tube was kept in a slanted position to set, a loopful of peptone water broth culture was inoculated onto the surface and incubated for 24 hours.

Result; The color remains yellow (unchanged) in the presence of negative organisms (*E. coli*)

Antibiotic Susceptability Test

Antibiotic sensitivity was carried out according to standard procedure using the Kirby-Bauer disc diffusion method and results interpreted according to NCCLS guide lines (2012). Briefly, a pure colony was picked and inoculated into peptone water and allowed to stand for 5-10minutes. Then a small amount of the sample was

pipette onto the centre of solidified nutrient agar medium. The glass bend spreader was sterilized by dipping it into ethanol and briefly flamed. The spreader was allowed to cool and then used to spread the sample evenly over the surface of the medium. The disc were gently pressed with flamed forceps to become flattened 0n the media and incubated at 37c for 24hours. After incubation, sensitive isolates showed a zone of inhibition around the disc, while resistant organism showed no zone of inhibition. The following antibiotics were used for susceptibility testing. CN=Gentamycin (10µg), S=Streptomycin (30µg), PN=Ampicillin (30µg), SXT= Septrin (30µg), OFX=Tarivid (10µg), CEP=Ceporex (10µg),PEF= Peflacine (10µg), AU=Augmentin (30µg), NA=Nalidixic acid (30µg) and CPX =ciproflax (30µg).

III. Results

On primary isolation on DCA and MacConkey Agar all bacterial isolates from the meat samples showed the typical *E. coli* morphological characteristics. Colonies were pinkish round, smooth,2-3mm in diameter opaque (fig 1). Sub-culturing the colonies EMB produced green metallic sheen colonies (fig 2).

A total of 400 samples were examined during the study period, out of which 200 were samples from cow meat and swab from the butchers table, and another 200 from goat meat and swab from the same sale point**.** Table 1 shows the place of collection of the samples in this study.

Prevalence

Of the 200 samples examined from cow, 100 were from fresh cow meat and 100 surface swab from butchers table with prevalence of 47% and 19% respectively**.** Higher prevalence was observed in the fresh cow meat as indicated in table 2

Antibiotic Susceptibility Test

Antibiotic sensitivity test was done using the 10-Tipped Multiple susceptibility disc (OPTUDISC). 10 different antibiotics were used, each having a given concentration per tip. The discs used contained CN=Gentamycin (10µg), S=Streptomycin (30µg), PN=Ampicillin (30µg), SXT= Septrin (30µg), OFX=Tarivid (10µg), CEP=Ceporex (10µg),PEF= Peflacine (10µg), AU=Augmentin (30µg), NA=Nalidixic acid (30µg) and PN =Ampicilin (30µg).

Isolates from the goat meat showed very high resistance to Ceporex (80.9%) and Ampicilin (80.9%) followed by Nalidixic acid, Septrin, Augmentin with (71.43%),Gentamycin and Streptomycin with 52.4%, Tarivid (42.9%) with Ciproflax and Peflacine having the least resistance with 19.5% and 14.3% respectively.

Also isolates from cow meat exhibited very high resistance to Ampicilin (95.8%) and Nalidixic acid (91.7%) followed by Ceporex, Streptomycin, Augmentin with (79.2%), Septrin (66.7%), Gentamycin (45.8%), Ciproflax (20.8%),Tarivid and Peflacine having least resistance of 12.0% and 8.3% respectively.

Table 1: Place of Sample collection

S/N	Place of sample collection	Source/number of samples			
		Cow	Swabs	Goat	Swabs
1	Monday market	20	20	20	20
2	Unimaid	20	20	20	20
3	Gamboru market	20	20	20	20
4	Bulunkutu market	20	20	20	20
5	Baga road market	20	20	20	20
Total (400)		**100**	**100**	**100**	**100**

TABLE 2: Prevalence of *E. coli* from fresh cow meat and surface swab from butcher's table from different sale points in Maiduguri metropolis

S/ no	Sources of sample	No tested	No of positive isolates	% of positive isolates
1.	Cow meat	100	47	47%
2.	Swab from butchers table of cow meat	100	19	19%
	Total	**200**	**66**	**33%**

TABLE 3: Prevalence of *E. coli* from fresh goat meat and surface swab from butcher's table from different sale points in Maiduguri metropolis

S/ no	Sources of sample	No tested	No of positive isolates	% of positive isolates
1.	Goat meat	100	52	52%
2.	Swab from butchers table of Goat meat	100	21	21%
	Total	**200**	**73**	**36.5%**

TABLE 4: Results of biochemical tests

Biochemical tests	Results
Indole	+
Citrate	–
MR	+
VP	–
Urease	–

TABLE 5: Antibiotic Sensitivity result

Antibiotic	Goat meat (n = 21)		Cow meat (n=24)	
	Sensitive	Resistance	Sensitive	Resistance
Tarivid (OFX)	12 (57.14%)	9 (42.86%)	21 (87.5%)	3 (12.5%)
Reflacine (PEF)	18 (85.71%)	3 (14.29%)	22 (91.67%)	2 (8.33%)
Ciproflax (CPX)	17 (80.95%)	4 (19.5%)	19 (79.17%)	5 (20.83%)
Augmentin (AU)	6 (28.57%)	15 (71.43%)	5 (20.83%)	19 (79.17%)
Gentamycin (CN)	10 (47.61%)	11 (52.39%)	13 (54.17%)	11 (45.83%)
Streptomycin (S)	10 (47.61%)	11 (52.39%)	5 (20.83%)	19 (79.17%)
Ceporex (CEP)	4 (19.5%)	17 (80.95%)	5 (20.83%)	19 (79.17%)
Nalidixic Acid (NA)	6 (28.57%)	15 (71.43%)	2 (8.33%)	22 (91.67%)
Septrin (SXT)	6 (28.57%)	15 (71.43%)	8 (33.33%)	16 (66.67%)
Ampicilin (PN)	4 (19.5%)	17 (80.95%)	1 (4.17%)	23 (95.83%)

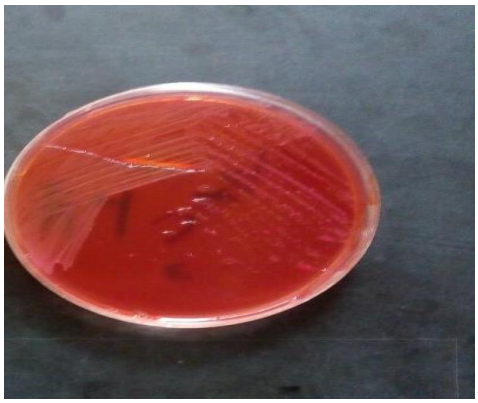

Plate 1: Positive lactose fermenters

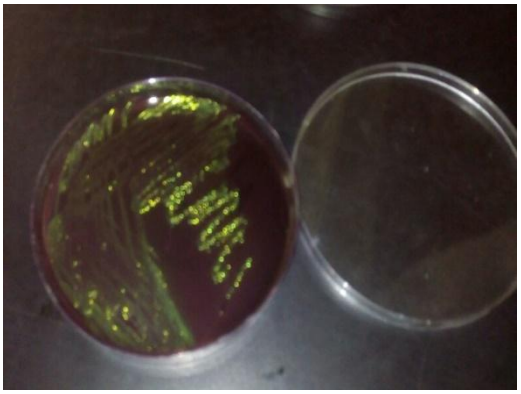

Plate 2: Appearance of *E. coli* on EMB

Plate 3: Indole positive

IV. Discussion

One of the most significant food-borne pathogen that has gained increased attention in recent years is *E. coli*. 400 samples were used in this study out of which 200 samples were cow and goat meat and another 200 samples of swabs from butchers table. The prevalence of *E. coli* from cow meat and its swab in this study is 33% and that of goat 36.5%. This finding is relatively higher than a study reported by Tizeta et al (2014) which reported a prevalence of 13.3% from cow and 7.8% from goat. This difference may be attributed to difference in sample size or geographical location. Antibiotics are often used for therapy of infected humans and animals as well as for prophylaxis and growth promotion of food producing animals. Many findings suggest that inadequate selection and abuse of antimicrobials may lead to resistance in various bacteria and make the treatment of bacterial infections more difficult.

Different antibiotic resistance profile have been reported from different sources including humans, animals and foods in various studies (Magwira *et al.,* 2005; Yeon *et al.,*2006)

In this study isolates of *E. coli* displayed very high resistance to ampicillin (80.9%), ceporex (80.9%) and Augumentin (71.43%). This is in contrast to the study of Abera (2011) which reported high in resistance to erythromycin (89.4%), and Gentamycin (79.6%).

Multi drug resistance of *E. coli* are a matter of concern as resistance genes are easily transferable to other strains pathogen cycling through food and might pose a potential health risk to consumer.

V. Conclusion

This study revealed slightly higher isolation rate of *E. coli* in goat meat compared to cow meat sold at various retail outlets in Maiduguri metropolis, The result of the study indicated that there were poor personal and general hygiene measures in the retail outlets and that workers are not focused on good hygienic practice**.** The result of work shows high rates of antimicrobial resistance to ampicillin, ceporex, and augumentin. Peflacine, Tarivid and Ciproflax are considered appropriate for the treatment of *E. coli* in this study area. Periodic monitoring of antimicrobial susceptibility in the metropolis is recommended.

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